Draft Environmental Impact Statement

Horse Heaven Wind Farm

Chapter 3 - Affected Environment

December 2022

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3.0 CHAPTER 3 – AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes the existing environment without the construction and operation of the proposed Horse Heaven Wind Farm (Project, or Proposed Action), which represents the existing conditions under the No Action alternative.

Chapter 3 has been subdivided into separate sections, one for each element of the environment listed in Washington Administrative Code (WAC) 197-11-444[1] and an additional section describing existing conditions related to the socioeconomic environment:

- Earth Resources (including seismic hazards)
- Air Quality
- Water Resources
- Vegetation
- Wildlife and Habitat
- Energy and Natural Resources
- Land and Shoreline Use
- Historic and Cultural Resources
- Visual Aspects, Light and Glare
- Noise and Vibration
- Recreation
- Public Health and Safety
- Transportation
- Public Services and Utilities
- Socioeconomics

Chapter 4, Analysis of Potential Impacts and Mitigation presents an evaluation of potential impacts to the affected environment.

3.1.1 Use of Applicant-Prepared/Provided Information

This analysis of affected environment is based primarily on information provided by Horse Heaven Wind Farm, LLC (Applicant) in the Application for Site Certification (ASC) for the Project. A variety of documents and information sources provided by the Applicant were used during the preparation of this Draft Environmental Impact Statement (EIS). These Applicant-provided documents include Applicant responses to formal Washington Energy Facility Site Evaluation Council data requests, preliminary engineering plans, and a variety of reports and technical documents prepared by the Applicant's consultants.

However, to support the decision-making process, a Washington State Environmental Policy Act review must be objective. To confirm what the Applicant has presented in their ASC, this Draft EIS used information sourced from independent institutions and government agencies. Additionally, the Draft EIS incorporates the professional judgment of specialists. Their insights and recommendations are supported by data, education, or experience and are substantiated with literature.

Pertinent sources used in addition to the ASC are listed in Chapter 6, References.

[1] Washington Administrative Code (WAC) 197-11-444 includes a list of "elements of the environment" that are typically considered for inclusion during preparation of an Environmental Impact Statement. The SEPA lead agency (i.e., EFSEC) has flexibility to narrow the topics addressed in the EIS within these topic areas.

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3.2 Earth Resources

This section describes existing earth resources and geologic hazards in the State of Washington, the proposed Horse Heaven Wind Farm (Project, or Proposed Action), and within the Project's 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. Section 4.2 presents an evaluation of the Project's consistency with relevant earth resource documents and ordinances and adopted state, county, and local plans, goals, and policies, including the potential impact the Project would have on earth resources.

Regulatory Setting

The State of Washington's Growth Management Act (GMA), Revised Code of Washington 36.70A, requires all cities, towns, and counties in the state to identify critical areas and establish regulations to protect and limit development in those areas. Among the critical areas defined by the GMA are frequently flooded areas and geologically hazardous areas. As defined by Washington Administrative Code (WAC) 365-190-120, geologically hazardous areas are areas that are susceptible to erosion, landslide, seismic activity, or other geological events such as coal mine hazards, volcanic hazards, mass wasting, debris flows, rock falls, and differential settlement. The GMA requires that local governments establish critical area protection programs that address the following:

- Protecting members of the public, public resources, and facilities from injury, loss of life, or property damage due to landslides and slope failures, erosion, seismic events, volcanic eruptions, or flooding
- Maintaining healthy, functioning ecosystems through the protection of unique, fragile, and valuable elements of the environment
- Directing activities not dependent on critical area resources to less ecologically sensitive sites, and mitigating unavoidable impacts on critical areas by regulating alterations in and adjacent to those areas
- Preventing cumulative adverse environmental impacts on frequently flooded areas

As defined by WAC 463-62-020, the seismicity standard for construction of energy facilities shall be the standards contained in the state building code.

3.2.1 Affected Environment

The Lease Boundary is located in the Horse Heaven Hills area of Benton County, Washington, within the larger Columbia Basin Physiographic Province of Washington and the wider Pacific Northwest region of the United States and British Columbia, Canada (Clarke and Bryce 1997).

3.2.1.1 Regional Geology

The geology and earth resources within the Lease Boundary are part of, and subject to, geological forces and processes affecting the wider Pacific Northwest region, which includes Oregon, Washington, Idaho, and British Columbia. This section provides a brief description of the major regional geological processes that have produced the earth resources within the Lease Boundary and Project vicinity.

Geological Processes – Plate Tectonics

The geological history of the Pacific Northwest reflects the evolution of plate tectonic forces. In the region of the proposed Project, between about 17 and 6 million years ago, large volumes of lava erupted from deep crustal fissures above a "mantle hotspot." These basalt flows make up the Columbia River Basalt Group, which is the

most common type of exposed rock in the region. The recent geology of the Pacific Northwest region has been strongly influenced by geological processes associated with the convergence of three major tectonic plates:

- North American
- Juan de Fuca
- Pacific

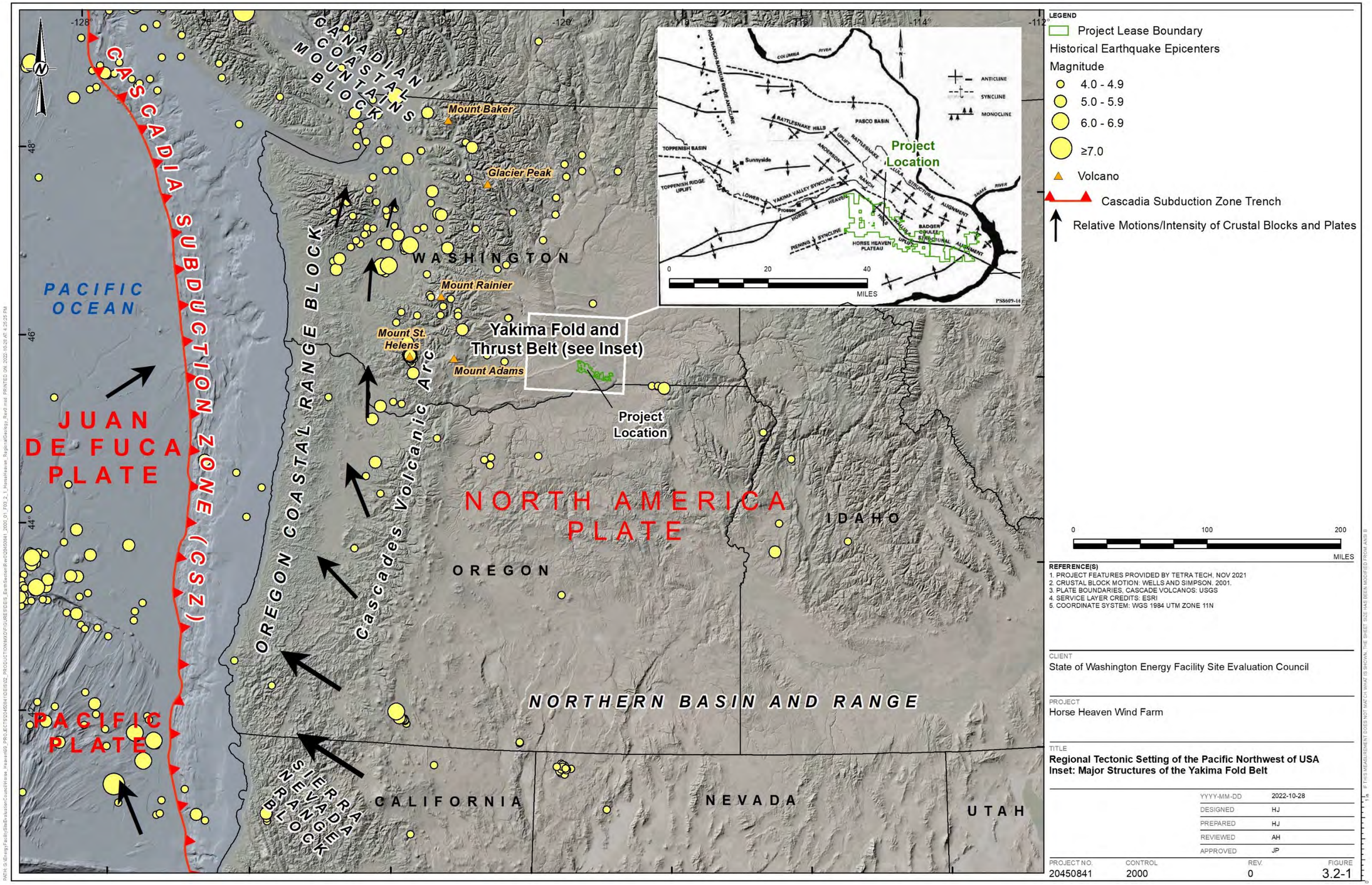
The region where the Juan de Fuca and North American tectonic plates interact is known as the Cascadia Subduction Zone (CSZ). The Juan de Fuca plate is entirely oceanic (below sea level) and is slowly sinking and moving eastward beneath the western edge of the North American plate (Yeats 2004). This type of movement is known as subduction. The Pacific plate is also an oceanic tectonic plate that lies beneath the Pacific Ocean and adjoins the Juan de Fuca plate. The separation of the Pacific and Juan de Fuca plates causes the Juan de Fuca plate to move eastward, beneath the western edge of the North American plate. As the Juan de Fuca plate moves away from the Pacific plate, the gap between the plates is filled with molten rock to form regions known as "spreading centers" that have many hot springs and undersea eruptions. The rate of the Juan de Fuca plate's eastward movement is about 2 inches per year (Swanson et al. 1989). This slow movement drives most of the active geological processes observed in the Pacific Northwest. These processes include the generation of large and small earthquakes, formation and eruption of volcanoes, and uplift and folding of the earth's surface.

The relative motions of the tectonic plates cause changes in the structure of the rocks in the overlying North American plate. Ongoing plate movements along the western edge of the North American plate have broken it into smaller pieces or crustal blocks. As shown in **Figure 3.2-1**, these blocks include the Oregon Coastal Range, Canadian Coastal Mountains, and Sierra Nevada blocks. The northward motion of the Oregon Coastal Range block has pushed western Washington against the Canadian Coast Mountains, which have not moved relative to the rigid North American plate. This process has caused most of Oregon and southwest Washington to rotate clockwise relative to North America at a rate of 0.4 to 1.0 degrees per million years (Wells and Heller 1988; Wells and Simpson 2001; Brocher et al. 2017). These rotations and block movements result in north-south-directed compression and the folding of the earth's crust in Washington.

The north-south-directed compression and folding in the shallow crust of eastern Washington has formed the Yakima Fold and Thrust Belt (YFTB). The YFTB is expressed as a series of alternating ridges and valleys known as anticlines (ridges) and synclines (valleys). An "anticline" is the geologically high part of one or more geological units that have been folded by geological forces. A "syncline" is a geological trough and, therefore, the lower part of one or more geological units. As shown in the inset in **Figure 3.2-1**, the geologically young ridge-and-valley topography of the YFTB consists of narrow anticlinal ridges up to 2,000 feet high, separated by broad synclinal valleys 1 to 10 miles wide over an area of about 5,500 square miles in eastern Washington (Reidel et al. 2003).

Geological Processes – "Ice Ages"

Another major impact on the geology of the region was the advance and retreat of the major continent-wide glaciers of many "ice ages" over at least the last million years. During the most recent period of major glaciation from about 15,000 to 10,000 years ago, glaciers created an ice dam on the Clark Fork River in northern Idaho. This caused the river to back up and form a lake, known as Lake Missoula. At the end of the ice age, ice began to melt, causing water to flow into the lake and further increase its size.



REFERENCE(S)
1. PROJECT FEATURES PROVIDED BY TETRA TECH, NOV 2021
2. CRUSTAL BLOCK MOTION: WELLS AND SIMPSON, 2001.
3. PLATE BOUNDARIES, CASCADE VOLCANOS: USGS
4. SERVICE LAYER CREDITS: ESRI
5. COORDINATE SYSTEM: WGS 1984 UTM ZONE 11N

CLIENT
State of Washington Energy Facility Site Evaluation Council

PROJECT
Horse Heaven Wind Farm

TITLE
Regional Tectonic Setting of the Pacific Northwest of USA
Inset: Major Structures of the Yakima Fold Belt

YYYY-MM-DD	2022-10-28
DESIGNED	HJ
PREPARED	HJ
REVIEWED	AH
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
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Figure 3.2-1: Regional Plate Tectonics

As the ice melted, glacial Lake Missoula overwhelmed the ice dam, causing it to suddenly collapse and release large-scale flooding across eastern Washington and around the Columbia River. This event caused huge volumes of lake water to flow rapidly west to the Pacific Ocean. Over a period of about 2,000 years, the ice dam of glacial Lake Missoula failed repeatedly, draining the lake and causing great floods down the Columbia River. These sudden releases of water carved wide and deep channels into the underlying basalt bedrock, forming a stripped and eroded “channeled scabland” landscape.

Evidence of the repeated flooding events caused by Lake Missoula can be seen today at the Wallula Gap and Grand Coulee. The Wallula Gap and Grand Coulee form a two-stage canyon 50 miles long and up to 900 feet deep. The giant floods through the Wallula Gap and Grand Coulee discharged an estimated 350,000,000 cubic feet per second each time the lake flooded. The extensive flooding from the repeated collapses of the Lake Missoula ice dams stripped most of the near-surface layers of topsoil and glacial deposits in eastern Washington and northern Oregon. Flood events before the last ice age deposited the older glacial and glacial lake sediments in western Washington and the Pacific Ocean. These sediments were subsequently blown back into the Columbia Basin by the dominant southwesterly winds (Sweeny et al. 2017). Geologists refer to these wind-blown silt and fine sand deposits as eolian loess.

3.2.1.2 Site Conditions

Geology

As shown in **Figure 3.2-2**, the surficial geology of the Lease Boundary consists of Columbia River Basalt Group lava flows that are overlain by wind-blown loess and some glaciolacustrine deposits. The Geologic Map of Washington describes the Lease Boundary geology as Quaternary-age (last 2.6 million years) non-marine loess and glaciolacustrine deposits consisting of the following:

- Homogeneous and unconsolidated fine-grained sand and silt with some gravel, clay, and diatomaceous earth
- Miocene-Pliocene dark gray, fine-grained basalt commonly interbedded with conglomerate, sandstone, and siltstone (Huntting et al. 1961).

As illustrated in **Figure 3.2-2**, the local bedrock is consistent with the Columbia River Basalt Group, with many lava flows interbedded with sedimentary layers formed by the erosion and deposition of the volcanic rocks. These basalt rocks and lava flows underlie the wind-blown loess and silt and form the bedrock within the Lease Boundary.

On-site Geotechnical Investigation

Horse Heaven Wind Farm, LLC (Applicant) conducted a preliminary geotechnical investigation of the Lease Boundary. The investigation found that:

- Basalt was encountered at various stages of weathering at depths of 5 to 45 feet below ground surface (bgs).
- Two basalt core samples from the geotechnical drilling were laboratory tested to evaluate the strength of the basalt for proposed facility foundations. The in-situ moist unit weight of basalt on site is estimated at 170 pounds per cubic foot, and the compressive rock strength of the basalt ranges from 470 to 2,415 tons per square foot.

The Applicant’s preliminary geotechnical evaluation concluded that variability in compressive strength reflects the variability in the degree of weathering and fracturing of the basalt on site (Horse Heaven Wind Farm, LLC 2021).

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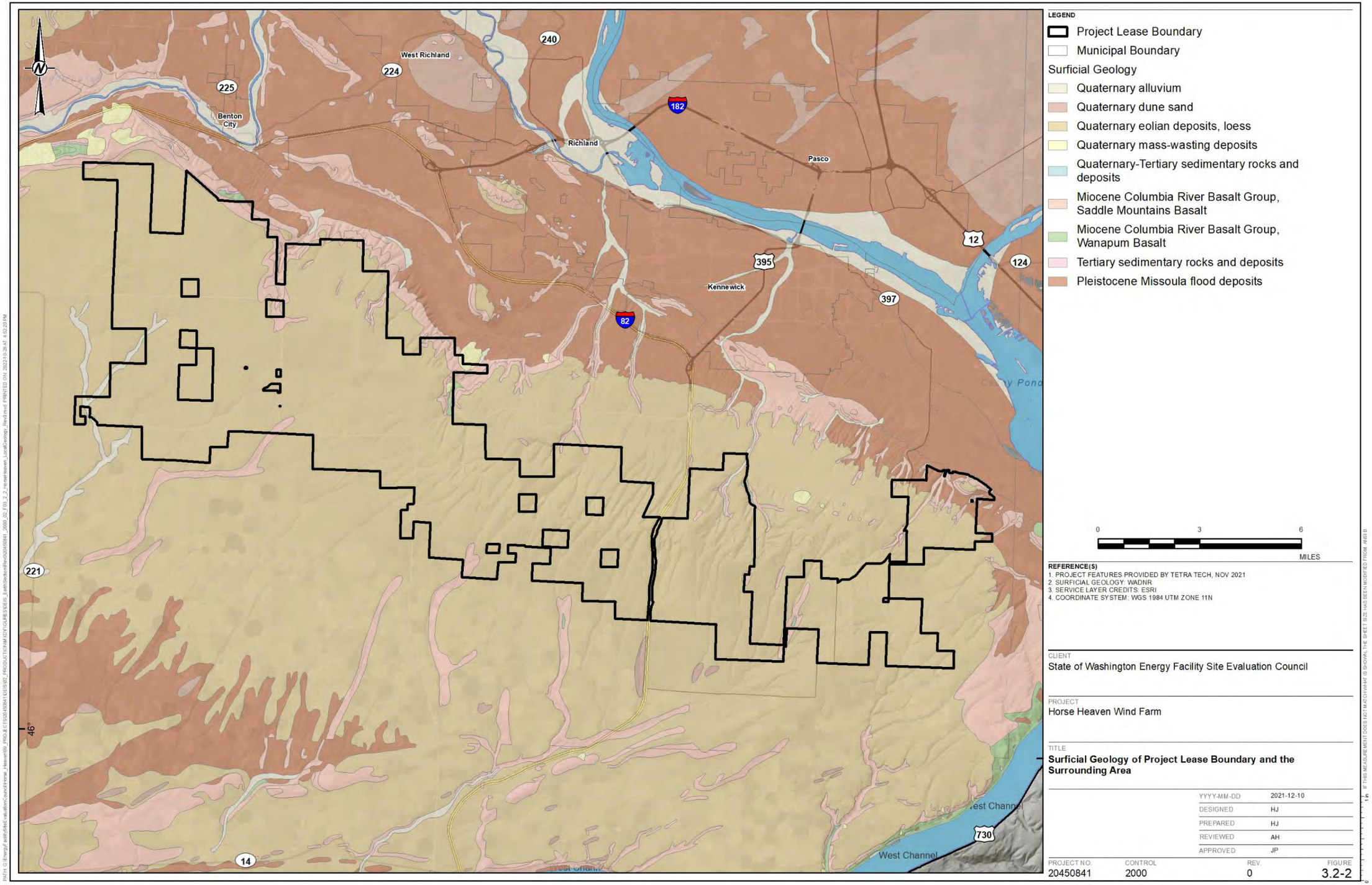

Figure 3.2-2: Project Vicinity and Lease Boundary Geology

Soils

To evaluate potential surface impacts from the Project, it is important to assess the types of soils at the site. The Applicant's preliminary geotechnical investigation report indicates that loess covers most of the Lease Boundary. Based on the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Web Soil Survey data, and as shown in **Figure 3.2-3**, the most prominent and widely distributed soil unit mapped within the Project area is Ritzville Silt Loam (USDA 2021).

The NRCS maps Ritzville Silt Loam within the Lease Boundary as a silt loess (ML). This mapping unit is characteristic of the loessial and glaciolacustrine deposits from the post-glacial Lake Missoula flood events. Less extensive soil units intermixed across the Lease Boundary include silt loams, fine sandy loams, very fine sandy loams, stony fine sandy loams, and very stony silt loams.

The most prevalent natural soil cover across the Lease Boundary is very loose to medium dense silt, with varying amounts of sand (loess). In some places, the soil has been modified by natural and agricultural activities. The Applicant's preliminary geotechnical study presented in the Application for Site Certification (ASC) describes the soil stratigraphy for the Lease Boundary as follows:

- **Topsoil.** Generally light brown and silty, with low to moderate organic content and active roots. Thicknesses range from non-existent to approximately 4 inches bgs. Topsoil layers are assumed to be thicker in topographic low areas and pastureland.
- **Silt, Silt with Sand, Sandy Silt.** Underlying the topsoil across the Lease Boundary is a wind-blown silt, or loess, with varying amounts of sand. The silty material within the Lease Boundary is light brown to brown, dry to damp, very loose to medium dense, and occasionally lightly cemented. Loess is encountered directly beneath the topsoil and occasionally extends to the underlying basalt, with thicknesses ranging from 5 to greater than 60 feet bgs.
- **Silty Sand.** Silty sand, with varying amounts of gravel, underlies the loess in some places. This soil unit is typically light brown to brown, dry to damp, and medium dense to very dense (Horse Heaven Wind Farm, LLC 2021).

Expansive soils can occur in areas where repeated changes in moisture content such as rainfall, irrigation, perched groundwater, or drought result in the formation of expansive clays. Shrinking and swelling of expansive clay soils can cause changes in foundation conditions that require special engineering. However, the Web Soil Survey data classify the soils within the Lease Boundary as generally having a low potential for soil expansion (USDA 2021).

On-site Soils Investigation

The Applicant performed laboratory tests on representative soil samples collected from the Lease Boundary to aid in the classification and evaluation of physical properties and engineering characteristics of site materials. The Applicant's preliminary geotechnical investigation for the Lease Boundary describes the geotechnical characteristics of the Lease Boundary's soils as follows:

- The in-situ gravimetric moisture contents of the soils range from approximately 2 to 5 percent, averaging 8 percent. These levels indicate relatively low levels of soil moisture. The in-situ moist unit weight of soil on site is estimated at 80 to 110 pounds per cubic foot for all soil types.
- The friction angle for the silty loess encountered on site is estimated to range from 28 to greater than 40 degrees, very loose to very dense soil (Horse Heaven Wind Farm, LLC 2021).

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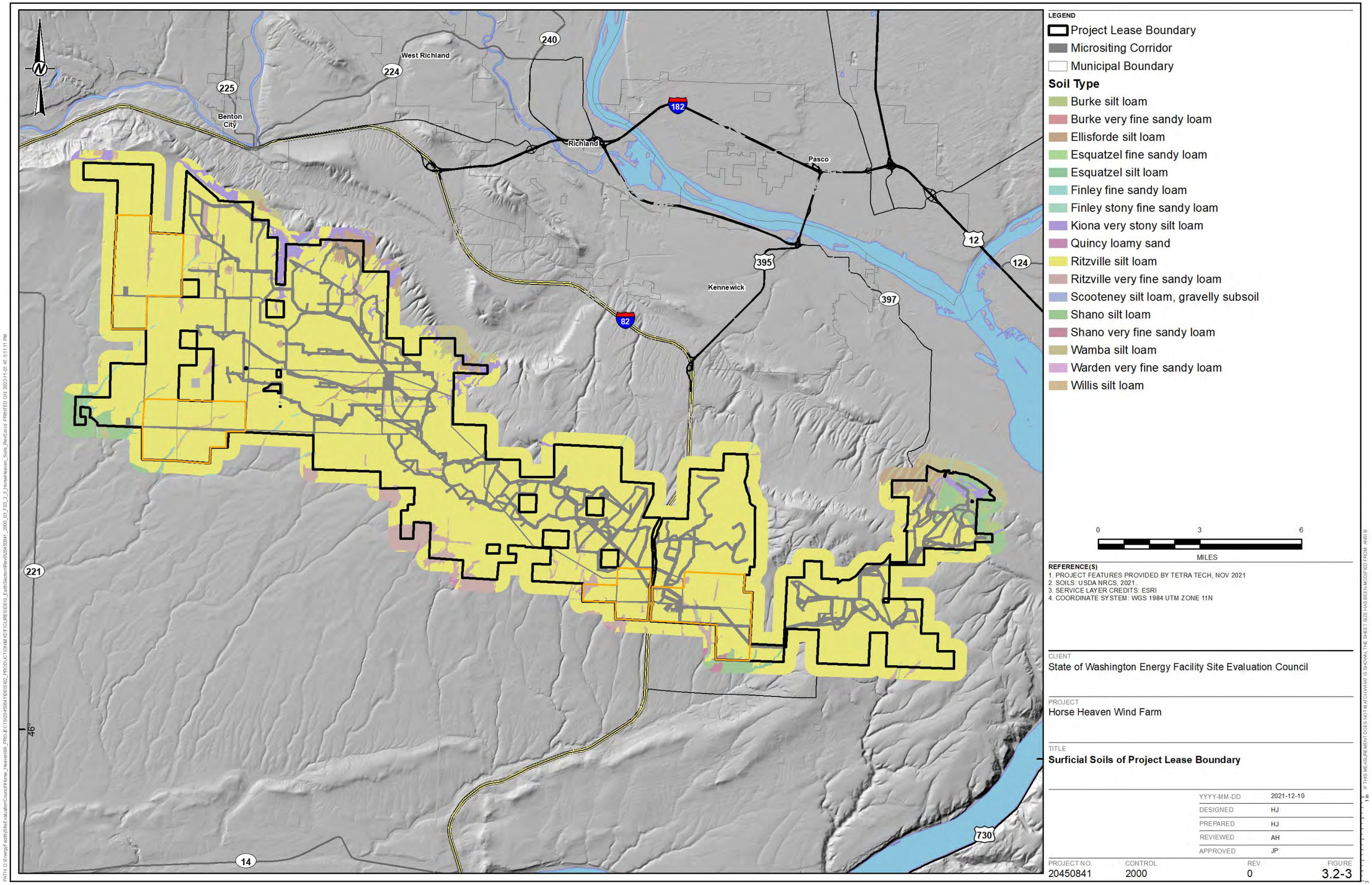

Figure 3.2-3: Lease Boundary Soils Data

The soil borings, descriptions, and laboratory tests indicate that the Lease Boundary is primarily underlain by very loose to medium dense silt. The loose silt layers are considered compressible and could be susceptible to static settlement upon loading. The shallow soil within the Lease Boundary is susceptible to collapse upon wetting. Soil collapse occurs when a relatively loose, dry, low-density material is inundated with water and subjected to a load. The Applicant's preliminary geotechnical investigation report concluded that the collapse potential of soils within the Lease Boundary is moderate to high. Loess silt is particularly prone to collapse because of its depositional mode (i.e., wind) and can result in development of a loose, low-density soil profile.

If fine- to medium-grained granular soils (silt and fine sand) are saturated during earthquake-induced strong ground shaking, they can lose strength through liquefaction. Under high levels of ground shaking, saturated loess silt deposits could become susceptible to soil liquefaction. The dense, coarse-grained sand and gravel layers within the Lease Boundary are much less susceptible to liquefaction (Horse Heaven Wind Farm, LLC 2021). Soil liquefaction processes are described further under General Earthquake Hazards, below.

Topography

The topography of the Columbia Basin Province is characterized by steep river canyons, sharp ridge lines, and broad plateaus. The Horse Heaven Hills ridgeline lies along the northern border of the Lease Boundary. To the south of the ridgeline, the topography is dominated by rolling hills and undulating plains, crossed by meandering canyons, with some ephemeral or intermittent drainage channels. As illustrated in **Figure 3.2-4**, the Lease Boundary is located on the Horse Heaven Hills ridgeline anticline at the eastern edge of the YFTB.

There are no major rivers or other perennial streams within the Lease Boundary. The elevation of the Lease Boundary ranges from 604 to 2,051 feet above mean sea level. The nearest major water bodies are the Columbia and Yakima Rivers. Both rivers are topographically lower than the Lease Boundary. At its nearest location, the Yakima River passes 1.5 miles north of the western part of the Lease Boundary. The Columbia River is located north, east, and south of the Lease Boundary. At its nearest location, the Columbia River is 1.3 miles away from the Lease Boundary's eastern border (Horse Heaven Wind Farm, LLC 2021).

Groundwater

Local water well depths within the Lease Boundary reportedly range between 55 and 1,506 feet bgs (Ecology 2020). During the Applicant's geotechnical investigation, boreholes were evaluated for the presence and level of any groundwater during and shortly after drilling operations. The boreholes did not display a static groundwater level (Horse Heave Wind Farm, LLC 2021). Sections 3.4 and 4.4 evaluate the Project's anticipated impacts on groundwater resources.

3.2.1.3 Geological Hazards

Geologic hazards include earthquakes, landslides, debris flow flooding, problem soils, and rock and volcanic hazards. This section discusses geological hazards that could impact the Project and Lease Boundary.

General Earthquake Hazards

The magnitude of an earthquake is measured by analyzing records from an array of regionally deployed seismometers. The most common magnitude scale now used by seismologists is the moment magnitude, expressed as M_W or M. This scale measures the energy released at the earthquake source. The M_W and most other earthquake magnitude scales are logarithmic, meaning that an earthquake of M_W 6 releases about 30 times more energy at the source than an M_W 5 earthquake. Most people do not feel earthquakes smaller than M_W 3

unless they are within approximately 5 miles of the epicenter and the earthquake is less than about 10 miles deep. The main hazards associated with earthquakes within the Pacific Northwest are:

- Surface fault rupture
- Strong ground shaking
- Soil liquefaction
- Surface fault rupture
- Tsunami and seiche

Earthquake hazards in the Pacific Northwest are primarily related to ongoing activity in the CSZ, with the convergence of the North American and Juan de Fuca tectonic plates. **Figure 3.2-4** presents the tectonic setting of the Pacific-Juan de Fuca-North American plate boundary region in the Pacific Northwest. The major types of earthquakes that occur in the Pacific Northwest region are:

- **Megathrust CSZ Earthquakes:** Also referred to as a subduction interface earthquake, this type results from shallow rupture at the interface or boundary between the Juan de Fuca and the overriding North America plate tectonic plates less than 30 miles from the surface.
- **Deep CSZ Earthquakes:** Also referred to as a subduction in-slab earthquake, this type results from stresses within the subducting Juan de Fuca plate beneath the plate interface during its slow descent beneath the Pacific Northwest.
- **Shallow Crustal Earthquakes:** Also referred to as a background earthquake, this type originates along known and mapped crustal fault zones. These earthquakes are known as crustal fault earthquakes. There are also shallow crustal earthquakes that are not associated with mapped faults and occur within the region between the mapped faults.

Convergence of the Juan de Fuca and the North American plates along the CSZ generates subduction interface earthquakes. The earthquakes are generated by sudden rupture along the upper, brittle part of the Juan de Fuca-North American plate boundary. Subduction interface earthquakes are infrequent, but when they do occur, they can be up to M_W 9+. Subduction interface earthquakes of this magnitude have not been recorded in the Pacific Northwest in written history, but geologic evidence along the Pacific Coast, from Northern California to British Columbia, indicates that multiple CSZ subduction interface earthquakes of M_W 8+ to M_W 9 have occurred during the last 10,000 years (e.g., Atwater et al. 1995, 2005; Clague at al. 2000; Kelsey et al. 2005; Nelson et al. 2006). The last known subduction interface earthquake in the Pacific Northwest occurred in January 1700, just over 300 years ago. Geological evidence indicates that such great earthquakes have occurred at least seven times in the Pacific Northwest over the last 3,500 years. This represents an average recurrence return interval of 400 to 600 years (Pacific Northwest Seismic Network 2021).

As the Juan de Fuca plate subducts beneath the North American plate, the increase in rock and bending stresses within the plate can lead to subduction in-slab earthquakes. In-slab earthquakes have lower maximum magnitudes and are deeper than megathrust subduction interface earthquakes. Most CSZ in-slab earthquakes have been recorded beneath the Puget Sound region; the largest historical in-slab earthquakes are the 1949 M_W 6.9 Olympia, the 1965 M_W 6.7 Seattle-Tacoma, and the 2001 M_W 6.8 Nisqually earthquakes.

The subduction of the Juan de Fuca plate also compresses and deforms the western edge of the North American plate to form crustal faults and folds. Crustal fault earthquakes are caused by rupture of shallow faults that extend to depths of up to 15 miles. Background earthquakes are generated by unmapped and deeper faults within the shallow crust away from known and mapped faults.

In addition to the major types of earthquakes that occur in the Pacific Northwest, the region's active volcanoes can also cause earthquakes. Volcanic earthquakes are not caused directly by tectonic plate motion, but rather occur during upward migration of molten rock (magma) beneath and within the present-day volcanoes of the Cascade Ranges. These earthquakes are local to the volcanic centers and typically are not felt away from the volcano and its immediate surrounding area. During larger volcanic eruptions, such as Mount St. Helens in 1980, volcanic earthquakes may cause strong shaking several miles from the volcano.

Project-specific Earthquake Hazards

The State of Washington experiences more than 1,000 earthquakes annually. Over the last 125 years, Washington has experienced more than 20 damaging earthquakes. Most of the earthquakes that happen in Washington occur in western Washington, but several have occurred east of the Cascade crest. For instance, the 1872 Lake Chelan earthquake occurred in eastern Washington and is one of the state's largest recorded earthquakes (Benton County 2019).

Within central Washington, the Wallula Fault Zone runs through Benton County. Researchers have suggested that the fault zone has the potential to produce a magnitude 7.5 earthquake. If an earthquake of this magnitude were to occur, it would generate very strong ground shaking with the potential to cause surface cracking, soil liquefaction, and damage to infrastructure throughout Benton County (Benton County 2019).

Surface Fault Rupture

The initial displacement along a fault, also referred to as a fault rupture, releases energy that moves away from the fault as seismic waves. In larger earthquakes that have a moment magnitude of 6, the fault can rupture to the ground surface. Surface fault rupture results in large differential ground displacements of up to 30 feet. Surface fault ruptures can cause structural damage to buildings, bridges, and other infrastructure located across the fault rupture.

Project-specific Hazard - Surface Fault Rupture

While tectonic plate subduction zones along the Pacific Coast can produce large, devastating earthquakes, the smaller faults within the eastern part of Washington typically produce small to moderate size earthquakes. Benton County and its neighboring counties experienced approximately 4,200 earthquakes between 1969 and 2018. The largest concentrations of earthquakes occurred in the northwest corner of Benton County and the vicinity of Wooded Island in the Columbia River. A swarm of earthquakes near Wooded Island occurred in 2009, and a similar cluster occurred southeast of Prosser in 2000. The largest earthquake to occur as part of the Wooded Island and Prosser events had a magnitude of 3.0 (Benton County 2019).

Figure 3.2-5 shows earthquake epicenters surrounding the Lease Boundary. Earthquake epicenters are not known to have been located within the Lease Boundary. Earthquake data obtained from the Pacific Northwest Seismic Network indicate that 48 earthquakes of M_W <4 have had epicenters within about 20 miles of the Lease Boundary, with three epicenters of M_W 3 to 3.7 occurring adjacent to the Lease Boundary. Larger historical earthquakes greater than M_W 4 are unknown to have occurred in Benton County. Three earthquakes of M_W 4.3 occurred in 1979 and 1991, with epicenters located within 50 miles of the Lease Boundary (USGS n.d.[a]).

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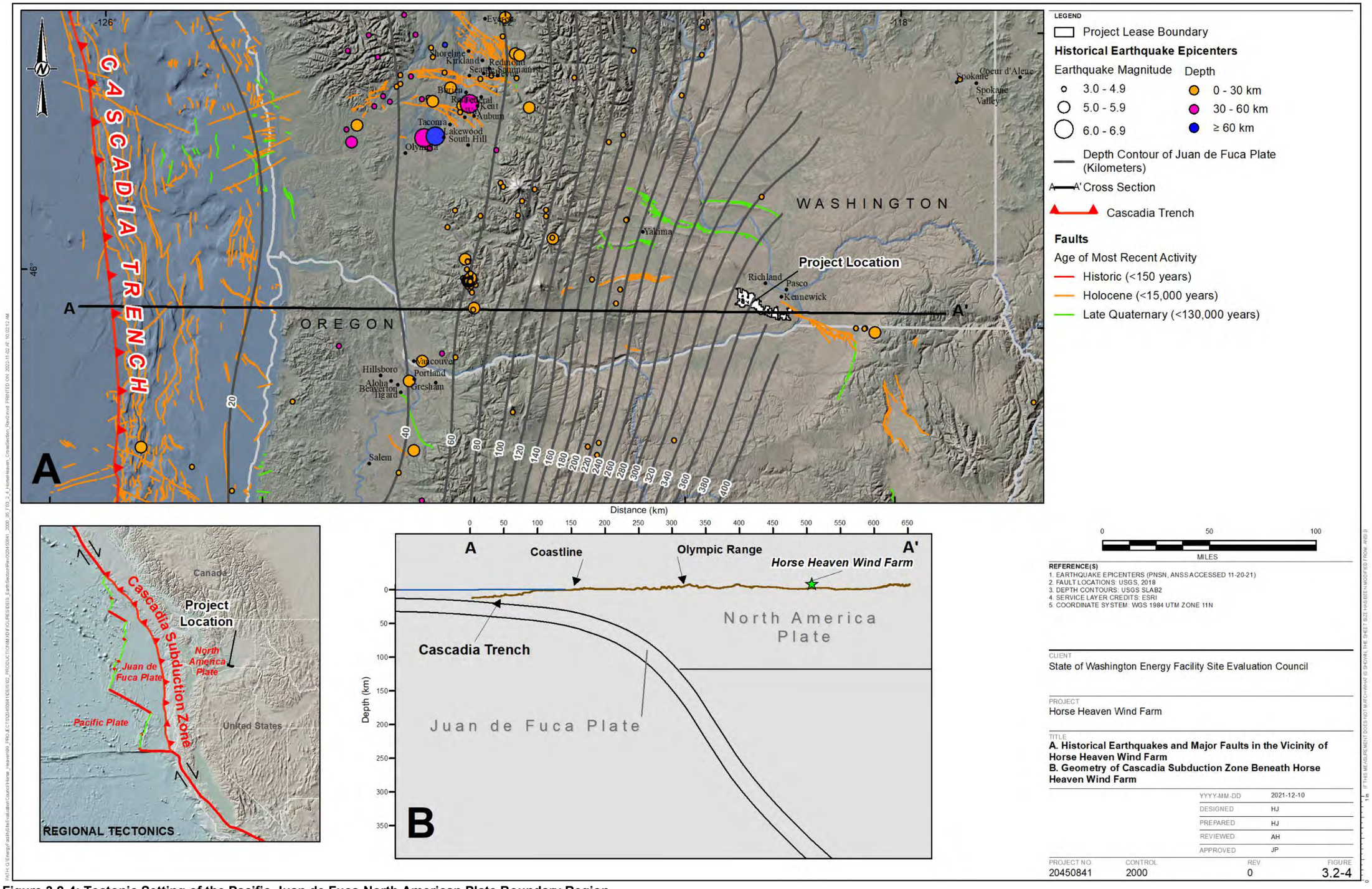


Figure 3.2-4: Tectonic Setting of the Pacific-Juan de Fuca-North American Plate Boundary Region

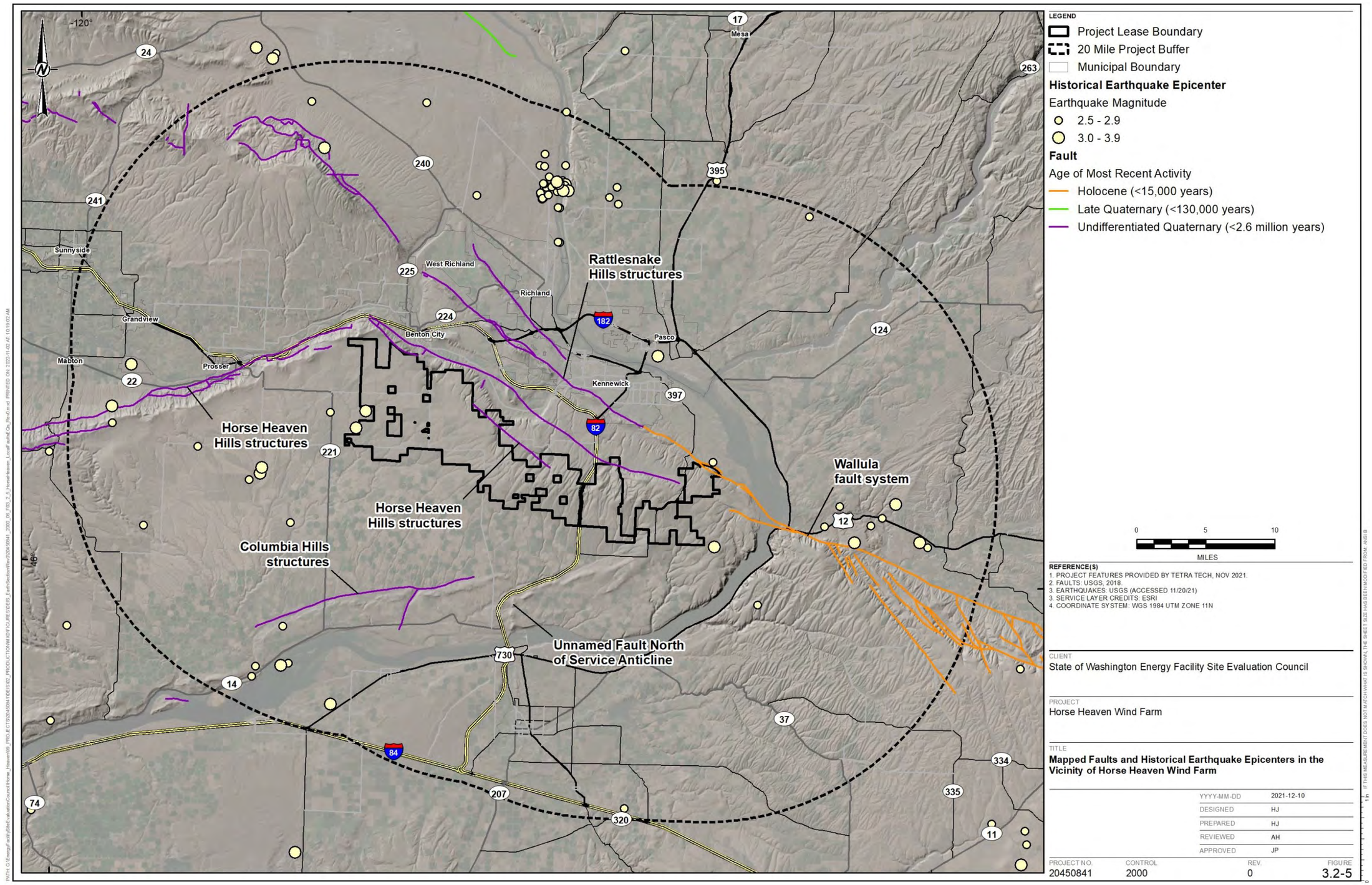


Figure 3.2-5: Earthquake Epicenters within the Project Region

The northeast- and northwest-trending, Quaternary (<2.6 million years old) thrust faults identified beneath the Horse Heaven Hills are present along the northern edge of the Lease Boundary. The northeast-trending faults underlying the Columbia Hills are located south of the Lease Boundary. To the southeast of the Horse Heaven Hills, and east of the Lease Boundary, are the northwest-trending, strike-slip faults of the Wallula fault system. The Wallula fault system is a prominent northwest-striking fault zone that extends from near Milton-Freewater, Oregon to near Kennewick, Washington. These fault locations are inferred, as accurate locations for the faults are not well known. The absence of mapped fault traces and instrumentally recorded earthquakes suggests that surface fault rupture is not a potential hazard within the Lease Boundary.

Strong Ground Shaking

Strong ground shaking from earthquakes is the most widespread hazard in the Pacific Northwest. Strong ground shaking during an earthquake can cause damage to engineered structures. Earthquake damage from shaking at a given location depends on:

- The structure of the earth between the earthquake source and the site (i.e., travel path)
- The properties of the near-surface soil and rock beneath the site
- The type, design, and construction of the structures subjected to the shaking

The intensity of earthquake ground motion is measured by several parameters. The horizontal peak ground acceleration (PGA) is the largest acceleration experienced by the ground at a given location during earthquake shaking. The U.S. Geological Survey (USGS) has developed the Unified Hazard Tool, which can be used to estimate a project-specific PGA and other important information used by engineers in designing facilities to resist earthquake shaking.

Properties that have a high risk of seismicity are in regions that have a 10 percent or greater probability of the maximum PGA equal to or greater than 0.15 gravity at any point in a 50-year period (Fannie Mae 2017). The USGS Unified Hazard Tool indicates that the Lease Boundary maintains a 2 percent probability of experiencing strong ground shaking within a 50 year-year period (USGS n.d.[b]).

Soil Liquefaction

Soil liquefaction is the temporary change of sandy soil from a solid state to a state with properties more like a liquid than a soil. Seismic liquefaction typically occurs when loose sandy or silty sand soils with poor drainage are saturated and experience strong ground shaking (Youd and Idriss 2001). Soils most prone to liquefaction are saturated, non-cohesive soils in areas that are frequently saturated near the ground surface. Soils susceptible to liquefaction are typically less than 50 feet bgs. Loose to medium dense sands, or soft to medium-stiff, low plasticity silts, are particularly susceptible to liquefaction because earthquake ground shaking can increase the pore pressures in the saturated soil materials.

The potential for liquefaction increases when ground shaking is prolonged. For example, megathrust subduction interface earthquakes tend to have more than 1 minute of strong shaking and are, therefore, more likely to induce liquefaction in susceptible soils. Liquefaction can result in ground settlement and sideways movement into surrounding areas along riverbanks or stream channels. This settlement can contribute to the loss of some bearing capacity for both shallow and deep foundations. Liquefaction-induced dynamic settlement and reduced bearing capacity can adversely affect structures.

Project-specific Hazard - Soil Liquefaction/Slope Failure/Lateral Spread

Soils most prone to liquefaction are saturated non-cohesive soils in areas that are frequently saturated near the ground surface (i.e., less than 50 feet bgs). The Applicant's preliminary geotechnical investigation report finds that the soils within the Lease Boundary are silts with varying amounts of sand extending from 5 to 60 feet bgs with no observable groundwater. The results presented in the ASC are in alignment with the USDA NRCS Soil Survey, which indicates that the soils within the Lease Boundary are generally well drained and that approximately 98 percent of the soils maintain moderate permeability and moderate runoff potential. Within the Lease Boundary, the Benton County Geologically Hazardous Areas Map shows restricted areas of moderate to high potential for liquefaction (Benton County 2021). These soils are inferred as soft to stiff, with soil Site Class D to E, as used in the 2018 IBC/ASCE 7-16 building code.

Tsunamis and Seiches

Tsunamis are long-duration (i.e., more than 20 minutes) ocean waves that are usually generated offshore by earthquakes, landslides, and volcanic eruptions that displace the seafloor. Tsunami waves can reach from a few feet to tens of feet in height and can inundate coastal and nearby low-lying inland areas. Tsunami risk is greatest near ocean shorelines and river mouths. Landslides generated on land that enter waterbodies with enough force to displace water can also cause localized tsunamis waves. These localized tsunamis can occur along rivers, lakes, or ocean shorelines.

Seiches are oscillating water waves that can occur in any enclosed or partially enclosed waterbodies such as lakes and rivers. Seiches are caused by earthquakes, volcanic activity, landslides, or extreme wind or weather events (USGS n.d.[c]). Seiches are hazardous when their extreme vertical waves approach shallow water or shorelines.

Project-specific Hazards – Tsunamis and Seiches

Coastal tsunamis are generated by earthquakes from the CSZ. They are not a potential hazard within the Lease Boundary as the Project is more than 250 miles from the Pacific Coast and 604 to 2,051 feet above mean sea level. Additionally, there are no major rivers or other perennial streams within the Lease Boundary.

After the 1964 Alaska earthquake, very minor (<1 foot) seiches were reported in the non-free-flowing upper section of the Columbia River system from McNary Reservoir (8 miles south of the site) to Franklin D. Roosevelt Lake (Grand Coulee Dam) (McGarr and Vorhis 1968). As previously noted, the Columbia and Yakima Rivers are topographically lower than the Lease Boundary and not subject to potential river and lake seiche effects.

Landslide Hazards

The USGS defines a landslide as the movement of a mass of rock, debris, or earth down a slope under the direct influence of gravity (USGS n.d.[d]). Landslide-caused disaster events within the State of Washington are a rare occurrence. Landslides are rare, but when they do occur, they have a major impact on the state's transportation systems, communities, and natural resources, causing severe property damage and loss of life. If the right conditions of soil, moisture content, and slope angle exist, landslides can occur on nearly any ground. Heavy rain, rapid snowmelt, flooding, earthquakes, vibrations, and other natural conditions or human-induced events can trigger a landslide (Benton County 2019).

The State of Washington has six landslide provinces: Olympic Mountains, Southwest Washington, Puget Lowland, Cascades, Columbia Plateau, and Okanogan Highlands. Benton County is part of the Columbia Plateau (Basin) landslide province. Landslides in this province include slope failures in bedrock along the soil interbeds

and in the overlying catastrophic flood sediments and loess deposits. These landslides usually move along sediment interbeds within the Columbia River Basalts (Benton County 2019). Benton County experienced only one major landslide between 1984 and 2014. The Prosser landslide occurred in 1986 and 1987 during the construction of Interstate 82 when interstate construction remobilized several very large, prehistoric landslide complexes (DNR 2015).

General Landslide Hazards

Landslides include rockfalls, slides, slumps, and debris flows. Gravity is the dominant force behind landslides, but water, wind, or large-scale disturbances such as earthquakes or volcanic activity can also trigger landslides and slope failures. Steep and/or unstable slopes are at the greatest risk of producing landslides. Other factors that influence the probability of a slide include soil type and thickness, geological structure, vegetative cover, soil conditions and soil saturation, and the amount, rate, and duration of precipitation. Landslide hazard areas are typically defined as areas that, due to a combination of slope inclination, soil type, geological structure, and the presence of water, are susceptible to failure and subsequent downhill movement.

Project-specific Hazards - Landslide Hazards and Ground Instability

As illustrated in **Figure 3.2-6**, the Lease Boundary includes areas identified as susceptible to erosion, landslides, and bluff failures. Although the nearby City of Kennewick receives an average annual precipitation of 7.7 inches, the Applicant has identified two landslides just within the northern edge of the Lease Boundary (Horse Heaven Wind Farm, LLC 2021).

Ground instability can result from underground caves and voids in rocks. This type of instability can be particularly hazardous in places where karst features such as caves develop slowly, and rapid failures can result in several feet of instantaneous subsidence. Karst features generally develop in areas of water-soluble rock that dissolve over time. The USGS map of karst hazard potential in the United States does not show the Lease Boundary as having karst potential (Weary and Doctor 2014).

The basalt underlying the Lease Boundary and wider region is a volcanic rock without karst formations. Volcanic lava rocks can form voids or lava tubes; however, the Applicant's preliminary geotechnical investigation report did not indicate a sudden loss of core fluid that would be indicative of a void in the rock (Horse Heaven Wind Farm, LLC 2021).

Volcanic Hazards

Cascade Range volcanoes have produced more than 100 eruptions in just the past few thousand years. Cascade volcanoes have the potential to cause widespread disasters. As Cascade volcanoes erupt, they can produce the following adverse conditions:

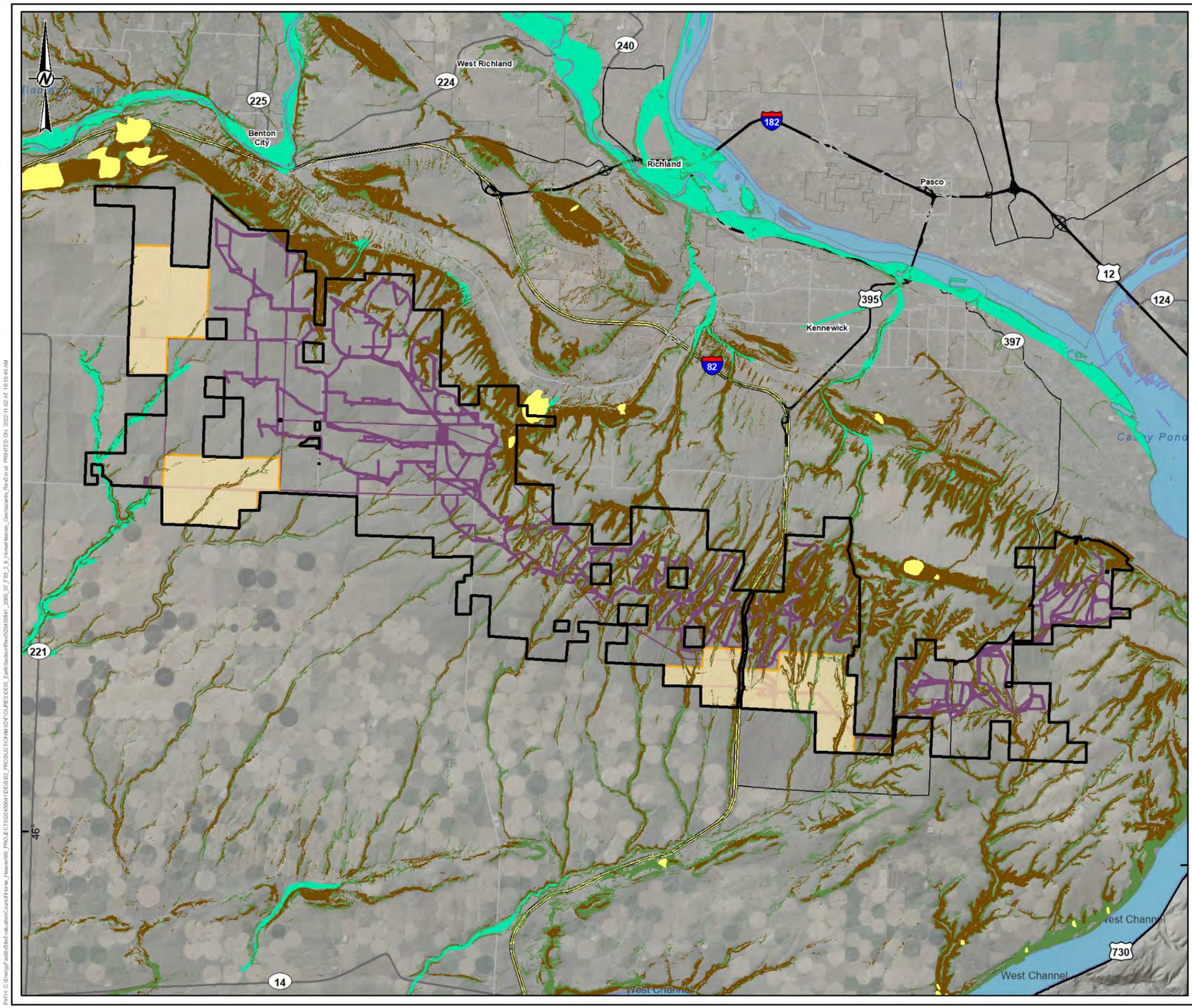
- **Ashfall:** This effect results when ash is forcibly ejected by a volcanic explosion and becomes airborne. Volcanic ash can become suspended in the air and travel great distances from the volcanic vent, entrained by the wind, before falling to the ground.
- **Lahars:** This component of a volcanic eruption occurs when volcanic ash and other debris mix with a water source to form volcanic mudflows. Lahars are typically generated during and after significant eruptions, when large volumes of loose volcanic ash are present along the flanks of a volcano. Lahars may continue to mobilize loose debris for years after the event. Lahars are very fast-moving, capable of destroying bridges, roads, and other infrastructure along drainage paths.

- **Debris flows:** Like lahars, debris flows contain a higher concentration of volcanic debris, but with lower water content. Debris flows are not easily mobilized and are extremely dense, capable of causing significant damage.
- **Lava flows:** Lava flows are streams of molten rock that pour or ooze from an erupting vent. Lava erupts during either nonexplosive activity or explosive lava fountains.
- **Pyroclastic flows:** These flows are chaotic blasts of volcanic ash, hot gases, and rock debris, usually generated from the collapse of an eruption column. Pyroclastic flows can spread out in any direction from a volcanic vent at very high speeds and are not restricted to drainage channels, unlike lahars, debris flows, and lava flows.
- **Other Effects:** Massive landslides can occur if the portions of a volcano collapse during an eruption, as seen in the Mount St. Helens eruption in May 1980. Another hazard is the seismicity associated with volcanic activity, which may trigger earthquake events. Significant volcanic activity is generally preceded by weeks to months of increased seismicity. The Pacific Northwest is extensively monitored by the USGS and the Cascades Volcano Observatory with an advanced seismic network.

For example, Benton County experienced adverse impacts from the disbursement of ash from the May 18, 1980, eruption of Mount St. Helens as it caused major crop losses, interruptions in dairy production, and disruptions to the county's transportation system (Benton County 2019).

Regional Volcanic Hazards

The Cascade Range volcanic centers extend from Lassen Peak in northern California in the south to Mount Baker in Washington near the border with Canada in the north. The Cascade volcanoes are periodically active and can be expected to produce volcanic eruptions in the future (USGS n.d.[e]). The active volcanism is part of the subduction process of the Juan de Fuca plate beneath North America. The volcanoes in the Cascade Range have both effusive and explosive eruption histories with ashfall, lahars, debris flows, lava flows, pyroclastic flows, and landslides.



LEGEND

- Project Lease Boundary
- Solar Siting Area
- Micrositing Corridor
- Municipal Boundary
- Historic Landslide Area
- Combined Erosion Hazard & Steep Slope (≥15%)
- Steep Slope (≥15%)
- Liquefaction Potential - Moderate to High

0 3 6

MILES

REFERENCE(S)
1. PROJECT FEATURES PROVIDED BY TETRA TECH, NOV 2021
2. HAZARD AREAS: WADNR, 2021.
3. SERVICE LAYER CREDITS: ESRI
4. COORDINATE SYSTEM: WGS 1984 UTM ZONE 11N

CLIENT
State of Washington Energy Facility Site Evaluation Council

PROJECT
Horse Heaven Wind Farm

TITLE
Geologically Hazardous Areas Surrounding Project Lease Boundary

YYYY-MM-DD	2021-12-10
DESIGNED	HJ
PREPARED	HJ
REVIEWED	AH
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
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Figure 3.2-6: Geologically Hazardous Areas within the Project Vicinity

Project-specific Volcanic Hazards

The Lease Boundary is underlain by effusive basaltic lava flows, deposited a million years ago under a very different volcanic regime than currently exists. The volcanic vents that produced these lavas are no longer considered capable of generating new eruptions. Washington has five Cascade volcanoes that the USGS has listed as having a high or very high threat potential: Mount Baker, Glacier Peak, Mount Rainier, Mount St. Helens, and Mount Adams. **Figure 3.2-1** illustrates the location of these volcanoes in relation to the Lease Boundary. The two nearest volcanoes to the Lease Boundary are Mount Adams and Mount St. Helens, described below:

- **Mount Adams:** This volcano is approximately 90 miles west of the Lease Boundary. It has not been active in recent history, but it was active from about 520,000 to about 1,000 years ago. Eruptions have occurred from 10 vents since the last period of glaciation about 15,000 years ago.
- **Mount St. Helens:** Mount St. Helens is the closest historically active volcano to the Lease Boundary, at approximately 125 miles west of the Project site. Its most recent major eruption was in 1980, when it erupted and subsequently collapsed. The heaviest ash deposition occurred in a 60-mile-long swath immediately downwind of the volcano. Another area of thick ash deposition occurred near Ritzville in eastern Washington, about 195 miles from Mount St. Helens, where nearly 2 inches of ash blanketed the ground, more than twice as much as at Yakima, which is only about half as far from the volcano (Moen and McLucas 1981).

The Lease Boundary is located more than 80 miles from areas considered subject to volcanic hazards by the USGS (Washington Division of Geology and Earth Resources 2016). The potential hazard to the Lease Boundary from volcanic flow deposits is in part determined by the mapping of existing flows. The distribution of lahar deposits and lava flows associated with Mount Adams and Mount St. Helens has not historically reached the area near the Lease Boundary.

Renewed volcanic activity may trigger earthquakes, and volcanic ash could reach, and cover, the Lease Boundary from an eruption at one of the Cascade Range volcanoes. The main hazard from volcanic activity at the Lease Boundary is the deposition of volcanic ash following large eruptions in the Cascade Range. Prevailing wind directions in the Pacific Northwest blow toward the north and northeast. The USGS estimates a 0.1 to 0.2 percent annual probability of 4 inches or more ash accumulation near the Lease Boundary from an eruption of major Cascade volcanoes (Wolfe and Pierson 1995).

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3.3 Air Quality

This section describes the existing air quality and regulatory setting in the proposed Horse Heaven Wind Farm (Project, or Proposed Action) vicinity. Section 4.3 presents an analysis of Project potential impacts on air quality. The Project vicinity includes the areas 4 miles south/southwest of Kennewick, Washington, in Benton County, and the larger Tri-Cities urban area along the Columbia River. The Project's consistency with relevant air quality standards, regulations, goals, and policies is evaluated in Section 4.3.

Regulatory Setting

Federal

The U.S. Environmental Protection Agency (EPA) regulates national air quality under the Clean Air Act (CAA), the primary federal statute governing air quality. The EPA has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants:

- Carbon monoxide (CO)
- Nitrogen dioxide (NO_2)
- Particulate matter less than 10 microns (PM_{10})
- Particulate matter less than 2.5 microns ($PM_{2.5}$)
- Ozone (O_3)
- Sulfur dioxide (SO_2)
- Lead (Pb)

The NAAQS are designed to protect public health and welfare with an adequate margin of safety. NAAQS are expressed in concentration levels in ambient air, averaged over a specific time interval. Washington ambient air quality standards are identical to the NAAQS (see Washington Administrative Code [WAC] 173-476, Ambient Air Quality Standards). Local air quality is measured relative to these national and state standards. Areas that comply with the NAAQS are designated "attainment areas." Areas that fail to meet the standards are designated "non-attainment" areas.

Under the CAA, the EPA requires each state to prepare, adopt, and administer a State Implementation Plan (SIP) to ensure that air quality in non-attainment areas is gradually brought into compliance with the NAAQS and that good air quality is maintained in areas that already attain the NAAQS. The SIP must consider the impact of both stationary and nonstationary sources of air pollution. In Washington, the Department of Ecology (Ecology) is the agency generally responsible for the SIP and overall air quality management.

State

The Washington Energy Facility Site Evaluation Council (EFSEC) has overarching responsibility for air quality standards compliance for energy facilities pursuant to Washington Administrative Code (WAC) 463-62-070:

"Air emissions from energy facilities shall meet the requirements of applicable state air quality laws and regulations promulgated pursuant to the Washington State Clean Air Act, chapter 70.A.15 RCW, and the Federal Clean Air Act (42 U.S.C. 7401 et seq.), and chapter 463-78 WAC."

In addition, 463-78 WAC adopts several provisions from WAC 173-400 regulations including key applicable provisions discussed in Section 3.3.1.2 below.

Local

The Benton County Clean Air Agency (BCAA) has local rules and regulations for potential sources of air pollution which are subsumed under EFSEC review for energy facilities.

Stationary Source Regulations

The SIP developed by Ecology and EFSEC includes both prohibitory rules (e.g., emission limits) for existing stationary sources of air pollution and rules for permitting new stationary sources of air pollution in both attainment and non-attainment areas of the state. Local air authorities, such as the Benton County Clean Air Agency (BCAA), may impose additional requirements. The State of Washington Energy Facility Site Evaluation Council has EPA-delegated authority for issuance of air permits for energy facilities under its jurisdiction pursuant to WAC 463-78-095.

Any new stationary emissions source that exceeds certain thresholds must generally obtain a preconstruction air quality permit by demonstrating that it would comply with all applicable federal, state, and local air quality requirements, including emissions standards and ambient air quality standards.

New sources of air emissions in non-attainment areas must generally satisfy more rigorous requirements than equivalently sized sources in attainment areas to bring the area back into compliance with air quality standards. The two most common permits associated with regulated air pollutants emitted by stationary industrial activity are Notice of Construction/New Source Review approvals, and Prevention of Significant Deterioration permits.

The Project would not be located within a non-attainment area for any criteria pollutants (EPA 2020a). The only possible stationary sources of emissions associated with the Project are a potential portable concrete batch plant and temporary backfeed power generators. Neither would be permanent sources of air pollution. A Notice of Construction approval and supplemental environmental analysis which would include air quality assessment would be required if either the batch plant or the generators are ultimately included in the final development.

Nonstationary and Fugitive Emission Source Regulation

Although construction emissions are not included in the permitting of stationary sources, mobile sources (such as construction equipment and maintenance pickups) are regulated separately under the federal CAA. Nonstationary emission sources, such as ships, trains, motor vehicles, and on-road and off-road construction equipment, are not generally required to obtain preconstruction air quality permits. Instead, nonstationary emission sources may be required to comply with mobile source emission standards established by the EPA. Mobile source regulations generally apply to mobile source equipment manufacturers prior to sale, who must certify that their equipment complies with applicable standards.

Washington State and the BCAA regulate “fugitive” air emissions not emitted through a chimney, smokestack, or similar facility. A common example of fugitive air emissions is dust blowing from construction sites, unpaved roads, and tilled agricultural fields. Wind and solar energy plants are not included among the facilities for which review and permitting of fugitive emissions are required (WAC 173-400). Nevertheless, WAC 173-400-040(9)(a) requires owners and operators of fugitive dust sources to take reasonable measures to prevent dust from becoming airborne and minimize emissions.

Other Washington State regulations that apply to nuisance emissions, including fugitive dust, and various equipment used during construction, include:

- WAC 173-400-040(3) Fallout. Prohibits emission of particulate matter from any source to be deposited beyond the property line in quantities that would interfere with the use and enjoyment of the impacted property
- WAC 173-400-040(4–4a) Fugitive emissions. Requires reasonable precautions to prevent the release of air contaminants from materials handling, construction, demolition, or other fugitive emissions sources
- WAC 173-400-040(5) Odors. Requires good practice and procedures to minimize odors that may interfere with another property owner's use and enjoyment of their property

In addition to the above, the BCAA requires (prior to commencement of construction):

- Notification of any work that would generate fugitive air emissions (BCAA Regulation 1 Article 4 Section 4.02.D)
- Preparation and implementation of a dust control plan that identifies management practices and operational procedures to control fugitive dust emissions (BCAA Regulation 1 Article 4 Section 4.02.E)

Climate Change – Greenhouse Gas Emissions

Greenhouse gases (GHGs) absorb infrared radiation in the atmosphere. The infrared radiation is selectively absorbed or "trapped" by GHGs, and heat is then reradiated back toward the earth's surface, warming the lower atmosphere and the earth's surface. Atmospheric concentrations of GHGs have risen dramatically since the Industrial Revolution. This has resulted in gradually increasing global temperature, thereby increasing the potential for indirect effects such as:

- Decrease in precipitation as snow
- Gradual melting of polar ice caps
- Increase in severe weather
- Changes to plant and animal species and habitat
- Rise in sea level

Climate impacts are not attributable to any single action but are exacerbated by diverse individual sources of emissions that each make relatively small additions to GHG concentrations.

Both natural processes and human activities emit GHGs. Human activities known to emit GHGs include industrial manufacturing, utilities, transportation, residential activities, and agricultural activities. The GHGs that enter the atmosphere because of human activities are CO_2, methane, nitrous oxide, and fluorinated carbons (hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride).

In 2020, the Washington Legislature set new GHG emission limits in order to combat climate change. Under the law, the state is required to reduce emissions levels as follows:

- 2020 – reduce to 1990 levels
- 2030 – reduce to 45 percent below 1990 levels

- 2040 – reduce to 70 percent below 1990 levels
- 2050 – reduce to 95 percent below 1990 levels and achieve net-zero emissions (Ecology n.d.)

In 2022, the Washington Legislature set a new rule, Chapter 173-446 WAC, Climate Commitment Act Program. The Climate Commitment Act requires Ecology to adopt rules to implement the cap-and-invest program to achieve Washington's goal of net zero greenhouse gas emissions by 2050 (Ecology n.d.).

WAC 173-441 establishes an inventory of GHG emissions through a mandatory GHG reporting rule for certain operations. Because wind and solar power do not emit GHGs during operations, these regulations would not apply to the Project (Horse Heaven Wind Farm, LLC 2021a).

3.3.1 Affected Environment

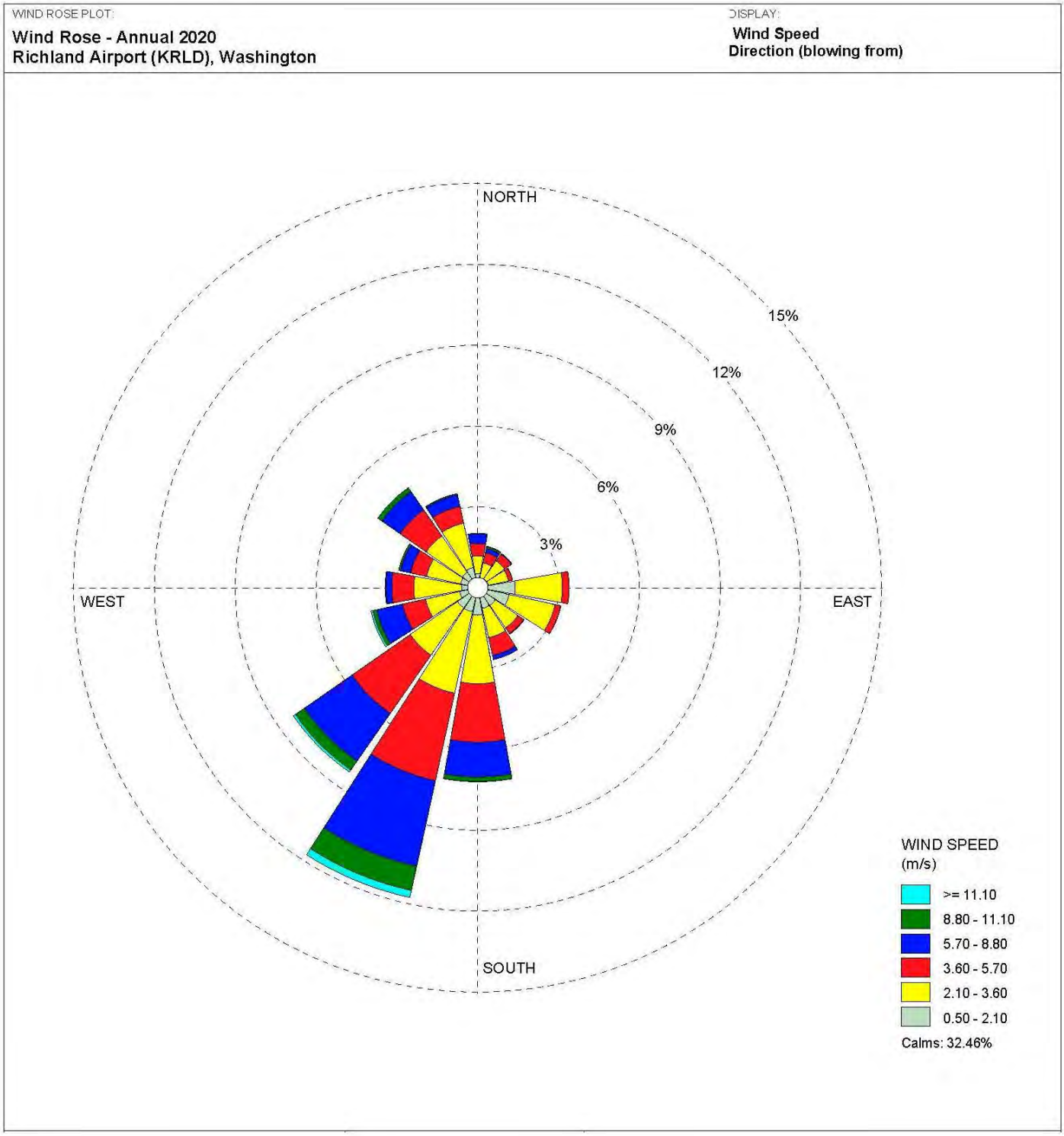
The following subsections discuss regional climate, emission inventory, and air quality conditions in the Project vicinity.

3.3.1.1 Regional Climate

Benton County is located within a rain shadow created by the Cascade Mountains, which causes a decrease in precipitation to the east. In this region of Washington, the summers are hot and mostly clear, winters are cold and partly cloudy, and it is typically dry year-round (on average, there are nearly 200 days of sunshine). The average annual precipitation at Kennewick, one of the cities closest to the Lease Boundary, is 7.7 inches. In winter, temperatures in Kennewick average a high of 43 degrees Fahrenheit (°F) and a low of 29.6°F, with extreme lows below 10°F. In summer, temperatures average a high of 87.1°F and a low of 59.6°F, with extreme highs above 100°F. The average relative humidity is 64 percent (Horse Heaven Wind Farm, LLC 2021a).

Wind speed, wind direction, and atmospheric stability strongly influence air quality conditions. Stronger winds improve local ventilation rates, increase atmospheric mixing, and generally improve dispersion of local point source emissions. However, higher winds can also contribute to windblown fugitive dust. **Figure 3.3-1** and **Figure 3.3-2** depict wind speed, wind direction, and stability parameter observations taken from the Richland, Washington meteorological station (KRLD), which is the closest station to the Project (Horse Heaven Wind Farm, LLC 2021b). The annual information provided in these figures is based on one full year of data from 2020.

Figure 3.3-1 shows the average annual wind speed and direction for the year 2020 in Richland, in a graphic form known as a “wind rose.” The rings in this figure represent the percentage of the year that the wind blows from each of 16 compass directions, with color-coded bands depicting wind speed categories within each compass direction. Wind in the Project vicinity blows predominantly from the southwest quadrant, with wind from other directions possible less frequently.

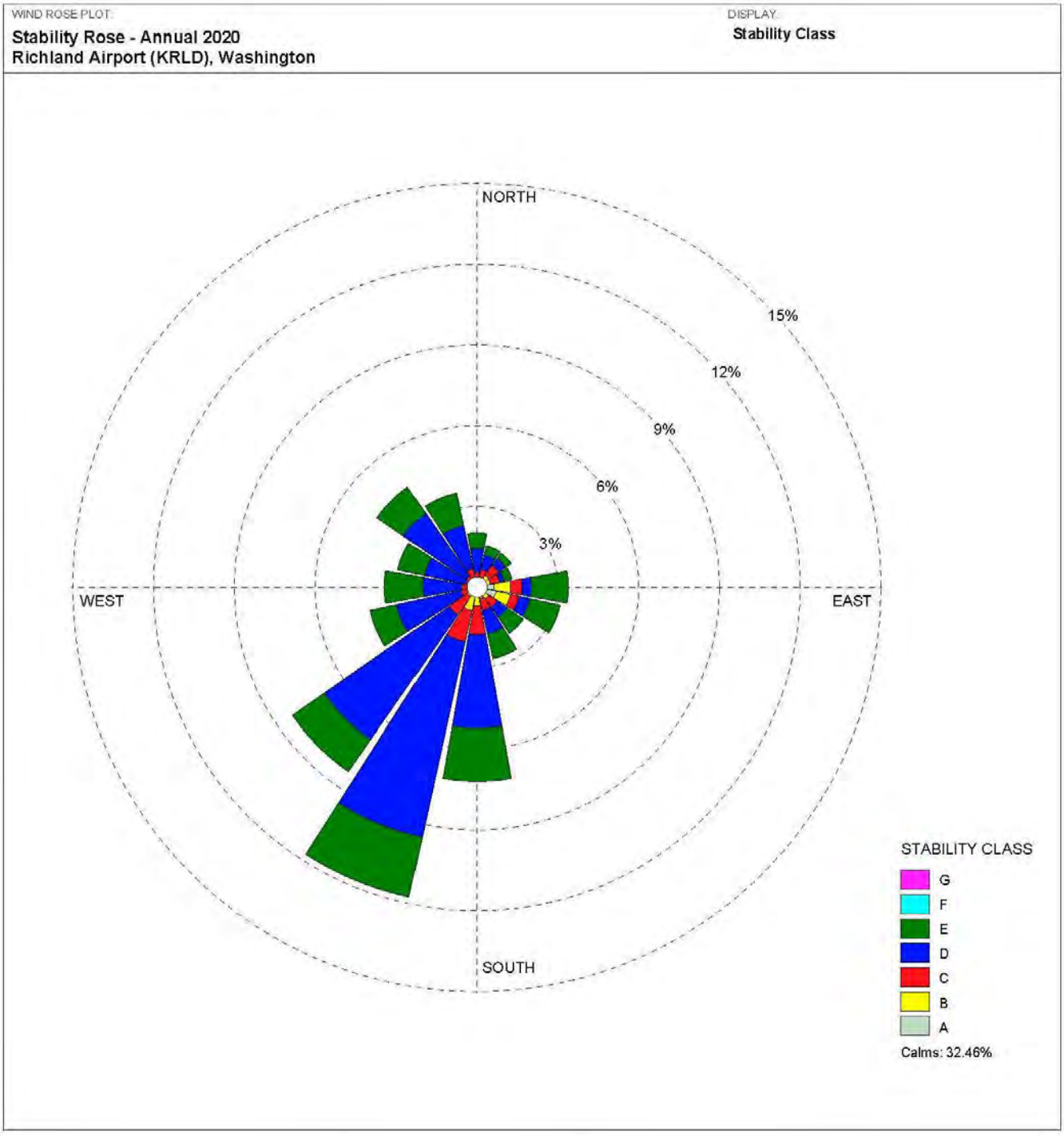


Source: Horse Heaven Wind Farm, LLC 2021b

Figure 3.3-1: 2020 Wind for Richland, Washington, Meteorological Station

Wind conditions near the Lease Boundary over a longer period can be characterized by Automated Surface Observing Systems (ASOS), which serve as the nation's primary surface weather observing network. The closest ASOS station to the Lease Boundary is located at the Tri-Cities Airport in Pasco, Washington (KPSC). Based on data collected from January 1, 1990, to December 31, 2019, the prevailing winds most frequently blow from the southwest (approximately 24 percent of the time) and the north-northwest (approximately 24 percent of the time), with calm conditions (less than 2.0 miles per hour) occurring approximately 23 percent of the time. The average wind speed for this period was approximately 6.7 miles per hour (3.0 meters per second) (Horse Heaven Wind Farm, LLC 2021a).

Atmospheric stability, which refers to a lack of vertical air movement, plays an important role in air quality because air contaminants are not dispersed as quickly or widely when the atmosphere is stable (Hanna et al. 1982). Atmospheric stability is generally characterized according to the Pasquill-Gifford scheme, which ranges from Class A (most unstable) to Class G (most stable). **Figure 3.3-2** shows the average atmospheric stability in Richland 2020. Similar to the wind rose in **Figure 3.3-1**, in this "stability rose," the spokes in the figure depict wind direction, but here the colors represent the atmospheric stability associated with each wind direction. The figure shows that unstable to neutral (Class A–D) atmospheric conditions, which promote acceptable pollutant dispersion, predominate in all compass directions in the Richland area and that highly stable conditions (Class F and G) with reduced atmospheric mixing are less frequent.



Source: Horse Heaven Wind Farm, LLC 2021b

Figure 3.3-2: 2020 Atmospheric Stability for Richland, Washington, Meteorological Station

3.3.1.2 Existing Air Quality

Background air quality conditions in the Project vicinity are somewhat difficult to determine because there are no comprehensive air quality monitors near the Lease Boundary. The monitors nearest to the Lease Boundary are located in Kennewick, Washington (with the monitor located approximately 4 miles to the north), which measure ozone and PM_{10}. The nearest $PM_{2.5}$ monitors are in Pendleton, Oregon (approximately 35 miles southeast of the Lease Boundary) and Toppenish, Washington (approximately 40 miles northwest of the Lease Boundary). The nearest SO_2 monitor is in Wenatchee, Washington (approximately 80 miles north of the Lease Boundary). The nearest CO monitor is in Portland, Oregon (approximately 155 miles west-southwest of the Lease Boundary). The nearest NO_2 monitors are in Tacoma, Washington (approximately 157 miles northwest of the Lease Boundary) and Portland, Oregon (approximately 157 miles west-southwest of the Lease Boundary). The nearest lead monitor to the site that collected data for the three-year period 2018–2020 is located in Chico, California (approximately 450 miles south of the Lease Boundary) (EPA 2020b). Air quality data for monitors near the Lease Boundary with complete records for 2018–2020 are summarized in **Table 3.3-1** (Horse Heaven Wind Farm, LLC 2021b).

Based on the air quality data that have been collected, as well as regional air quality trends, the EPA has not designated Benton County, Washington, as a non-attainment area for any criteria air pollutant.

Table 3.3-1: Background Air Quality Data from Monitoring Stations near the Lease Boundary

Pollutant	Averaging Period	Units	Monitor Site	Measured Concentration[a]				NAAQS
				2018	2019	2020	Avg.	
CO	1-hour	ppm	Portland - SE Lafayette (41-051-0080)	1.9	1.8	15.1	6.3	35[b]
	8-hour	ppm		1.6	1.6	14.1	5.8	9[b]
NO_2	1-hour	ppb	Portland - SE Lafayette (41-051-0080)	35.4	31.5	29.4	32.1	100[c]
	Annual	ppb		8.6	7.7	6.4	7.6	53[d]
Ozone	8-hour	ppm	Kennewick S Clodfelter Road (53-005-0003)	0.073	0.061	0.061	0.065	0.070[e]
$PM_{2.5}$	24-hour	µg/m^3	Toppenish - Ward Rd (Yakama Tribe) (53-077-0015)	50.4	34.4	90	58.3	35[f]
	Annual	µg/m^3		11.1	9.8	14.5	11.8	12.0[g]
SO_2	1-hour	ppb	Portland - SE Lafayette (41-051-0080)	2.8	2.5	2.3	2.5	75[h]
	3-hour	ppb		2.4	2.6	2.2	2.4	500[i]
Lead	Rolling 3-month	µg/m^3	Chico, CA - Chico-East Avenue (06-007-0008)	0.0935	0.0033	0.0026	0.0331	0.15[j]
PM_{10}	24-hour	µg/m^3	Kennewick - Metaline (53-005-0002)	65	566	88	240	150[k]

Source: Horse Heaven Wind Farm, LLC 2021b – data compiled from EPA AirData tool, https://www.epa.gov/outdoor-air-quality-data

Notes:

[a] All concentrations are presented in the same statistical form as the corresponding NAAQS standard, as noted below.
[b] Not to be exceeded more than once per year. Values shown are for the maximum second highest value in each year.
[c] 98th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
[d] Annual mean.
[e] Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.
[f] 98th percentile, averaged over 3 years.
[g] Annual mean, averaged over 3 years.
[h] 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
[i] Not to be exceeded more than once per year. Values shown are for the maximum second highest value in each year.

Table 3.3-1 notes, continued

(j) Not to be exceeded. Values shown are for the maximum quarterly average value in each year.

(k) Not to be exceeded more than once a year on average over 3 years. Values shown are for the maximum second highest value in each year. 2019 high concentration and 3-year average are likely influenced by wildfires in the area.

Avg. = average; CO = carbon monoxide; $\mu g/m^3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; ppb = parts per billion; ppm = parts per million; SO_2 = sulfur dioxide

3.3.1.3 Regional Emissions

Air quality in the Project vicinity is influenced by, and can be correlated to, regional emissions. Accordingly, collection of regional emissions data is a key and necessary component of air quality planning by state and regional agencies responsible for attaining and maintaining ambient air quality standards. Emission sources in Benton County are regularly tabulated and reported by Ecology for five of the six criteria air pollutants (except lead) in 24 source categories that include both natural and man-made sources. The most recently published emission inventory for Benton County (for the year 2017) is provided in **Table 3.3-2**.

Table 3.3-2: 2017 Emissions Inventory for Benton County, tons per year

Source Category	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOCs
Aircraft	122	1	3	2	0	3
Nonroad Equipment and Vehicles - Boats	889	60	4	3	0	259
Dust from Construction	-	-	5,265	526	-	-
Industrial/Commercial/Institutional Fuel Combustion	123	121	57	43	18	7
Residential Non-Wood Fuel	22	52	0	0	1	3
Fertilizer Application	-	-	-	-	-	-
Commercial Cooking	35	-	89	83	-	13
Livestock	-	-	323	67	-	37
Miscellaneous	57	1	12	10	0	104
Natural Emissions from Soil and Vegetation	1,307	111	-	-	-	3,078
Nonroad Equipment and Vehicles	4,049	674	63	61	1	304
Agricultural Burning	946	56	148	141	2	123
Residential Outdoor Burning: Yard Waste, Trash	227	6	40	39	4	25
Silivicultural Burning	15	1	3	3	0	4
On-road Mobile	14,881	2,911	154	86	7	1,658
Nonpoint Gasoline Stations, Storage, and Marketing	-	-	-	-	-	340
Large Point Sources	146	254	51	37	9	49
Dust from Roads	-	-	1,331	222	-	-
Locomotives	256	1,110	28	27	1	47
Residential Wood Combustion	677	10	77	77	2	104
Commercial Marine Vessels	-	-	-	-	-	-

Table 3.3-2: 2017 Emissions Inventory for Benton County, tons per year

Source Category	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOCs
Nonpoint Solvent Use	-	-	-	-	-	4,024
Dust from Agricultural Tilling and Harvesting	-	-	6,207	1,221	-	-
Wildfires	5,711	141	638	540	62	1,365
Total	29,463	5,510	14,493	3,190	106	11,548

Source: Ecology 2020
Notes (general):
1. Emissions inventory for 2017 is the most current year for which published data is available
2. Emissions are reported in whole numbers. Where a value of 0 is reported, emissions are less than 0.5 tons per year.
"-" = no emissions were reported for this pollutant for this source category
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

As **Table 3.3-2** shows, most emissions of oxides of nitrogen (NO_X) and CO—pollutants that result primarily from combustion—in Benton County come from mobile sources. On- and off-road, boats, aircraft, and locomotives account for about 85 and 70 percent of all NO_X and CO emissions, respectively. Natural sources and wildfires together account for about 6 and 24 percent of countywide NO_X and CO emissions, respectively. Large point sources of air pollution, on the other hand, account for less than 1 percent of countywide CO emissions and less than 5 percent of countywide NO_X emissions.

Volatile organic compounds (VOCs), together with NO_X, are the primary precursors to ozone, which is not emitted directly but rather formed in the atmosphere as a result of sunlight, heat, and complex photochemical reactions. Natural sources and wildfires together account for nearly 40 percent of countywide VOC emissions. Solvent use accounts for about 35 percent of Benton County VOC emissions, and mobile sources account for about 20 percent.

Fugitive dust from agricultural operations, construction activity, and roadways accounts for the majority of PM_{10} and $PM_{2.5}$ emissions in the county—about 88 and 62 percent, respectively. Wildfires are also an important source of PM_{10} and $PM_{2.5}$ emissions in the county, accounting for about 4 and 17 percent, respectively.

3.4 Water Resources

This section describes existing water resources within the proposed Horse Heaven Wind Farm (Project, or Proposed Action) Lease Boundary. Section 4.4 provides an analysis of the Project's potential impacts on water resources. The following water resources are addressed herein:

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

Regulatory Setting

The applicable federal, state, and county laws and regulations relevant to water resources are provided in Section 4.4.

Methodology

The spatial boundaries of the water resources affected environment are the same as the Project's Lease Boundary. The description of the affected environment provided in Section 3.4.2 is based on information available in the Application for Site Certification (ASC) from Horse Heaven Wind Farm, LLC (Applicant) and additional information provided by the Applicant through data requests for preparation of the Draft Environmental Impact Statement, as well as available government and publicly available literature.

3.4.1 Affected Environment

The Lease Boundary is located in Benton County, in eastern Washington. Benton County falls within the rain shadow of the Cascade Mountains, which creates dry conditions year-round. The average annual precipitation for the nearest community, the City of Kennewick, is approximately 7.7 inches (U.S. Climate Data 2021). The average annual snowfall is approximately 1 inch (U.S. Climate Data 2021). Summers are hot and mostly clear, while winters are very cold and partly cloudy (Horse Heaven Wind Farm, LLC 2021). The annual high temperature is 66 degrees Fahrenheit (°F), with annual low temperatures of 44°F (U.S. Climate Data 2021).

The Lease Boundary is located in an upland area dominated by agricultural activity with no irrigated crops (Tetra Tech 2021). Water resources in the area are limited. The Lease Boundary falls within the Rock – Glad watershed (Water Resource Inventory Area [WRIA] 31) and the Lower Yakima watershed (WRIA 37) (Ecology 2021). Watersheds and water resources are shown in **Figure 3.4-1.** The majority of the Lease Boundary drains toward the Columbia River, with the exception of a small area that drains north toward the Yakima River (Horse Heaven Wind Farm, LLC 2021).

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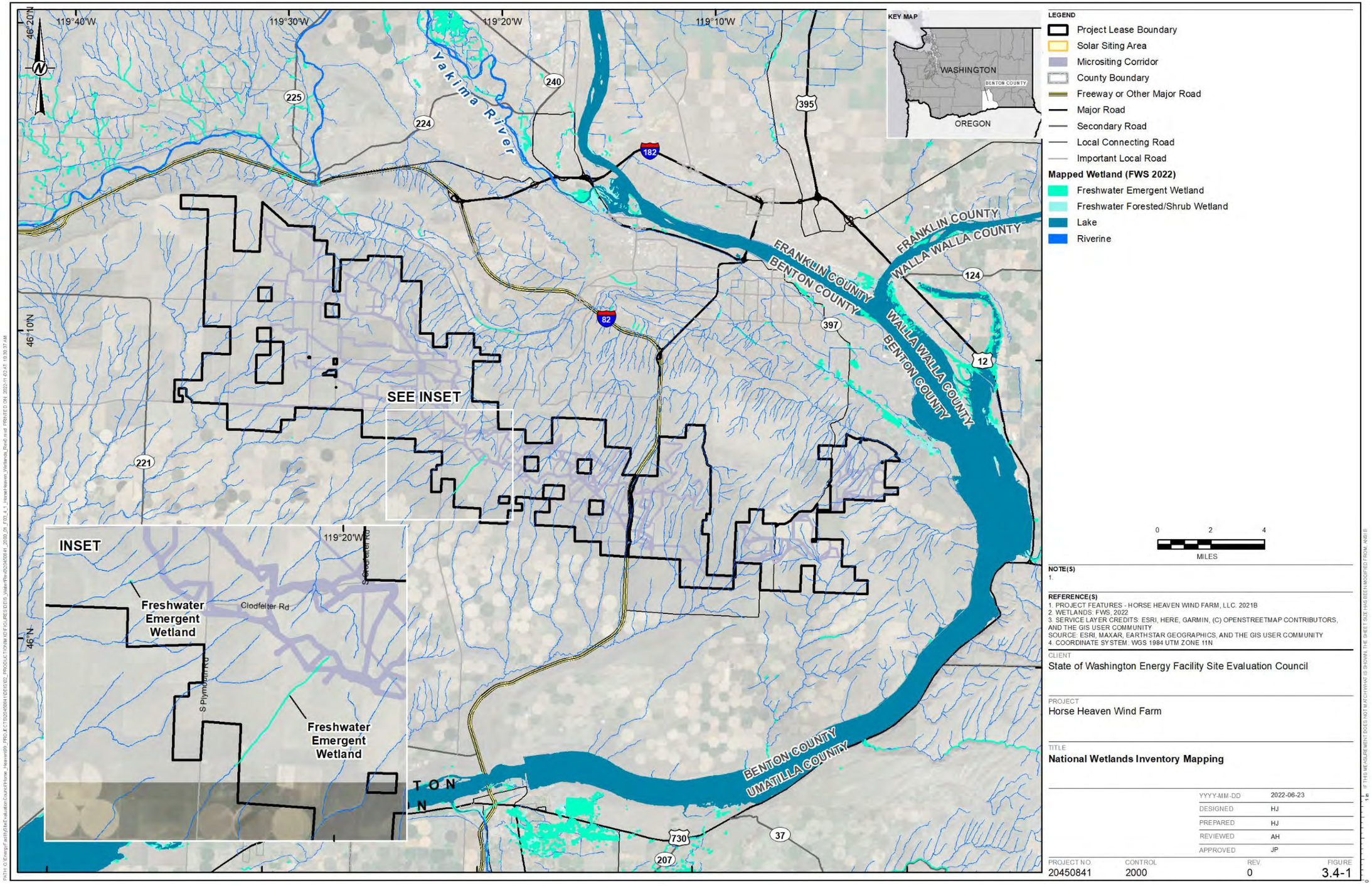

Figure 3.4-1: Watersheds and Water Resources in the Project Lease Boundary

3.4.1.1 Surface Water and Wetlands

The study area used by the Applicant for the background review of water resources comprised an area of approximately 21,680 acres and included the Wind Energy Micrositing Corridor and Solar Siting Areas. The background review completed by the Applicant is summarized below (Horse Heaven Wind Farm, LLC 2021).

- No hydric soils were identified in the Lease Boundary, based on Natural Resource Conservation Service data.
- Desktop review of the Washington Natural Heritage Program for high-quality wetlands did not identify any high-quality wetlands within the Lease Boundary.
- The National Hydrography Dataset and the Benton County Critical Area Ordinance fish and wildlife habitat conservation areas map identified 253 intermittent streams within the Lease Boundary (Ecology 2019; Benton County n.d.). No perennial streams are located within the Lease Boundary.
- No impaired or threatened waterbodies, as defined on the Washington State Department of Ecology 303(d) or 305(b) list, occur within the Lease Boundary (Ecology 2020).
- The Applicant notes that the U.S. Geological Survey Washington Current Water Condition data do not include any water quality conditions within the Lease Boundary. No water quality monitoring stations are located within the Lease Boundary; however, three are located within the downstream environment of the Lease Boundary (USGS 2022). One station is located on the Yakima River (Site 12510500 Yakima River at Kiona), and two are located on the Columbia River (Site 14019220 Columbia River at McNary Dam Lock and Site 14019240 Columbia River below McNary Dam) (USGS 2022).
    - Yearly Freshwater Quality Index (WQI) for the Yakima River at the Kiona site in 2019 was rated moderate concern with a score of 61.[2] Fecal coliform bacteria, oxygen levels, pH, and temperature were all rated as good, indicating that they meet expectations relative to the given conditions, while suspended solid, total persulfate nitrogen, total phosphorus, and turbidity were rated as moderate concern (Ecology 2020, 2022a).[1]
    - Yearly WQI for the Columbia River above the McNary Dam site is not available (Ecology 2022a).
    - Yearly WQI for the Columbia River below the McNary Dam site in 2019 was rated as good, with a score of 89. All yearly parameter scores were rated as good, including levels of fecal coliform bacteria, oxygen, pH, suspended solids, temperature, total persulfate nitrogen, total phosphorus, and turbidity (Ecology 2022a).
- The Lease Boundary includes areas identified as susceptible to erosion, landslides, and bluff failures.
- The Applicant reported no wetlands within the study area. Based on independent review, data available from the National Wetlands Inventory indicate that there are two freshwater emergent wetlands and/or palustrine features within the Lease Boundary, one of which crosses the Wind Energy Micrositing Corridor (USFWS 2021).

[2] Ecology's Freshwater Quality Index (WQI) assigns a score of 1 to 100, with higher numbers indicating better water quality. A WQI of 80 and greater is given a rating of "good," indicating that the combined water quality conditions meet expectations relative to the given conditions and the water quality is of lowest concern. A score of 40 to 80 is rated "moderate concern." A score of 40 and below is rated "poor," indicating that the water quality does not meet expectations and these sites are of highest concern (Ecology 2020, 2022b).

The Applicant conducted wetland delineation surveys and surveys for non-wetland surface water in February, August, October, and November 2020 within the Lease Boundary. Additional surveys were completed in May 2021 within the Lease Boundary. In total, approximately 21,680 acres were surveyed for wetlands and other waters, with an emphasis on areas within the Wind Energy Micrositing Corridor and Solar Siting Areas (Appendix I, Horse Heaven Wind Farm, LLC 2021; Tetra Tech 2021). Plant species names and associated wetland indicator status ratings are from the State of Washington 2016 Wetland Plant List (Lichvar et al. 2016). Findings from the field surveys are summarized below (Horse Heaven Wind Farm, LLC 2021; Tetra Tech 2021):

- No wetlands within the Wind Energy Micrositing Corridor and Solar Siting Areas were identified during field surveys.
- One wetland, surveyed in May 2021, was identified within the Lease Boundary approximately 240 feet west of the Wind Energy Micrositing Corridor in Badger Canyon and is approximately 0.03 acres in size (Wetland ID: E10). The location of the wetland relative to the Micrositing Corridor is displayed in **Figure 3.4-2**. The wetland is located downslope from the Micrositing Corridor. It is described as a depressional wetland, and further details from the U.S. States Army Corps of Engineers data sheet are provided below (Tetra Tech 2021):
  - The wetland is a depressional wetland located in a valley bottom downslope from the Micrositing Corridor. A spring with a well underneath a balsam poplar (*Populus balsamifera*) tree occurs within the site.
  - The wetland is located in the Ritzville Silt Loam soil map unit. Slope gradient on site is approximately 30 to 65 percent.
  - The soil profile on site is a sandy loam texture. Hydric soils and wetland hydrology indicators are present, including a hydrogen sulfide odor. Depth to bedrock is approximately 12 inches.
  - Hydrophytic vegetation is present on site. Dominant species include balsam poplar and common horsetail (*Equisetum arvense*), with some cover of Great Basin ryegrass (*Leymus cinereus*). All species are categorized as facultative species in the Arid West (USACE 2020). “Facultative” describes species that are found in wetland and non-wetland ecosystems (Lichvar et al. 2012).
  - Surface water was not present at the time of the survey, and the water table was not encountered; however, water saturation was present at a depth of 0 inches (i.e., surface).
  - The wetland was rated as a Category IV wetland based on function. Wetlands in Washington are provided a category rank based on their sensitivity to disturbance, rarity, functional value, and whether they are replaceable (Hruby 2014). Wetlands are ranked from Category I, being the most rare, sensitive, undisturbed, or irreplaceable to Category IV wetlands, which have the lowest functional value and are often heavily disturbed (Hruby 2014).
  - Disturbance was identified within the wetland area. The site was previously used as a water trough for cattle, and evidence of cattle grazing was observed at the site.
- Field surveys in the Wind Energy Micrositing Corridor and Solar Siting Areas mapped two intermittent streams and 31 ephemeral stream channels, all of which are considered waters of the state. The ephemeral and intermittent streams are depicted in **Figure 3.4-3**. Stream acreage within the field survey study area was calculated to be 2.58 acres based on the average length and width of streams (Tetra Tech 2021). Ephemeral streams flow only during, or immediately following, precipitation events, and stormwater is their main source of water (Nadeau 2015). An intermittent stream contains water for only a portion of the year—typically,

seasonally during winter and spring when the channel is below the water table or when snowmelt provides sustained flow (Nadeau 2015).

The location of streams within the Lease Boundary based on field surveys (Tetra Tech 2021) was compared against the Project infrastructure to better quantify the crossing of streams for each Project component. The number of streams with which each Project component interacts is summarized in **Table 3.4-1,** based on the Applicant's field surveys (Horse Heaven Wind Farm, LLC 2021).

Ephemeral and intermittent streams are important components of the broader watershed. While no streams within the Lease Boundary are fish bearing, streams within the Lease Boundary drain into the Columbia and Yakima Rivers, which provide important migratory and rearing fish habitat. Streams within the Lease Boundary provide inputs of sediment, nutrients, and organic matter to downstream environments and are hydraulically connected to the larger Yakima and Columbia Rivers (EPA 2008). The Columbia River contains fish, including species listed under the Endangered Species Act (ESA). The Columbia River provides critical habitat for salmonids, including ESA-listed Chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*O. nerka*), steelhead (*O. mykiss*), and bull trout (*Salvelinus confluentus*). The Yakima River provides habitat for ESA-listed steelhead and bull trout (Horse Heaven Wind Farm, LLC 2021).

Table 3.4-1: Interaction of Streams with the Proposed Project

Project Infrastructure	Location	Interactions with Ephemeral Streams	Interactions with Intermittent Streams
Wind Energy Micrositing Corridor	Turbine Option 1	31	2
	Turbine Option 2	31	2
Solar Siting Areas	East Solar Field	5	0
	County Well Solar Field	0	0
	Sellards Solar Field	2	0
BESS	BESS adjacent to the Bofer Canyon – HH-East Substation	0	0
	BESS adjacent to the Primary HH-West Step-up Substation	0	0
	BESS adjacent to the Alternate HH-West Step-Up Substation	0	0
Substations	HH-East Substation	0	0
	Primary HH-West Intermediate Substation	0	0
	Alternate HH-West Intermediate Substation	0	0
	Primary HH-West Step-Up Substation	0	0
	Alternate HH-West Step-Up Substation	0	0

BESS = battery energy storage system

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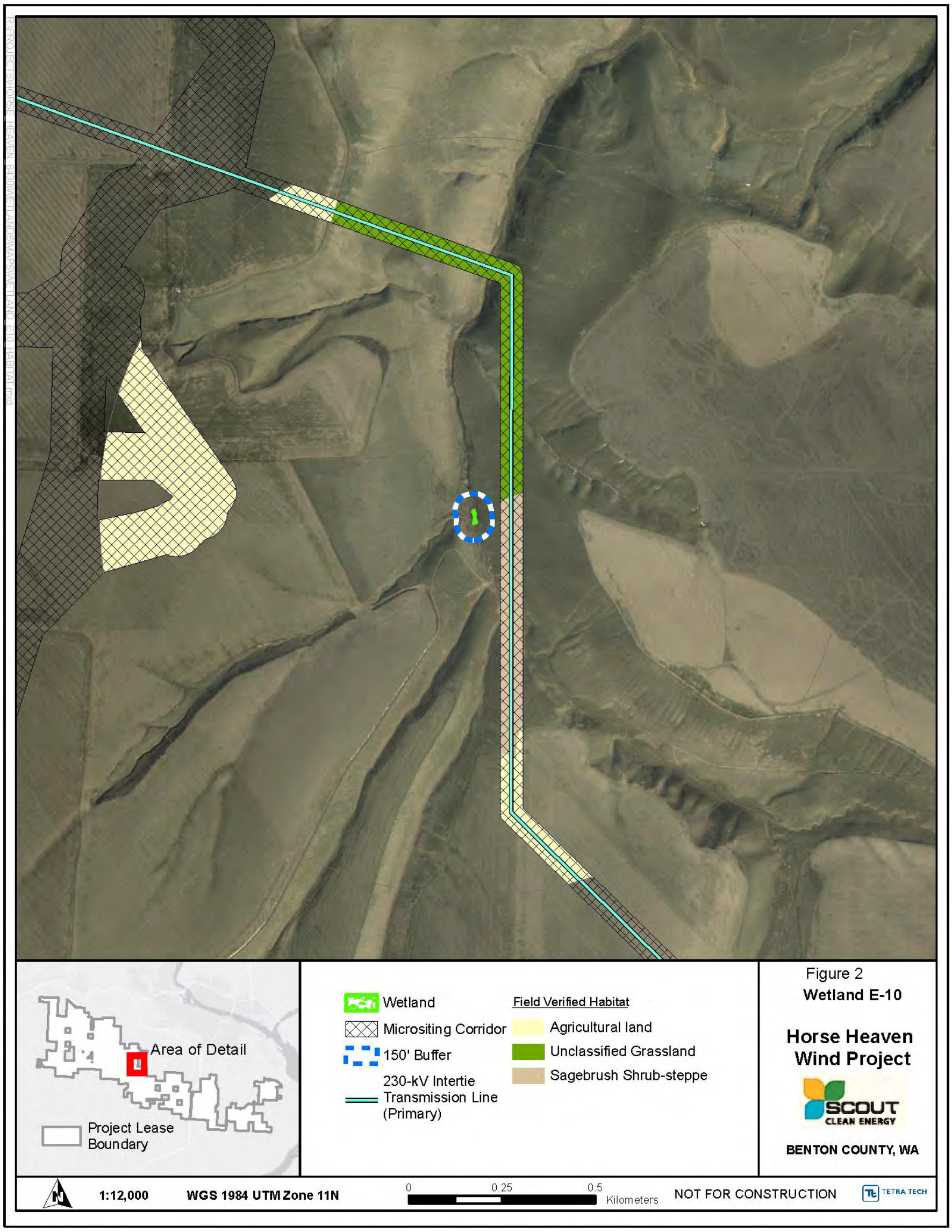
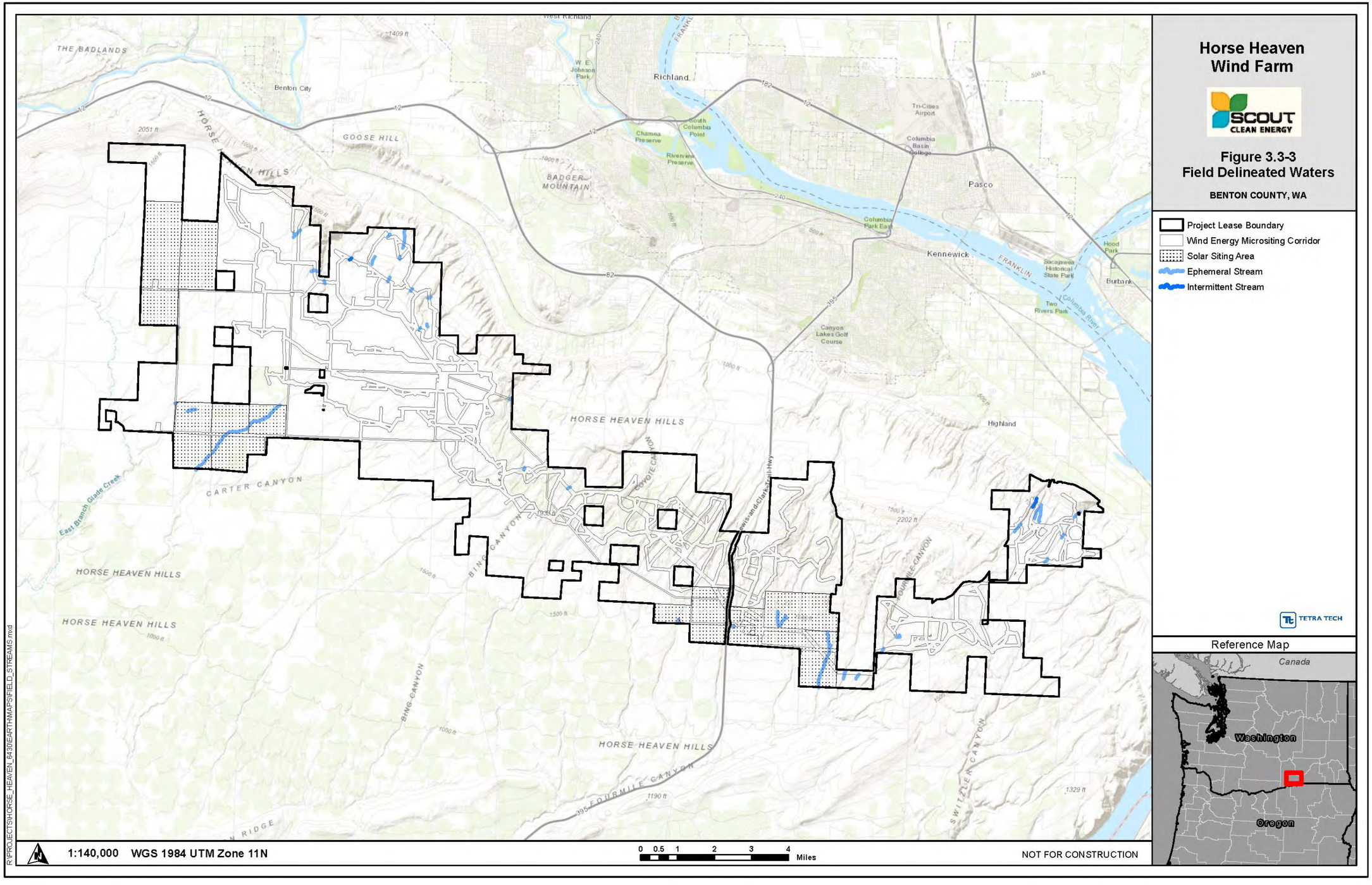


Source: Tetra Tech 2021

Figure 3.4-2: Wetland Delineated in the Lease Boundary during May 2020 Field Surveys by the Applicant



Source: Horse Heaven Wind Farm, LLC 2021

Figure 3.4-3: Waters Delineated in the Lease Boundary from Field Surveys

3.4.1.2 Runoff/Absorption

The Applicant provided the following information to characterize the existing runoff and absorption conditions within the Lease Boundary (Horse Heaven Wind Farm, LLC 2021).

- Surface water is anticipated to infiltrate to the ground, based on the moderate permeability and depth of soils in the Lease Boundary.
- Ultimately, surface water drains to the Yakima River, located north of the Lease Boundary, and the Columbia River, located north, east, and south of the Lease Boundary.
- Construction of the Project is anticipated to increase the total area of impervious surfaces in the Lease Boundary from the gravel access roads; however, the increase is not expected to notably affect the runoff. Assuming that the developed/disturbed habitat category from the Applicant's habitat mapping is all impervious surfaces, there are approximately 836 acres of impervious surface in the Project Lease Boundary (1.2 percent) at present (Horse Heaven Wind Farm, LLC 2021).

3.4.1.3 Floodplains

The Applicant provided the following information to characterize the floodplains within the Lease Boundary (Horse Heaven Wind Farm, LLC 2021).

- Approximately 149 acres of 100-year floodplains, also referred to as Frequently Flooded Areas in the Benton County Code, occur within the Lease Boundary. These areas are visible in **Figure 3.4-4** in the western section of the Lease Boundary and are associated with Critical Aquifer Recharge Areas (CARAs) as defined by Benton County Code Chapter 15.06 (Benton County 2018). CARAs are areas that act to recharge aquifers, which are used for potable water, as defined by Washington Administrative Code 365-190-100 (Washington State 2022).
- Approximately 160 acres of alluvial soils that are associated with CARAs also occur within the Lease Boundary. Alluvial soils are characterized by deposition by running water such as within a stream bed.
- No data on five-year and 50-year floodplains are available within the Lease Boundary.

Based on the present layout, approximately 0.8 acres of 100-year floodplain occur within areas identified as requiring temporary disturbance located within the Micrositing Corridor.

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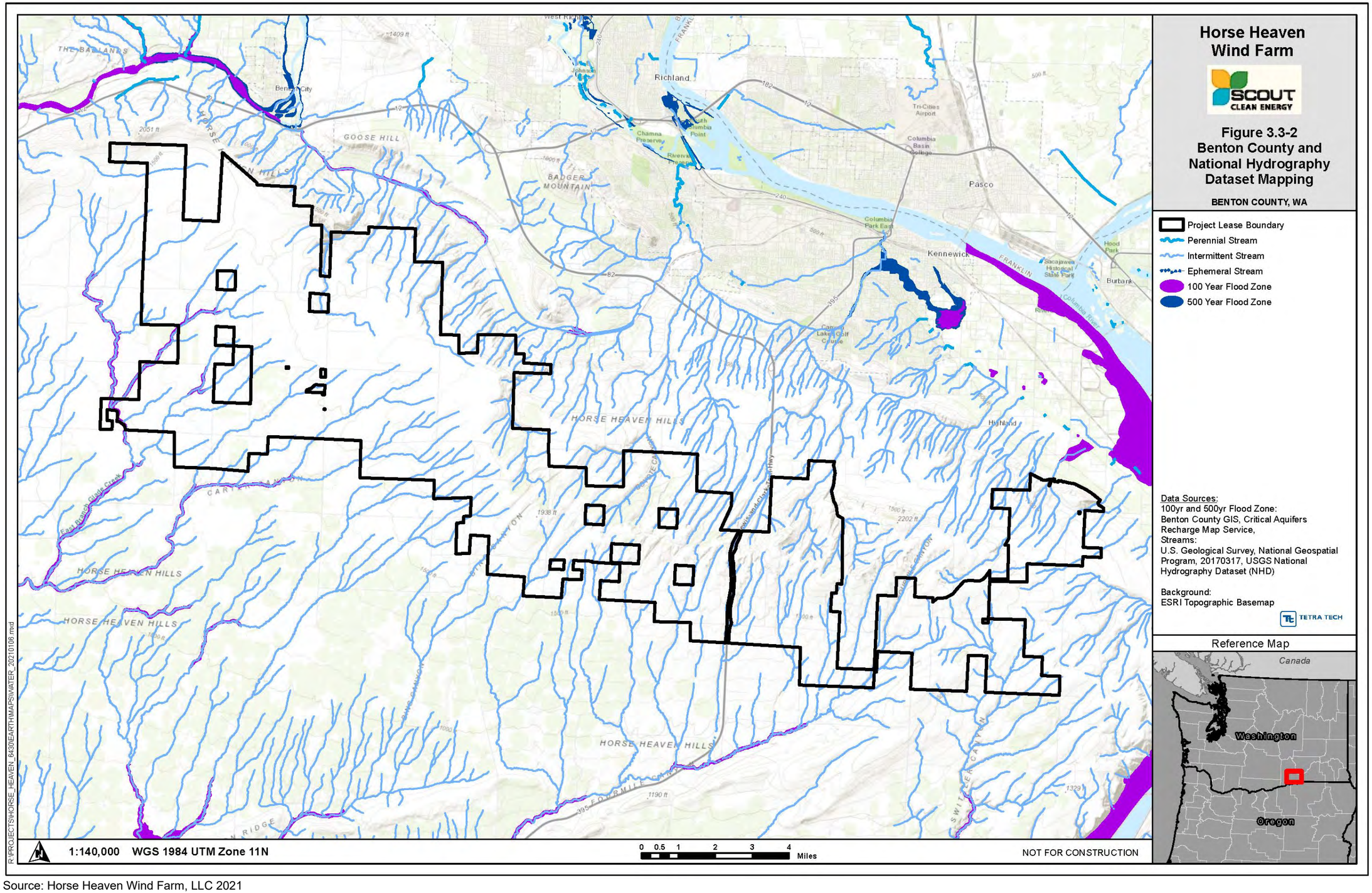

Source: Horse Heaven Wind Farm, LLC 2021

Figure 3.4-4: 100-Year and 500-Year Floodplain in the Project Lease Boundary Vicinity

3.4.1.4 Groundwater

The Applicant provided the following information to characterize the existing groundwater regime within the Lease Boundary (Horse Heaven Wind Farm, LLC 2021).

- Data available from the U.S. Geological Survey Washington Current Water Conditions identify the depth to groundwater as below normal, corresponding to approximately 184 feet below ground surface over most of the Lease Boundary. Data regarding groundwater movement, quality, and quantity within or near the Lease Boundary were not provided in the ASC for the Project (Horse Heaven Wind Farm, LLC 2021).
- Water well depths within the Lease Boundary range from approximately 55 to 1,506 feet below ground surface and are drilled primarily into the Columbia Plateau basaltic-rock aquifers. These water wells are used for domestic, stock, and irrigation (Horse Heaven Wind Farm, LLC 2021).
- As described in Section 3.4.1.3, there are approximately 160 acres of alluvial soils (i.e., soils deposited by surface water) associated with CARAs within the Lease Boundary (Benton County Code 15.06; Benton County 2018). CARAs are areas identified as important for critical recharge of aquifers (Benton County 2018).
- As described in Section 3.2, boreholes were evaluated for the presence and level of any groundwater during and shortly after drilling operations associated with the Applicant's geotechnical investigations. The boreholes did not display a static groundwater level (Horse Heaven Wind Farm, LLC 2021). Groundwater is not anticipated to impact Project design or construction. During the detailed geotechnical investigation, piezometers may be installed for more accurate site groundwater levels (Appendix B, Horse Heaven Wind Farm, LLC 2021).

3.4.1.5 Public Water Supply

The Applicant provided the following information to characterize public water supply sources (Horse Heaven Wind Farm, LLC 2021).[3]

- No public water supply wells are located within the Lease Boundary.
- The proposed water supply for construction is the City of Kennewick. Public water supply sources are the Columbia River and two groundwater collector wells on the banks of the Columbia River. An estimated 120 million gallons of water would be required for all construction activities.
- Water would be required during operations to wash solar modules in the Solar Siting Areas. Solar modules would be washed once per year during operations and would require an estimated 2,025,000 gallons of water annually. No additives would be used to wash solar panels. In addition, an estimated 5,000 gallons of water a day would be required for consumption and domestic use for kitchen and washroom facilities at the operation and maintenance buildings.
- A contractor such as Wing Air would be used to supply water during operations. If Wing Air is selected as the contractor, they have indicated that they propose to obtain water from the City of Kennewick for annual washing of the solar modules and consumption and domestic use at the operation and maintenance facilities during operations.

[3] Characteristics of public water supply for the study area are further discussed in Section 3.15.1, Public Services and Utilities.

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3.5 Vegetation

This section describes the vegetation and supporting habitat in the proposed Horse Heaven Wind Farm (Project, or Proposed Action) vicinity. Section 4.5 presents an analysis of Project potential impacts on vegetation. The vegetation analyzed in this section is restricted to upland vegetation. Wetlands are covered under Section 3.4.

Regulatory Setting

The applicable federal, state, and county laws and regulations relevant to vegetation resources are provided in Section 4.5.

Methodology

The affected environment described in this section has been categorized into four spatial boundaries to assess vegetation. These areas were independently calculated from spatial data provided by Horse Heaven Wind Farm, LLC (Applicant) (Horse Heaven Wind Farm, LLC 2021b). To enable an assessment of each Project component independent of the others, the spatial data were used as the Application for Site Certification (ASC) did not provide data summaries to a sufficient degree of detail. The calculated numbers do not match what was provided in the ASC, due to overlapping areas that occur both within the Wind Energy Micrositing Corridor and the Solar Siting Areas. The four areas used in this analysis are:

- The Lease Boundary, which encompasses approximately 72,428 acres on Horse Heaven Hills.
- The Wind Energy Micrositing Corridor, which encompasses approximately 11,845 acres of predominantly linear features, including the turbines, support infrastructure (i.e., roads, crane paths, laydown yards, operations and maintenance facilities, meteorological towers), collector lines (overhead and underground), transmission lines (230 kilovolt [kV] and 500 kV), the Primary HH-West Intermediate Substation, the Alternate HH-West Intermediate Substation, the Primary HH-West Step-up Substation, and the battery energy storage system (BESS) adjacent to the Alternate HH-West Step-up Substation. The Micrositing Corridor is located mostly within the Lease Boundary, except for three locations where infrastructure crosses Interstate 82.
- Solar Siting Areas, which encompass approximately 10,755 acres. Where information provided by the Applicant allows, the Solar Siting Areas are further divided into the following areas:
    - East Solar Field, which encompasses approximately 4,389 acres, including the HH-East Substation and the BESS adjacent to the Bofer Canyon – HH-East Substation
    - County Well Solar Field, which encompasses approximately 3,343 acres, including the Alternate HH-West Step-up Substation and the BESS adjacent to the Alternate HH-West Step-up Substation
    - Sellards Solar Field, which encompasses approximately 3,023 acres[4]
- The Vegetation Area of Analysis (VAA), which encompasses approximately 202,289 acres and includes the Lease Boundary plus an additional 2-mile buffer.

The VAA is the same area used for analysis of wildlife and habitat in Section 3.6. A 2-mile buffer was selected because this was the distance used for aerial raptor surveys by the Applicant during stick nest surveys (Appendix K, Horse Heaven Wind Farm, LLC 2021a), and vegetation is closely associated with wildlife and

[4] Unlike the East Solar Field and County Well Solar Field, the substation is located outside what is shown as the Solar Siting Area for the Sellards Solar Field.

wildlife use. Where data are available from the Applicant, analyses are provided for each Project component (i.e., Wind Energy Micrositing Corridor, Solar Siting Areas, substations, and BESS[s]). Where data by Project component are unavailable from the Applicant, analyses are summarized for all Project components.

Field studies were not conducted for this Draft Environmental Impact Statement (EIS); rather, this analysis relies on information provided in the ASC and the 2021 Botany and Habitat Survey Report for Horse Heaven Wind Farm (Horse Heaven Wind Farm, LLC 2021a; Tetra Tech 2021) and from government and publicly available sources. Habitat summaries provided in Section 3.5.2 for the Lease Boundary, Micrositing Corridor, and Solar Siting Areas were calculated independently, using the spatial data provided by the Applicant (Horse Heaven Wind Farm, LLC 2021b).

3.5.1 Affected Environment

The VAA is in the Columbia Plateau Ecoregion, which is an arid environment dominated by grassland-steppe and shrub-steppe (Clarke and Bryce 1997). The dominant vegetation association in the VAA was historically big sagebrush (*Artemisia tridentata*) and bluebunch wheatgrass (*Pseudoroegneria spicata*) (Franklin and Dyrness 1988). However, much of the land and associated vegetation has been altered by anthropogenic activities, predominantly agriculture and grazing in the Horse Heaven Hills area.

The VAA is located in Benton County, in eastern Washington. Benton County falls within the rain shadow of the Cascade Mountains, which creates dry conditions year-round. Elevation within the Lease Boundary ranges from 604 to 2,051 feet above mean sea level (Horse Heaven Wind Farm, LLC 2021a). The average annual precipitation for the nearest city, the city of Kennewick, is approximately 7.7 inches (U.S. Climate Data 2021). Average annual snowfall is approximately 1 inch (U.S. Climate Data 2021). Summers are hot and mostly clear, while winters are cold and partly cloudy (Horse Heaven Wind Farm, LLC 2021a). The annual average high temperature is approximately 66 degrees Fahrenheit (°F), with low average yearly temperatures of 44°F (U.S. Climate Data 2021).

3.5.2 Habitat

The following sections describe the existing habitat within the Lease Boundary and VAA.

3.5.2.1 Habitat Mapping in the Lease Boundary

Habitat mapping is available from the Applicant for the area within the Lease Boundary and was developed using both aerial imagery and field survey data. The Applicant adapted habitat types and subtypes to describe the existing environment from descriptions in the Washington Department of Fish and Wildlife's (WDFW) Wind Power Guidelines (WDFW 2009) and Johnson and O'Neil (2001), except the description for rabbitbrush shrubland and non-native grassland, which have been described by the Applicant in the ASC. The Applicant completed field surveys of the Wind Energy Micrositing Corridor and Solar Siting Areas in 2020 and 2021 to characterize the existing conditions. All parts of the Micrositing Corridor and Solar Siting Areas were field surveyed, except for 604 acres that were not accessible within two parcels of land in the Sellards Solar Field. Photos of representative habitat subtypes in the Lease Boundary are provided in Appendix 3.5-1. Descriptions of each habitat type and subtype occurring in the Lease Boundary are provided below (Horse Heaven Wind Farm, LLC 2021a).

- **Agricultural land (photo 1, Appendix 3.5-1)** is defined as areas used for agricultural purposes. Within the Lease Boundary, this is primarily active wheat fields and fallow wheat fields.

- **Developed/disturbed areas (photo 2, Appendix 3.5-1)** are areas of anthropogenic development such as roads, buildings, and structures associated with human development (e.g., radio towers), which are primarily unvegetated or dominated by weedy species.
- **Grasslands** are graminoid and forb-dominated ecosystems. Grassland subtypes in the Lease Boundary are described below based on the information provided in the ASC and the 2021 Botany and Habitat Survey Report for Horse Heaven Wind Farm (Horse Heaven Wind Farm, LLC 2021a; Tetra Tech 2021).
  - **Eastside (interior) grassland (photo 3, Appendix 3.5-1)** is dominated by native perennial grasses: bluebunch wheatgrass (*Pseudoroegneria spicata*), Sandberg's bluegrass (*Poa secunda*), and Great Basin wildrye (*Leymus cinereus*). The forb layer is diverse and includes species such as Carey's balsamroot (*Balsamorhiza careyana*), fiddleneck (*Amsinckia* sp.), and lupine (*Lupinus* sp.). The shrub layer is typically less than 5 percent of total vegetation cover with green rabbitbrush (*Chrysothamnus viscidiflorus*) and rubber rabbitbrush (*Ericameria nauseosa*). The areas identified by the Applicant as Eastside (interior) grassland are considered Eastside Steppe Priority Habitat in Washington State (WDFW 2008).
  - **Non-native grassland (photo 4, Appendix 3.5-1)** includes areas of formerly planted and native grassland that are now dominated by non-native grass and forb species and have transitioned into non-native grassland. Within the Lease Boundary, non-native grasslands are areas dominated by cereal rye (*Secale cereale*), cheatgrass (*Bromus tectorum*), prickly lettuce (*Lactuca serriola*), tall tumblemustard (*Sisymbrium altissimum*), and yellow salsify (*Tragopogon dubius*). Native plants may be present but represent a small percentage of the overall vegetation cover.
  - **Planted grasslands (photo 5, Appendix 3.5-1)** are lands that have been planted with non-native grasses, native grasses, and native shrubs. These lands may or may not be enrolled in the U.S. Department of Agriculture Conservation Reserve Program. Within the Lease Boundary, planted grasslands are typically characterized by perennial crested wheatgrass (*Agropyron cristatum*), bluebunch wheatgrass, big bluegrass (*Poa secunda* ssp. *juncifolia*), rabbitbrush, and low forb diversity.
  - **Unclassified grasslands** are areas identified as herbaceous (forb or graminoid) land cover, as classified by the National Land Cover Database (NLCD), that were not further classified into one of the above grassland subtypes. This classification is used for the portion of the Lease Boundary that lies outside the Wind Energy Micrositing Corridor and Solar Siting Areas, where field data are limited.
- **Shrublands** are ecosystems that have a conspicuous shrub layer. Shrubland subtypes within the Lease Boundary are described below.
  - **Dwarf shrub-steppe (photo 6, Appendix 3.5-1)** is a shrubland habitat located on lithosol soil. Dwarf shrub-steppe is dominated by the native dwarf shrub rock buckwheat (*Eriogonum sphaerocephalum*) and the native perennial grasses bluebunch wheatgrass and Sandberg's bluegrass. Non-native plants such as cheatgrass and cereal rye may be present. Dwarf shrub-steppe is part of the Shrub-steppe Priority Habitat in Washington State (WDFW 2008).
  - **Rabbitbrush shrubland (photo 7, Appendix 3.5-1)** is characterized by areas dominated by rubber rabbitbrush, which readily colonizes post-fire or post-agricultural development. Within the Lease Boundary, rabbitbrush shrubland occurs in former agriculture land areas that have been planted with native grasses, native shrubs, and/or non-native grasses. Rabbitbrush shrubland is dominated by

rabbitbrush, mainly green rabbitbrush and rubber rabbitbrush, with various native and non-native grasses and forbs. These areas may or may not be enrolled in the Conservation Reserve Program.

- **Sagebrush shrub-steppe (photo 8, Appendix 3.5-1)** is dominated by the native shrub big sagebrush (*Artemisia tridentata*), often with spineless horsebrush (*Tetradymia canescens*), rubber rabbitbrush, and green rabbitbrush. Sagebrush shrub-steppe ecosystems within the Lease Boundary typically have greater than 50 percent cover of sagebrush, but cover can range from 10 to 80 percent. Sagebrush shrub-steppe is part of the Shrub-steppe Priority Habitat in Washington State (WDFW 2008).
- **Unclassified shrubland** includes areas mapped as shrub or scrub by the NLCD and areas mapped as shrub-steppe during the 2018 surveys that could not be further differentiated into subtypes. This classification is only used for the area within the Lease Boundary outside the Wind Energy Micrositing Corridor and Solar Siting Areas, where field data are limited.

A summary of areas classified as each habitat type and subtype within the Lease Boundary and within areas of the proposed Project components is provided in **Table 3.5-1**. The location of habitat types identified by the Applicant is provided in **Figure 3.5-1**. The habitat types within each Solar Siting Area are further broken out in **Table 3.5-2**. For each habitat type, the percentage of habitat occurring in areas of the proposed Project components was compared to the total area available in the Lease Boundary (**Table 3.5-1**). All the Eastside (interior) grassland (Eastside Steppe), 89.7 percent of the dwarf shrub-steppe, and 17.9 percent of the sagebrush shrub-steppe habitats within the Lease Boundary occur in the areas of the proposed Project components.

Table 3.5-1: Habitat Types and Subtypes within the Lease Boundary and Project Component Areas[a]

Habitat Type/Subtype	Lease Boundary (acres)	Wind Energy Micrositing Corridor (acres)	Solar Siting Areas (acres)	Substation Areas (acres)	BESS Areas (acres)	Percentage of Habitat Type Available within Lease Boundary located within Project Component Areas
Agriculture land	53,450.1	9,219.3	8,409.0	36.6	18.1	33.0%
Developed/disturbed	835.7	206.5	128.8	0	0	40.1%
Grassland						
Eastside (interior) grassland (Eastside Steppe)[b]	173.5	56.8	153.3	0	0	100%
Non-native grassland	1,635.5	656.5	451.4	1.6	0	67.7%
Planted grassland	4,338.3	934.1	519.4	0	0	33.5%
Unclassified grassland[c]	6,125.2	0	0	0	0	0%
Shrubland						
Dwarf shrub-steppe[b]	23.2	20.8	0	0	0	89.7%
Rabbitbrush shrubland	3,037.7	560.3	1,024.9	0	0	52.2%
Sagebrush shrub-steppe[b]	1,372.0	190.1	67.9	0	0	18.8%
Unclassified shrubland[c]	1,436.6	0	<0.1	0	0	0%
Total	**72,427.9**	**11,844.5**	**10,754.7**	**38.2**	**18.1**	

Sources: WDFW 2008; Horse Heaven Wind Farm, LLC 2021c; Tetra Tech 2021

Notes:

[a] Calculations were completed using the spatial data provided by the Applicant (Horse Heaven Wind Farm, LLC 2021a). Areas of overlap may occur between Project components (e.g., the Wind Energy Micrositing Corridor may extend into the Solar Siting Area).

[b] Priority Habitats in the State of Washington (WDFW 2008).

[c] Unclassified grassland and unclassified shrubland habitat subtypes include the areas mapped during surveys conducted in 2018 or using National Land Cover Database data that were not further classified into subtypes (e.g., planted grassland, sagebrush shrub-steppe) during the 2020 and 2021 field surveys or 2020 desktop analysis.

BESS = battery energy storage facility

Table 3.5-2: Habitat Types and Subtypes in Each of the Solar Siting Areas[a]

Habitat Type	East Solar Field (acres)	County Well Solar Field (acres)	Sellards Solar Field (acres)
Agriculture land	2,471.6	3,223.7	2,713.6
Developed/disturbed	53.8	34.8	40.2
Grassland			
Eastside (Interior) Grassland (Eastside steppe)[b]	153.3	0	0
Non-native grassland	398.5	4.5	48.4
Planted grassland	236.1	79.9	203.3
Unclassified grassland[c]	0	0	0
Shrubland			
Dwarf shrub-steppe[b]	0	0	0
Rabbitbrush shrubland	1,024.9	0	0
Sagebrush shrub-steppe[b]	50.9	0	17.0
Unclassified shrubland[c]	<0.1	0	0
Total	**4,389.2**	**3,342.9**	**3,022.63**

Sources: WDFW 2008; Horse Heaven Wind Farm; LLC 2021b

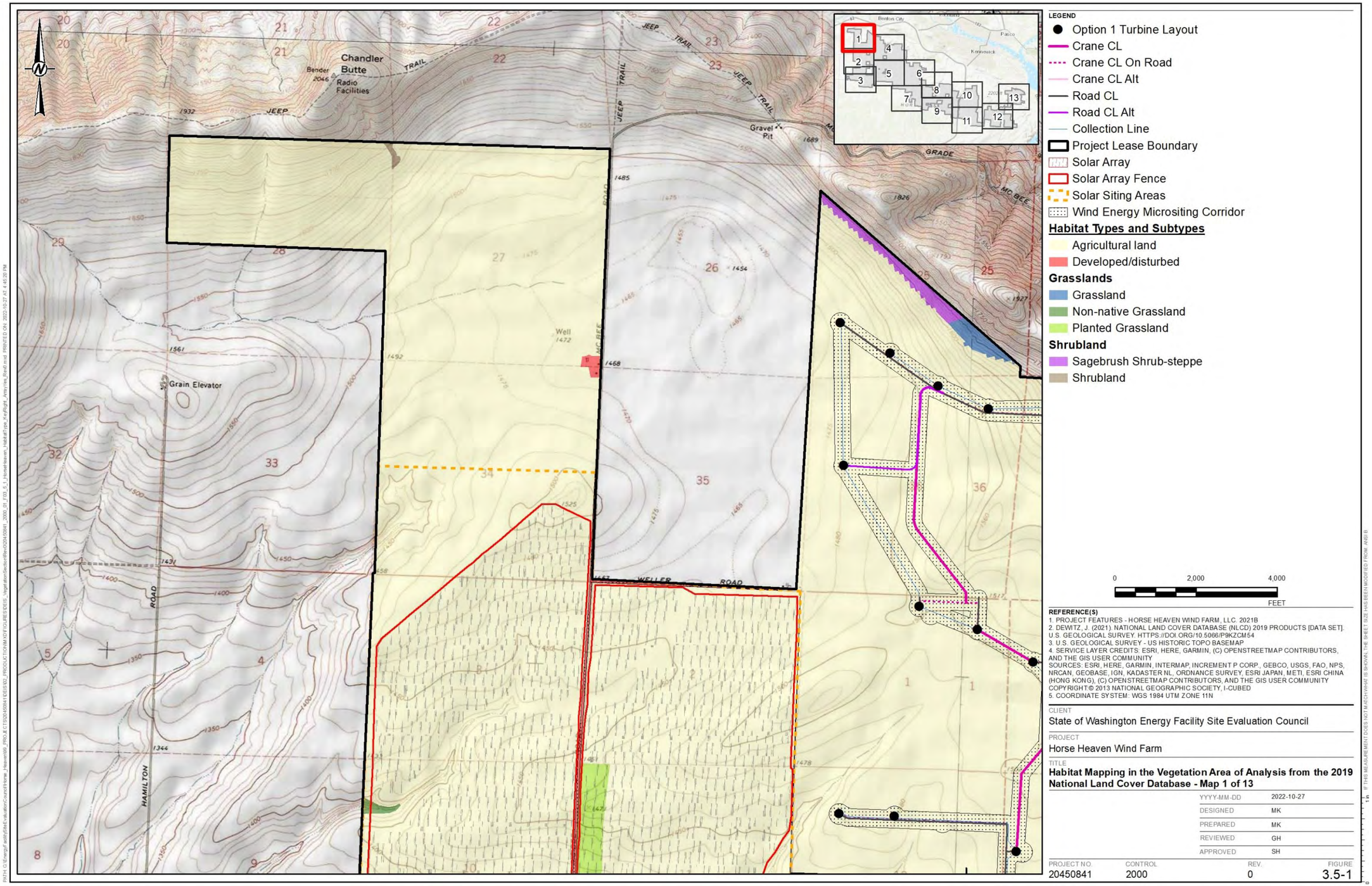
Notes:

[a] Calculations were completed using the spatial data provided by the Applicant (Horse Heaven Wind Farm, LLC 2021b). Areas of overlap may occur between Project components (e.g., the Wind Energy Micrositing Corridor may extend into the Solar Siting Area).

[c] Priority Habitats in the State of Washington (WDFW 2008).

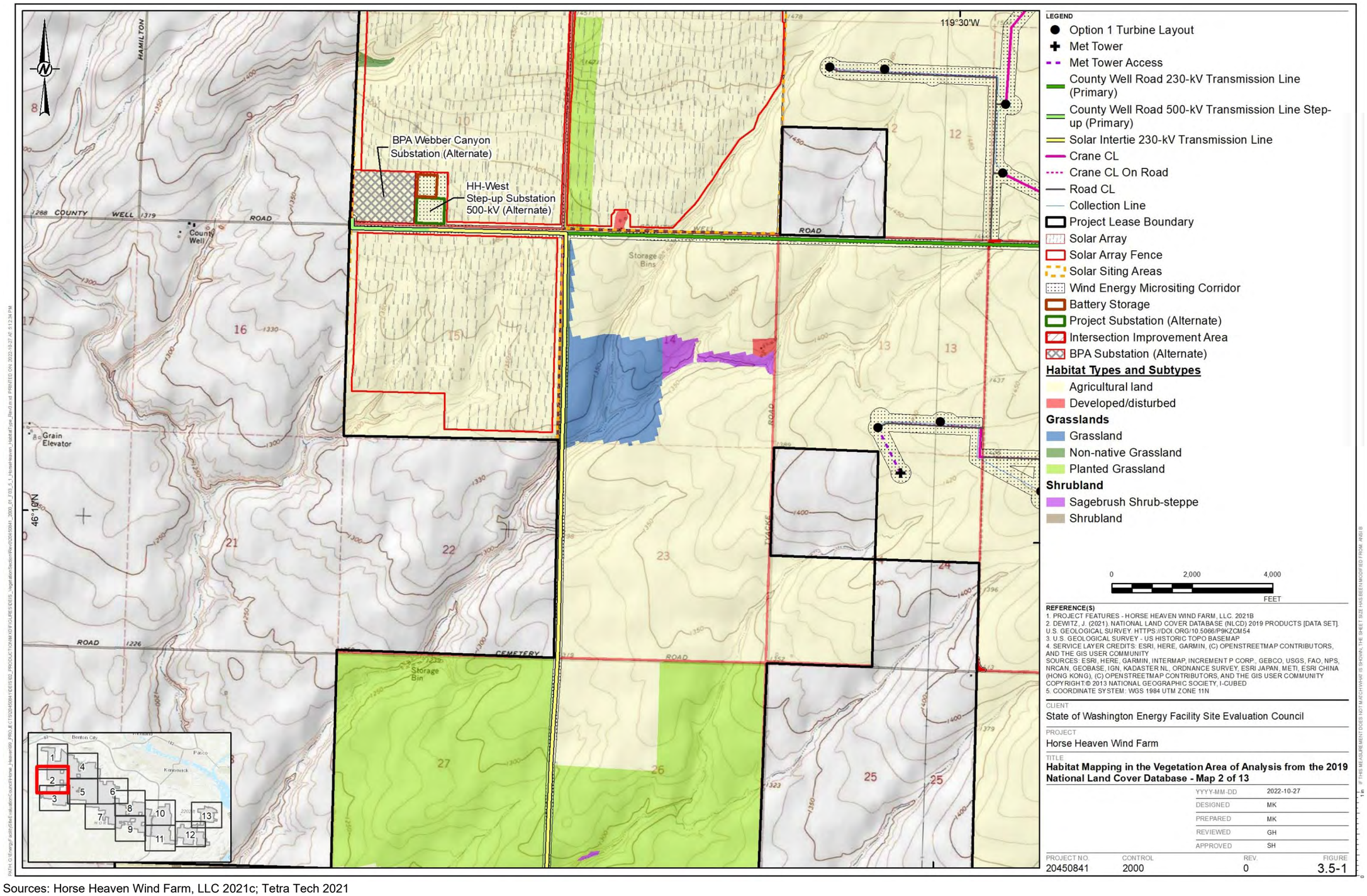
[b] Unclassified grassland and unclassified shrubland habitat subtypes include those areas mapped during surveys conducted in 2018 or using NLCD data that were not further classified into subtypes (e.g., planted grassland, sagebrush shrub-steppe) during the 2020 and 2021 field surveys or 2020 desktop analysis.

NLCD = National Land Cover Database



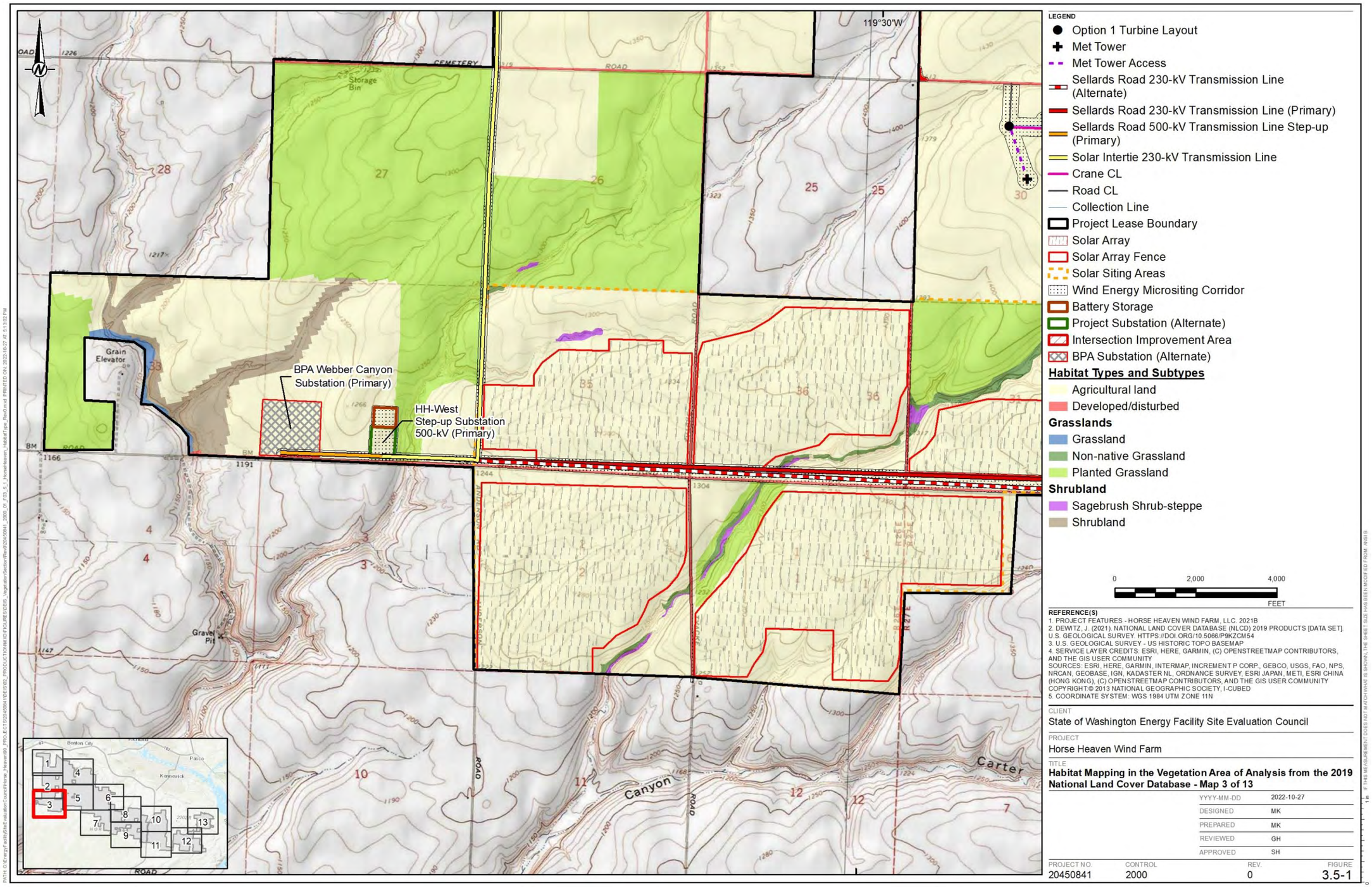
Sources: Horse Heaven Wind Farm, LLC 2021c; Tetra Tech 2021

Figure 3.5-1: Habitat Types and Subtypes within the Project Lease Boundary page 1 of 13



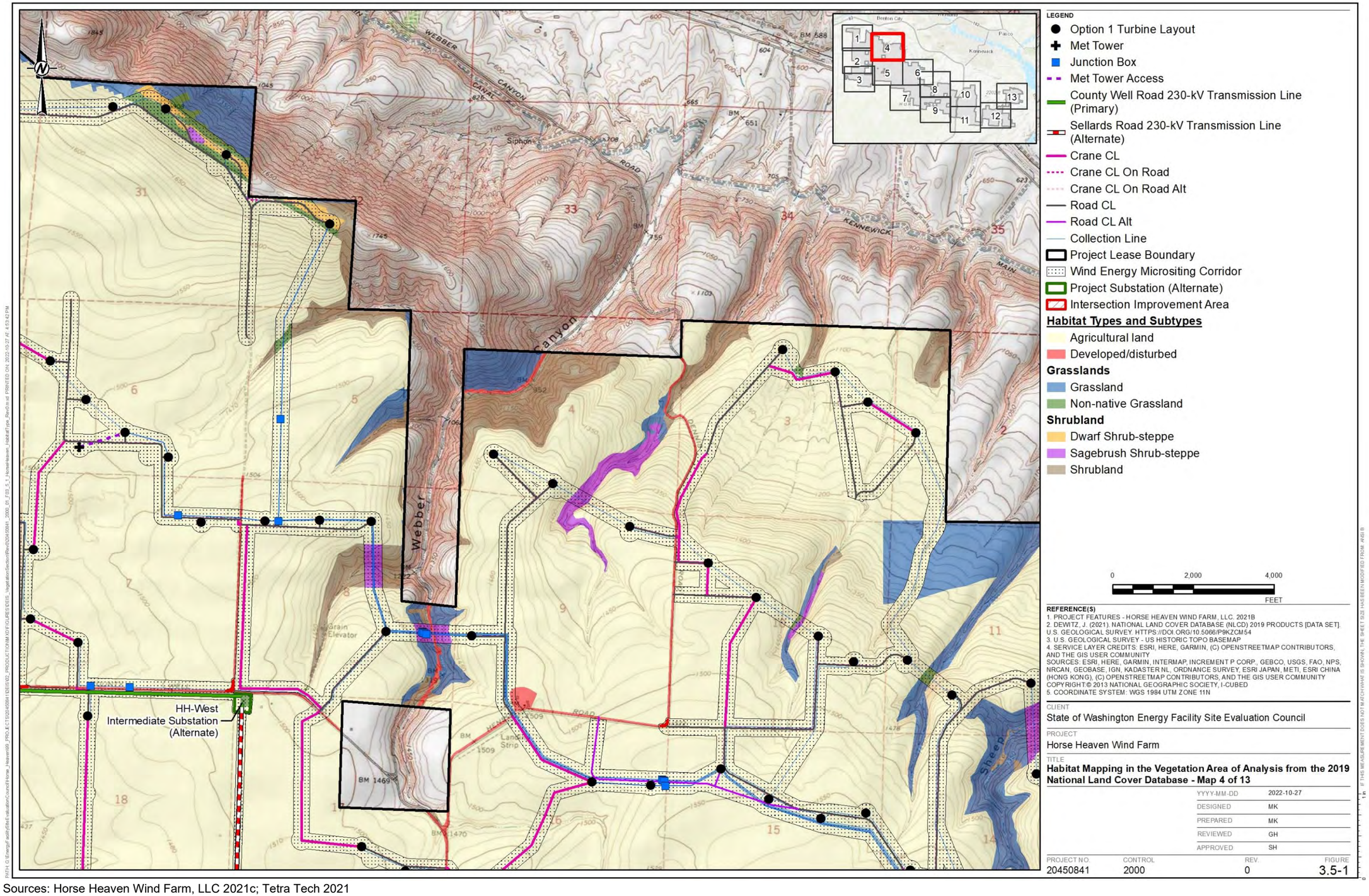
Sources: Horse Heaven Wind Farm, LLC 2021c; Tetra Tech 2021

Figure 3.5-1: Habitat Types and Subtypes within the Project Lease Boundary page 2 of 13



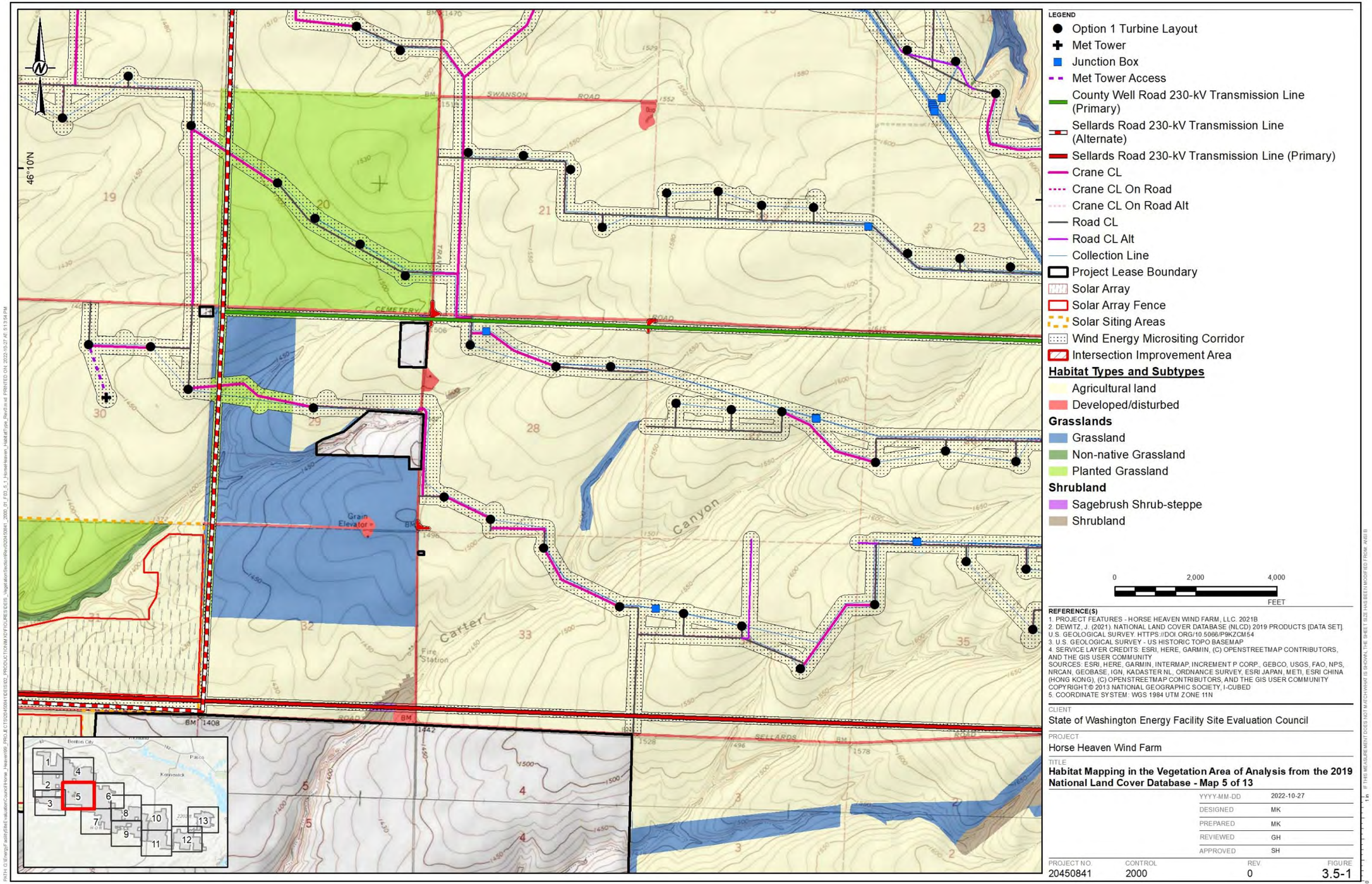
Sources: Horse Heaven Wind Farm, LLC 2021c; Tetra Tech 2021

Figure 3.5-1: Habitat Types and Subtypes within the Project Lease Boundary page 3 of 13



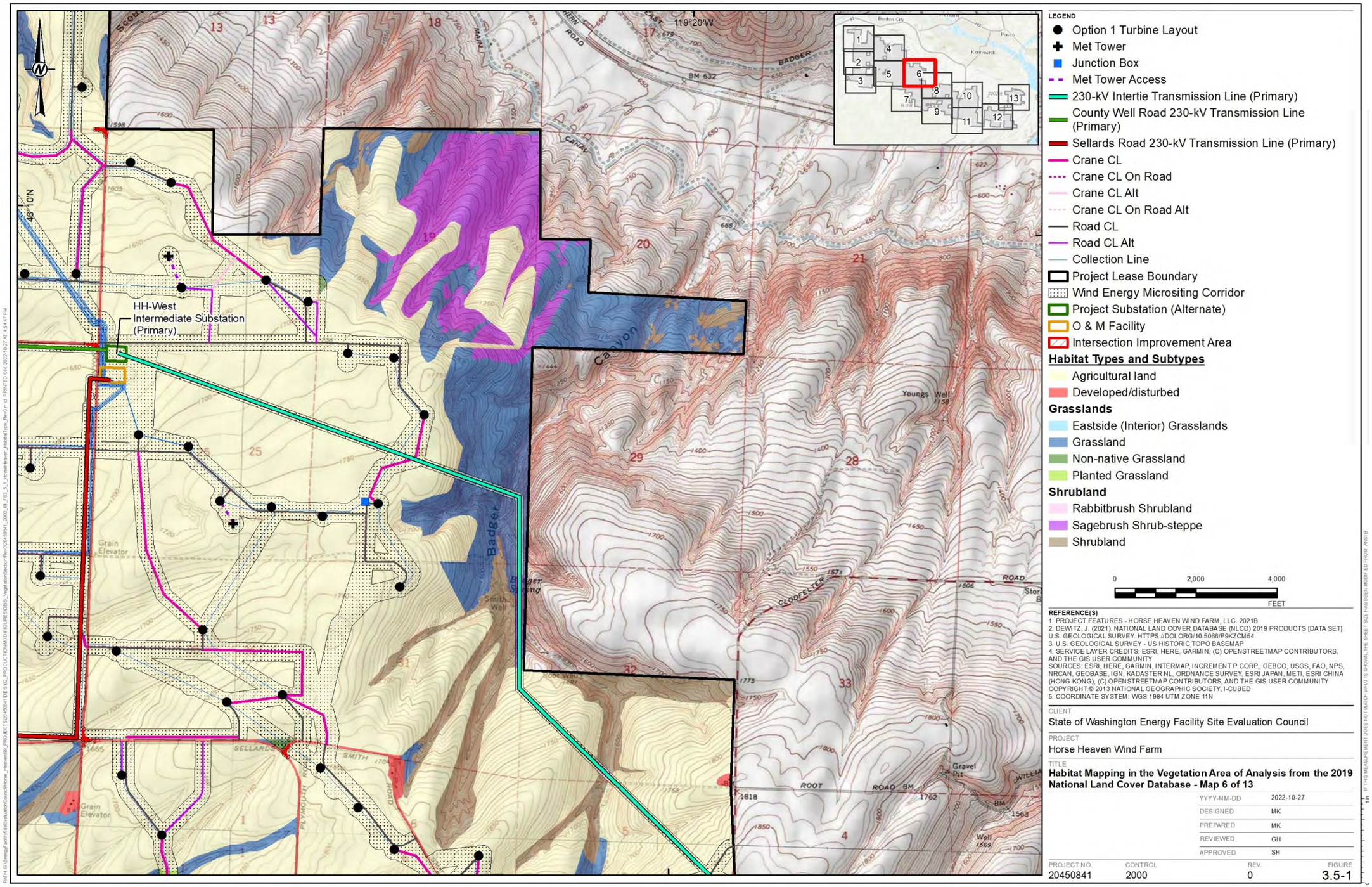
Sources: Horse Heaven Wind Farm, LLC 2021c; Tetra Tech 2021

Figure 3.5-1: Habitat Types and Subtypes within the Project Lease Boundary page 4 of 13



Sources: Horse Heaven Wind Farm, LLC 2021c; Tetra Tech 2021

Figure 3.5-1: Habitat Types and Subtypes within the Project Lease Boundary page 5 of 13



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1. PROJECT FEATURES - HORSE HEAVEN WIND FARM, LLC. 2021B
2. DEWITZ, J. (2021). NATIONAL LAND COVER DATABASE (NLCD) 2019 PRODUCTS [DATA SET]. U.S. GEOLOGICAL SURVEY. HTTPS://DOI.ORG/10.5066/P9KZCM54
3. U.S. GEOLOGICAL SURVEY - US HISTORIC TOPO BASEMAP
4. SERVICE LAYER CREDITS: ESRI, HERE, GARMIN, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
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5. COORDINATE SYSTEM: WGS 1984 UTM ZONE 11N

CLIENT
State of Washington Energy Facility Site Evaluation Council

PROJECT
Horse Heaven Wind Farm

TITLE
Habitat Mapping in the Vegetation Area of Analysis from the 2019 National Land Cover Database - Map 6 of 13

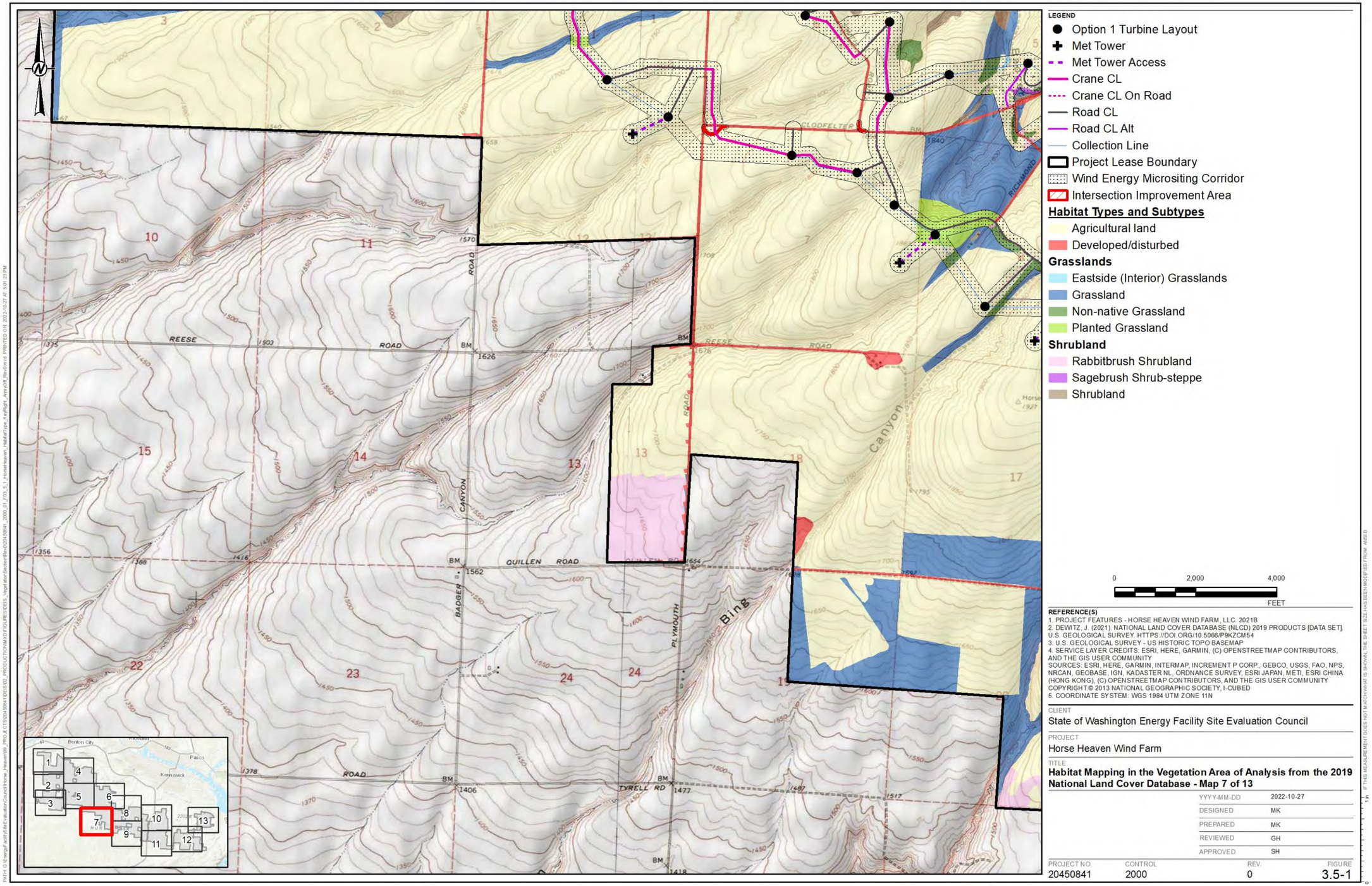
YYYY-MM-DD	2022-10-27
DESIGNED	MK
PREPARED	MK
REVIEWED	GH
APPROVED	SH

PROJECT NO.	CONTROL	REV.	FIGURE
20450841	2000	0	3.5-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

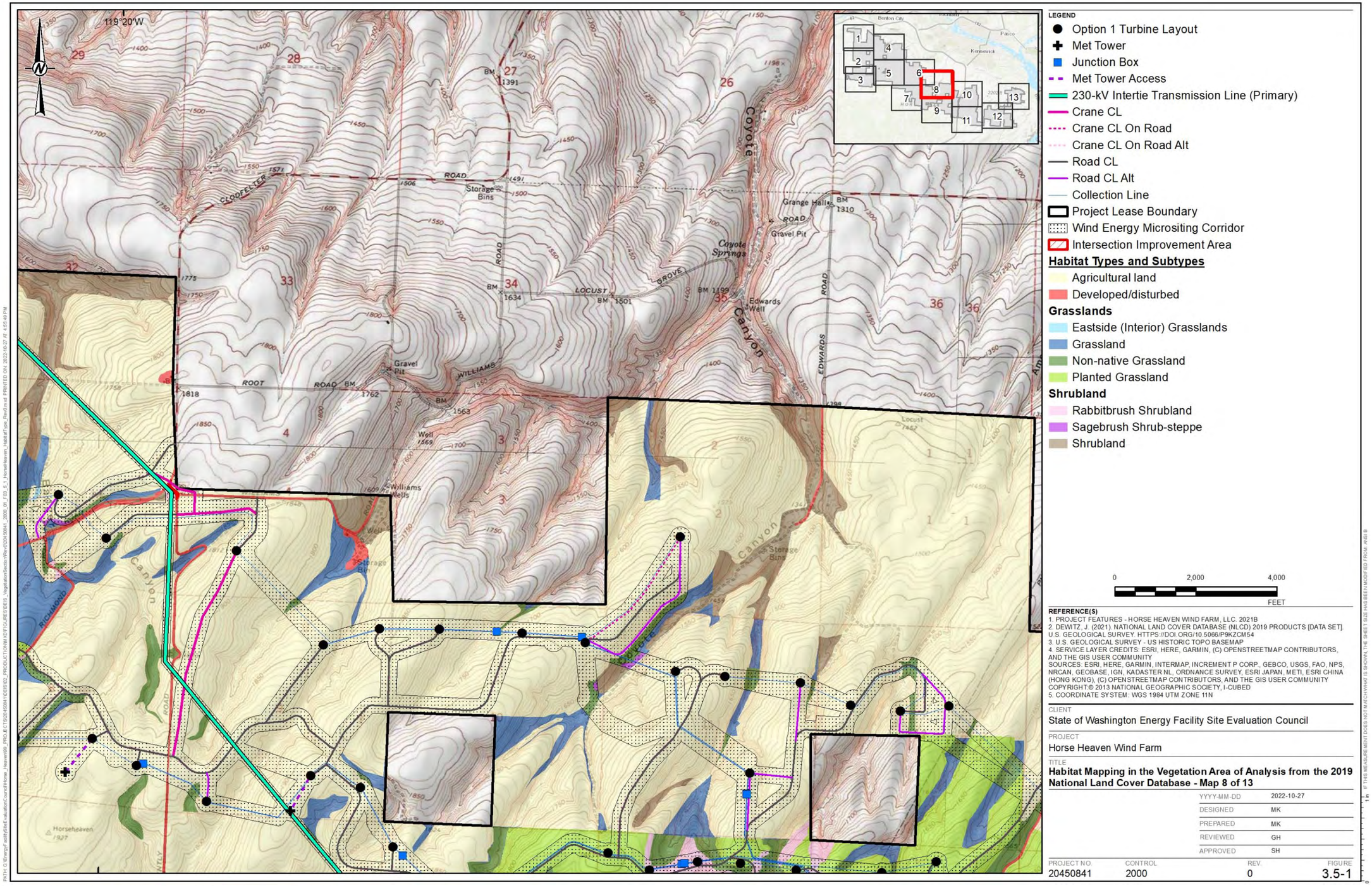
Sources: Horse Heaven Wind Farm, LLC 2021c; Tetra Tech 2021

Figure 3.5-1: Habitat Types and Subtypes within the Project Lease Boundary page 6 of 13



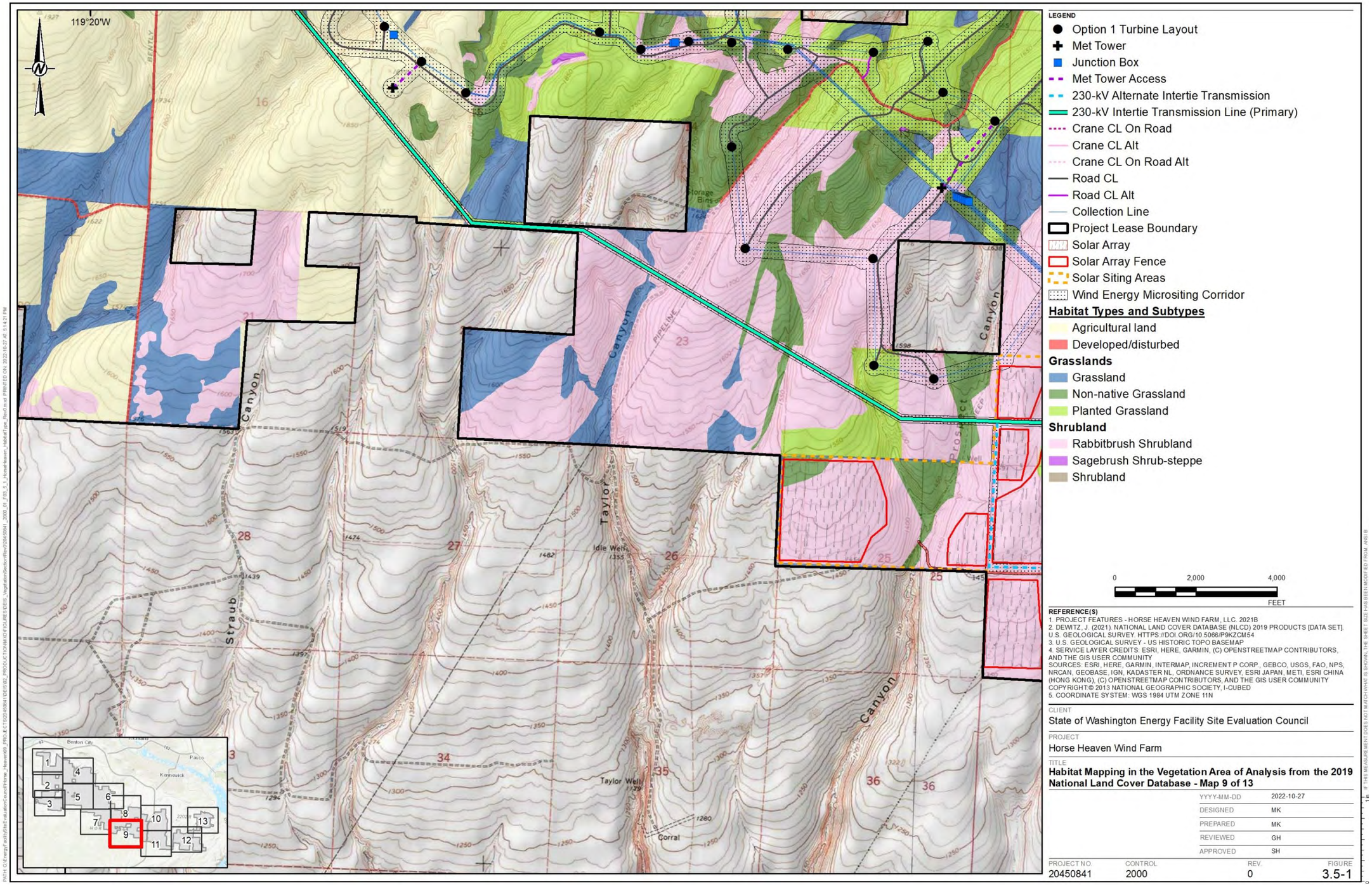
Sources: Horse Heaven Wind Farm, LLC 2021c; Tetra Tech 2021

Figure 3.5-1: Habitat Types and Subtypes within the Project Lease Boundary page 7 of 13



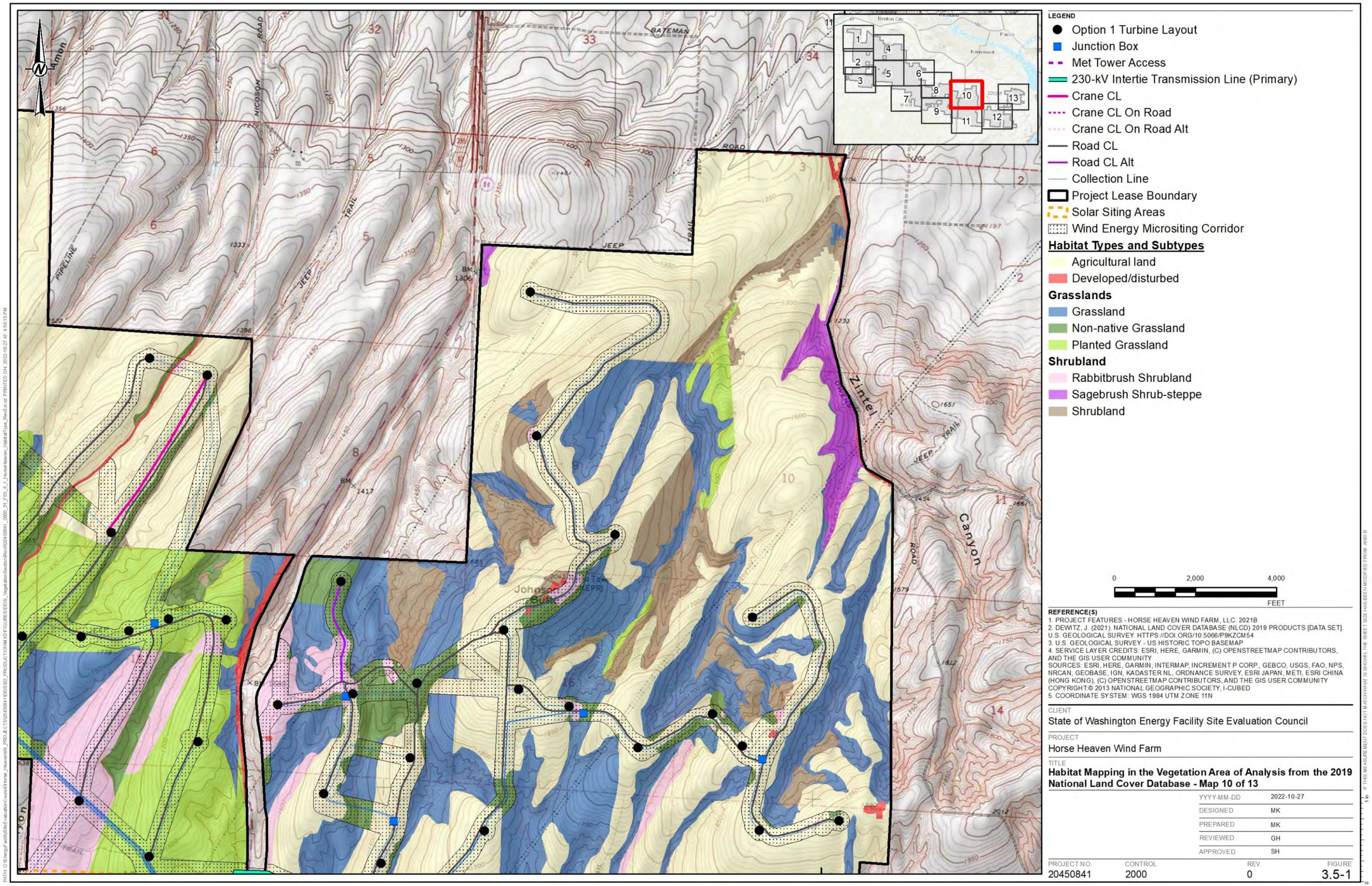
Sources: Horse Heaven Wind Farm, LLC 2021c; Tetra Tech 2021

Figure 3.5-1: Habitat Types and Subtypes within the Project Lease Boundary page 8 of 13



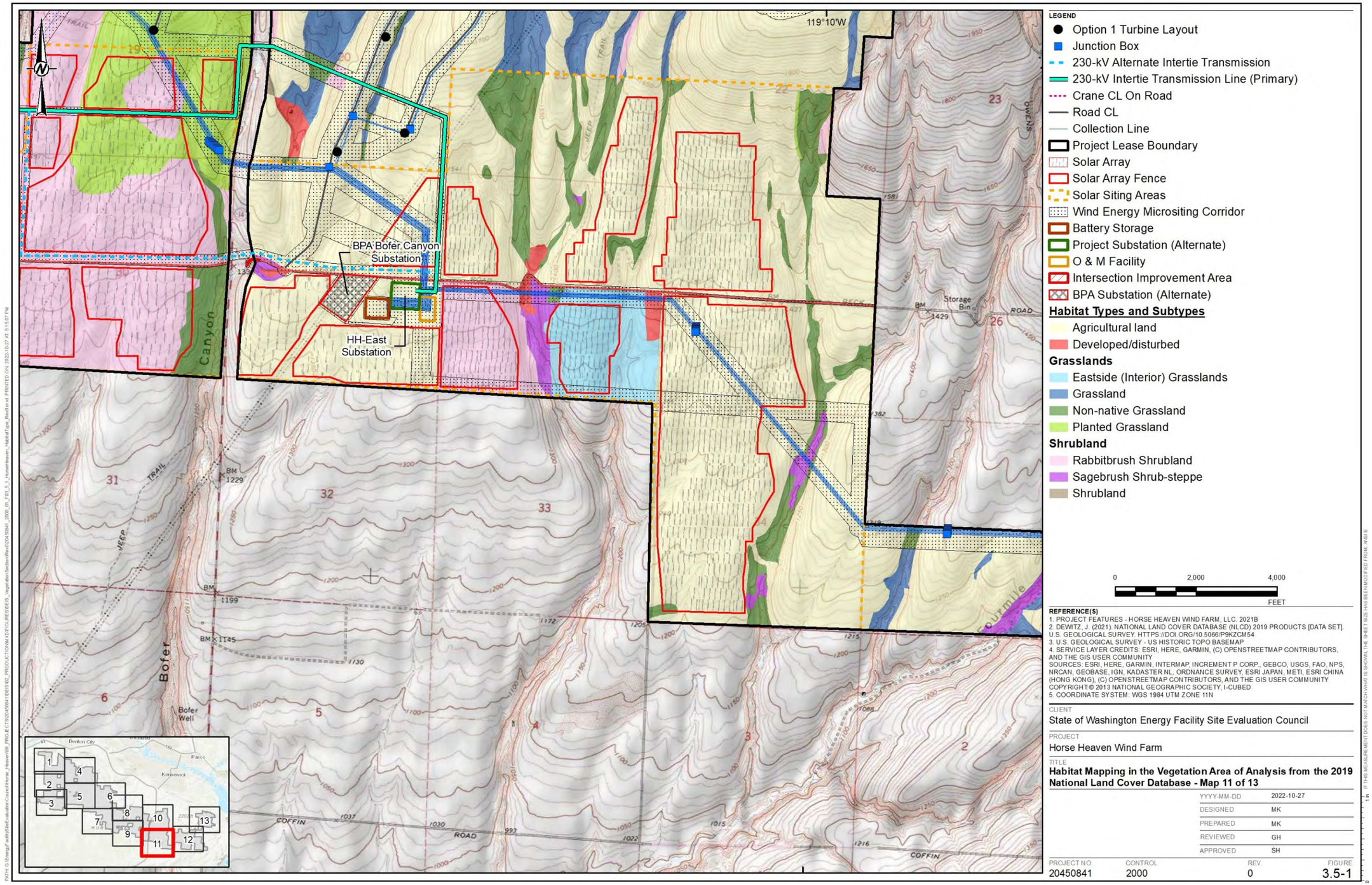
Sources: Horse Heaven Wind Farm, LLC 2021c; Tetra Tech 2021

Figure 3.5-1: Habitat Types and Subtypes within the Project Lease Boundary page 9 of 13



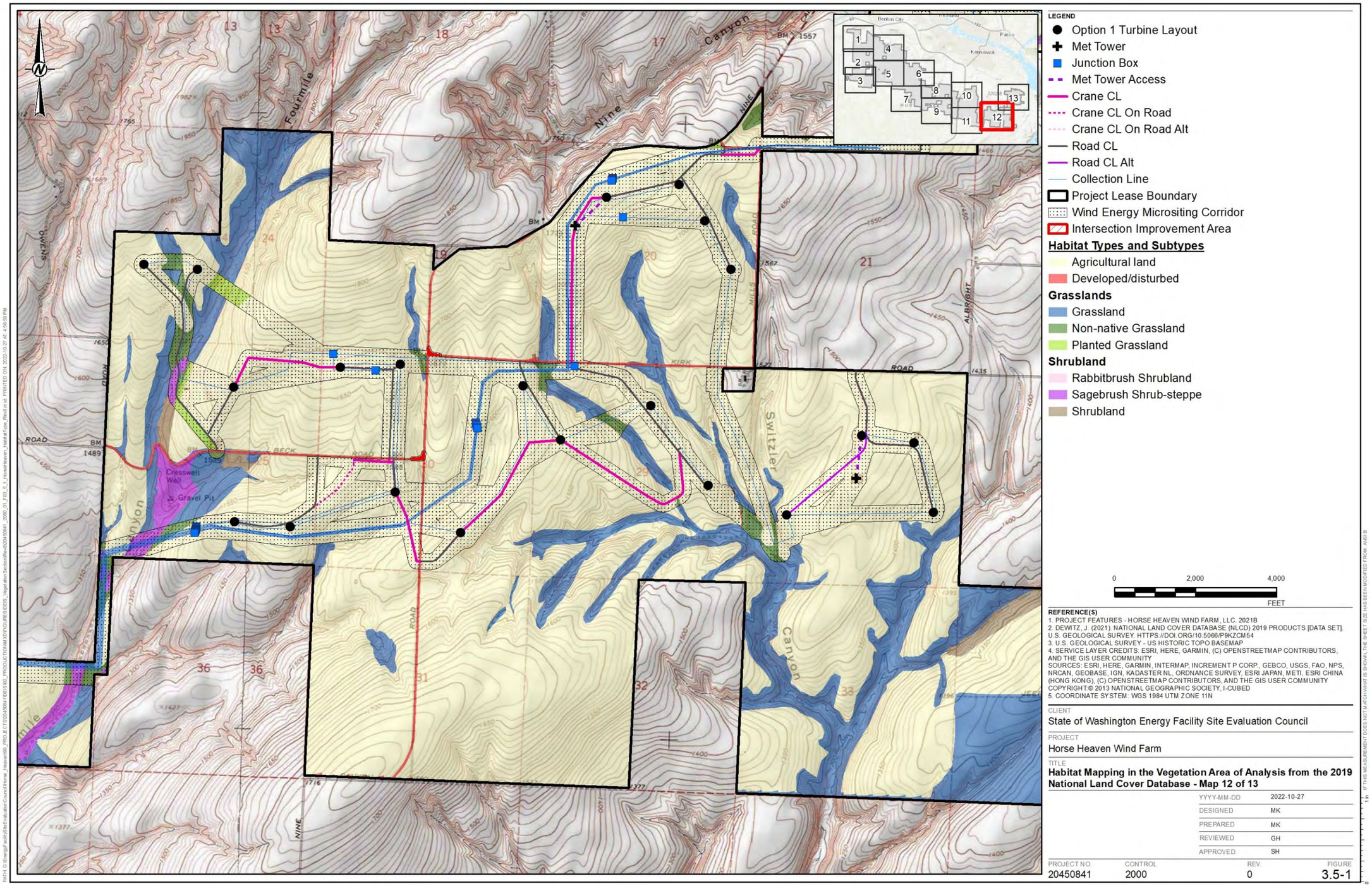
Sources: Horse Heaven Wind Farm, LLC 2021c; Tetra Tech 2021

Figure 3.5-1: Habitat Types and Subtypes within the Project Lease Boundary page 10 of 13



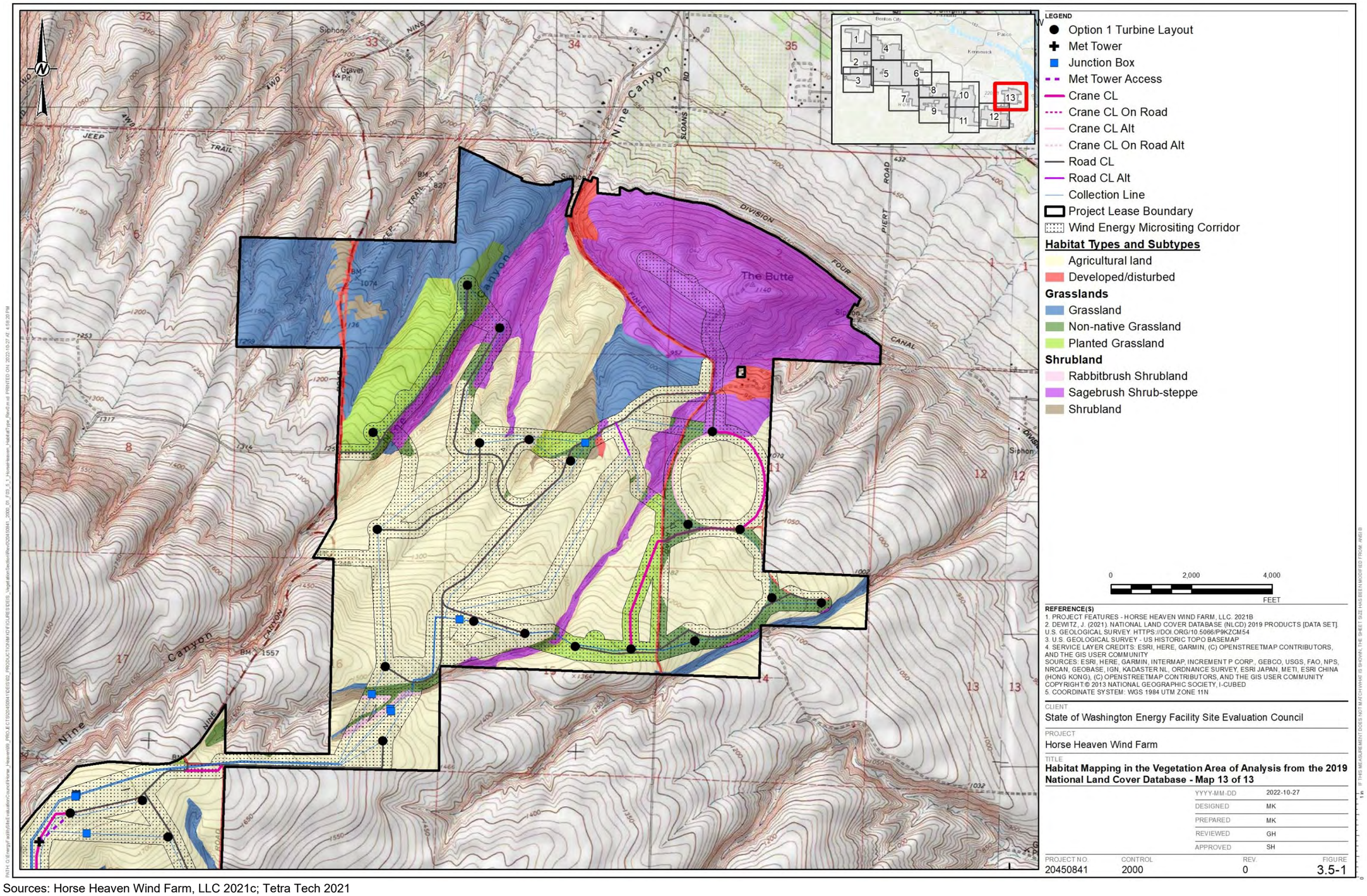
Sources: Horse Heaven Wind Farm, LLC 2021c; Tetra Tech 2021

Figure 3.5-1: Habitat Types and Subtypes within the Project Lease Boundary page 11 of 13



Sources: Horse Heaven Wind Farm, LLC 2021c; Tetra Tech 2021

Figure 3.5-1: Habitat Types and Subtypes within the Project Lease Boundary page 12 of 13



Sources: Horse Heaven Wind Farm, LLC 2021c; Tetra Tech 2021

Figure 3.5-1: Habitat Types and Subtypes within the Project Lease Boundary page 13 of 13

3.5.2.2 Habitat Mapping in the Vegetation Area of Analysis

Habitat mapping within the larger VAA, outside the Lease Boundary, was not available from the Applicant. To describe habitat within the VAA, data on habitat types were obtained from 2019 NLCD data (MRLC n.d.). This represents the best available data for the VAA. The data available from MRLC (n.d.) are low resolution, leading to inaccurate estimates in the total acreage. The data were summarized using a proportional value rather than the total acreage and provided as a percentage of the overall area to adjust for the low resolution. A summary of habitat types within areas of the proposed disturbance, the Lease Boundary, and the greater VAA is provided in **Table 3.5-3**. The habitat mapping in the VAA is provided in **Figure 3.5-2**. While it is understood that these data may overestimate or underestimate the amount of certain habitat types, they are nevertheless useful for understanding habitat types available in the surrounding area and therefore potential impacts on these habitats.

Habitat types within the VAA are described below (MRLC n.d.).

- **Barren Land:** areas of bedrock, desert pavement, scarps, talus, etc., where vegetation accounts for less than 15 percent of total cover
- **Cultivated Crops:** areas used to produce annual crops, including agricultural fields, orchards, and vineyards
- **Deciduous Forest:** areas dominated by trees taller than 5 meters and containing greater than 20 percent total vegetation cover
- **Developed:** Developed is divided into four categories based on the estimated cover of impervious surfaces
  - **Developed, Open Space:** areas of mixed use but mostly vegetated with lawn grasses, with impervious surfaces accounting for less than 20 percent of total cover
  - **Developed, Low Intensity:** areas of mixed construction and vegetation, with impervious surfaces accounting for 20 to 40 percent of total cover
  - **Developed, Medium Intensity:** areas of mixed construction and vegetation, with impervious surfaces accounting for 50 to 70 percent of total cover
  - **Developed, High Intensity:** areas of mixed construction and vegetation, with impervious surfaces accounting for 80 to 100 percent of total cover
- **Emergent Herbaceous Wetlands:** areas of perennial herbaceous vegetation accounting for greater than 80 percent of vegetative cover, and with soil or substrate periodically saturated with or covered by water
- **Evergreen Forest:** areas dominated by coniferous trees (75 percent of vegetation cover), where trees are greater than 5 meters and vegetation cover is greater than 20 percent
- **Grasslands/Herbaceous:** areas dominated by graminoid or herbaceous vegetation, generally greater than 80 percent of total vegetation cover
- **Open Water**: areas of open water with less than 25 percent cover of vegetation or soil
- **Pasture/Hay**: areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed and hay crops, typically on a perennial cycle

- **Shrub/Scrub**: areas dominated by shrubs less than 5 meters tall, with shrub canopy typically greater than 20 percent of total vegetation; includes true shrubs, early successional stage trees, and trees stunted due to environmental factors
- **Woody Wetlands**: areas where forest or shrubland vegetation accounts for greater than 20 percent of vegetation cover, with soil or substrate, periodically saturated with or covered by water

A summary of information from the 2019 NLCD (MRLC n.d.) mapping is provided based on the data presented in **Table 3.5-3**.

Vegetation Area of Analysis

- The description of cultivated crops from the 2019 NLCD habitat description is comparable to the Applicant's category of agriculture land. The 2019 NLCD shrub/scrub habitat description is comparable to the Applicant's category of shrubland habitat, which includes the habitat subtypes dwarf shrub-steppe, sagebrush shrub-steppe, rabbitbrush shrubland, and unclassified shrubland. The 2019 NLCD grassland/herbaceous habitat description is comparable to the Applicant's category of grassland habitat, which includes Eastside (interior) grassland (Eastside Steppe), planted grassland, non-native grassland, and unclassified grassland.
- Within the VAA, cultivated crops occupy the greatest proportion of land, covering 58.2 percent. Shrub/scrub makes up the second largest proportion, covering 23.1 percent. Grassland/herbaceous is the third largest proportion, covering 10.8 percent of the total area.

Lease Boundary

- The dominant habitat mapped in the 2019 NLCD (MRLC n.d.) mapping within the Lease Boundary is cultivated crops, covering 71.3 percent of the total area. The proportional area of cultivated crops mapped in the Lease Boundary is greater than available in the VAA. The proportional area of cultivated crops is comparable to the amount of area mapped as agriculture land by the Applicant's field surveys, which covers 73.8 percent of the total area within the Lease Boundary.
- Shrub/scrub habitat makes up the second largest area within the Lease Boundary, based on the 2019 NLCD (MRLC n.d.), covering 18.4 percent of the total area. The proportional area of shrub/scrub in the Lease Boundary is less than the proportional area available within the VAA. The proportional area of shrub/scrub habitat is more than double the proportional area identified as shrubland by the Applicant. The Applicant's mapping identifies 8.1 percent of the total area within the Lease Boundary as shrubland habitat.
- Grassland/herbaceous habitat makes up the third largest area within the Lease Boundary, based on the 2019 NLCD (MRLC n.d.), covering 5.0 percent of the total area. The proportional area of grassland/ herbaceous habitat in the Lease Boundary is less than the proportional area identified as grassland by the Applicant. The Applicant's mapping identifies 16.9 percent of the total area within the Lease Boundary as grassland habitat.

Wind Energy Micrositing Corridor

- The dominant habitat type mapped in the 2019 NLCD (MRLC n.d.) within the Wind Energy Micrositing Corridor is cultivated crops, covering 75.6 percent of the total area. The proportional area of cultivated crops mapped in the Micrositing Corridor is greater than that available in the VAA. The proportional area of cultivated crops is comparable to the area mapped as agriculture land by the Applicant's field surveys, which covers 77.8 percent of the total area within the Micrositing Corridor.

- Shrub/scrub habitat makes up the second largest area within the Micrositing Corridor, based on the 2019 NLCD (MRLC n.d.), covering 14 percent of the total area. The proportional area of shrub/scrub habitat mapped in the Micrositing Corridor is less than that available in the VAA. The proportional areas of shrub/scrub are more than double the proportional area identified as shrubland habitat by the Applicant. The Applicant's mapping indicates 6.5 percent of the total area within the Micrositing Corridor as shrubland habitat.
- Grassland/herbaceous habitat makes up the fourth largest area within the Micrositing Corridor, based on the 2019 NLCD (MRLC n.d.), covering 3 percent of the total area. The proportional area of grassland/ herbaceous habitat is less than that available in the VAA. The proportional area of grassland/herbaceous habitat is less than the proportional area of grassland habitat identified by the Applicant, which makes up 13.9 percent of the total area.

Solar Siting Areas

- The dominant habitat type in all three Solar Siting Areas is cultivated crops, based on the 2019 NLCD (MRLC n.d.); however, the proportional area of cultivated crops varies among the Solar Siting Areas.
    - The East Solar Field has the smallest mapped area of cultivated crops, covering 57.3 percent of the total area based on the 2019 NLCD (MRLC n.d.). The proportional area of cultivated crops within the East Solar Field is comparable to the proportional area mapped in the VAA. The proportional area of cultivated crops is comparable to the proportional area of agriculture land identified by the Applicant's field surveys, which classified 56.3 percent of the total area as agriculture land.
    - The County Well Solar Field has 90.5 percent of the total area mapped as cultivated crops based on the 2019 NLCD (MRLC n.d.). The County Well Solar Field occupies a larger proportional area of cultivated crops than is available in the VAA. The proportional area of cultivated crops is slightly less than the proportional area of agriculture land identified by the Applicant's field surveys, which classified 96.4 percent of the total area as agriculture land.
    - The Sellards Solar Field has the highest proportion of cultivated crops, with 93.9 percent based on the 2019 NLCD (MRLC n.d.). The Sellards Solar Field occupies a larger proportional area of cultivated crops than is available in the VAA. The proportional area of cultivated crops is slightly more than the proportional area identified by the Applicant's field surveys, which classified 89.8 percent of the total area as agriculture land.
- Shrub/scrub habitat makes up the second largest area within all three Solar Siting Areas, based on the 2019 NLCD (MRLC n.d.); however, the proportional area varies by Solar Siting Area.
    - The East Solar Field has the largest area mapped as shrub/scrub, covering 41.3 percent of the total area from the 2019 NLCD (MRLC n.d.). The proportional area of shrub/scrub within the East Solar Field is greater than the proportional area mapped in the VAA. The shrub/scrub proportional area is greater than the proportional area of shrubland habitat identified by the Applicant's field surveys, which classified 24.5 percent of the total area as shrubland.
    - The County Well Solar Field has 7.9 percent mapped as shrub/scrub, based on the 2019 NLCD (MRLC n.d.). The County Well Solar Field occupies a smaller proportional area of shrub/scrub than is available in the VAA. The shrub/scrub proportional area is greater than the proportional area of

shrubland habitat identified by the Applicant's field surveys, which did not identify any shrubland within the County Well Solar Field.

- The Sellards Solar Field has the lowest proportional area of shrub/scrub, which covers 5.2 percent based on the 2019 NLCD (MRLC n.d.). The Sellards Solar Field occupies a smaller proportional area of shrub/scrub than is available in the VAA. The proportional area of shrub/scrub is greater than the proportional area of shrubland habitat identified by the Applicant's field surveys, which classified 0.6 percent of the total area as shrubland.

■ Grassland/herbaceous habitat within the Solar Siting Areas varies but occupies a relatively small area of the total.

- The East Solar Field has a proportional area of 0.4 percent grassland/herbaceous habitat, based on the 2019 NLCD (MRLC n.d.). The proportional area of grassland/herbaceous habitat within the East Solar Field is less than the proportional area available in the VAA. The grassland/herbaceous habitat proportional area is less than the proportional area of grassland habitat identified by the Applicant's field surveys, which classified 18 percent of the total area as grassland.
- The County Well Solar Field has 0.6 percent mapped as grassland/herbaceous based on the 2019 NLCD (MRLC n.d.). The County Well Solar Field occupies a smaller proportional area of grassland/herbaceous habitat than is available in the VAA. The grassland/herbaceous proportional area is less than the proportional area of agriculture land identified by the Applicant's field surveys, which identified 2.5 percent of the total area as grassland.
- The Sellards Solar Field does not include any grassland/herbaceous habitat, based on the 2019 NLCD (MRLC n.d.). The Sellards Solar Field occupies a smaller proportional area of grassland/herbaceous habitat than is available in the VAA. The proportional area of grassland/herbaceous habitat is less than the proportional area of grassland habitat identified by the Applicant's field surveys, which classified 8.3 percent of the total area as grassland.

Based on comparison of the proportional area identified by the 2019 NLCD data (MRLC n.d.) and the field-verified habitat types mapped by the Applicant (**Table 3.5-2**), the 2019 NLCD mapping provided proportional area estimates similar to the Applicant's field mapping for cultivated crops. However, the 2019 NLCD mapping tended to overestimate the amount of shrub/scrub habitat in the Lease Boundary, Wind Energy Micrositing Corridor, and Solar Siting Areas in comparison to the Applicant's mapping. As the Applicant's mapping is field verified, this might mean that the amount of shrub/scrub habitat available within the VAA is also overestimated by the 2019 NLCD. Furthermore, the 2019 NLCD mapping tended to underestimate the amount of grassland/herbaceous habitat within the Micrositing Corridor and Solar Siting Areas in comparison to the Applicant's habitat mapping. This might mean that the amount of grassland/herbaceous habitat available within the VAA is also underestimated by the 2019 NLCD.

From the VAA data, the Micrositing Corridor, Sellards Solar Field, and County Well Solar Field have been sited in areas to maximize cultivated crop land cover, as the proportional area of cultivated crops is greater than available in the VAA.

The 2019 NLCD data are too coarse to identify Priority Habitats; however, the Shrub-steppe Priority Habitat would fall within shrub/scrub, and the Eastside Steppe Priority Habitat would fall within the NLCD grasslands/ herbaceous category. Priority Habitat data obtained from WDFW (WDFW 2022) indicate approximately 67,691.5 acres of Priority Habitat within the VAA. This includes approximately 37,175.7 acres of Eastside Steppe

and 30,515.8 acres of Shrub-steppe Priority Habitat. Priority Habitat summaries based on the WDFW data are provided for the VAA, Lease Boundary, and Project components below.

- Eastside Steppe covers 18.3 percent of the VAA, and Shrub-steppe covers 15.1 percent of the VAA.
- Eastside Steppe covers 13.3 percent of the Lease Boundary, and the Shrub-steppe covers 10.2 percent of the Lease Boundary.
- Within the Wind Energy Micrositing Corridor, Eastside Steppe covers 8.1 percent of the total area and Shrub-steppe covers 6.1 percent.
- Within the Solar Siting Areas, Eastside Steppe covers 13.5 percent of the total area and Shrub-steppe covers 7.2 percent.

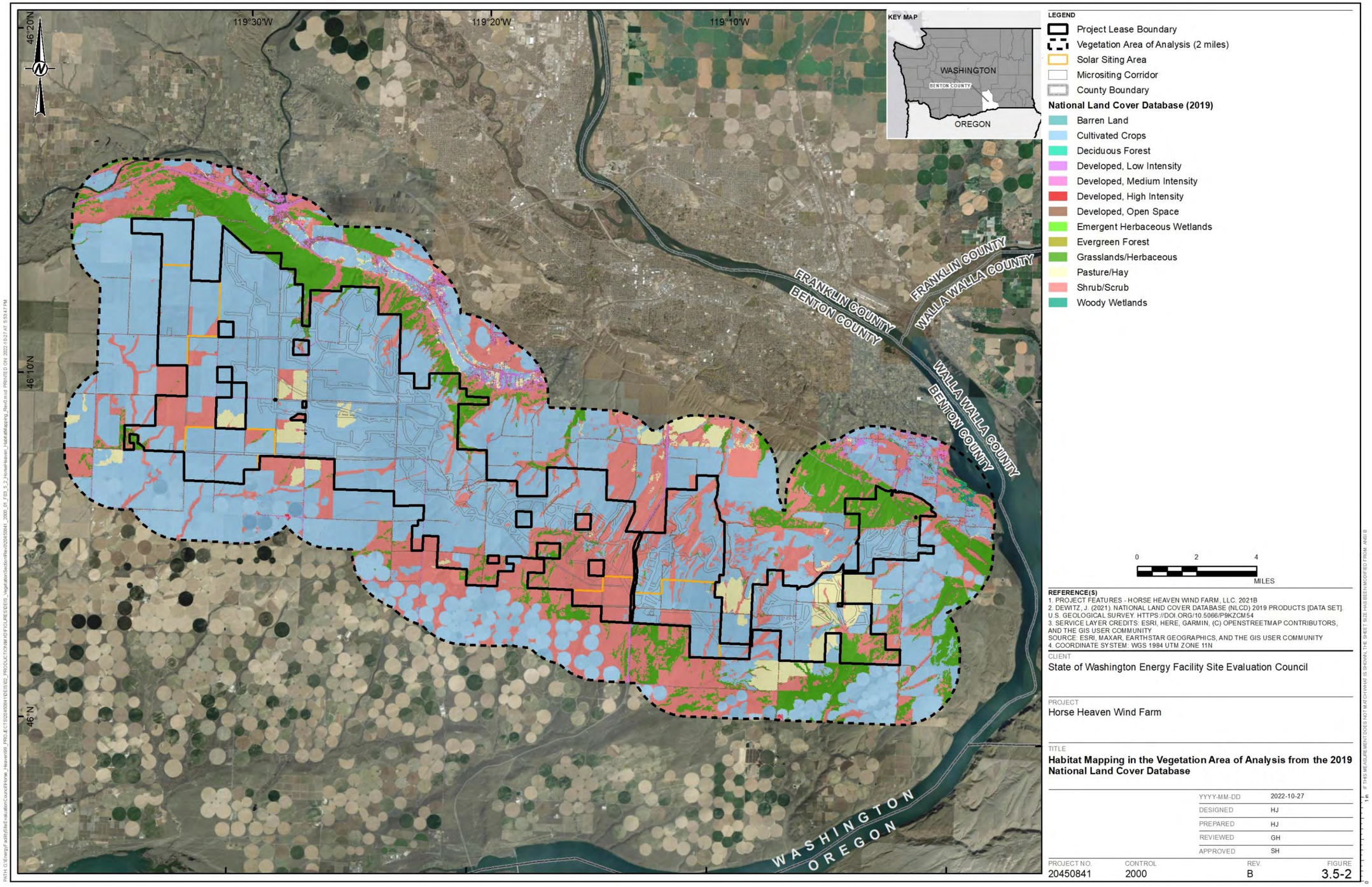
Table 3.5-3: Proportion of Habitat Types in the Vegetation Assessment Area from the National Land Cover Database and the Applicant's Habitat Mapping

Habitat Type/Subtype	Vegetation Assessment Area (%)	Lease Boundary (%)	Micrositing Corridor (%)	East Solar Field (%)	County Well Solar Field (%)	Sellards Solar Field (%)
National Land Cover Database[a]						
Barren Land	<0.1	0	0	0	0	0
Cultivated Crops	58.2	71.3	75.6	57.3	90.5	93.9
Deciduous Forest	<0.1	0	0	0	0	0
Developed, High intensity	<0.1	<0.1	<0.1	0	0	0
Developed, Low intensity	1.3	0.4	0.6	<0.1	0.2	0.1
Developed, Medium intensity	0.4	0.1	0.1	<0.1	<0.1	<0.1
Developed, Open Space	1.8	1.4	2.4	0.8	0.9	0.7
Emergent Herbaceous Wetlands	0.1	<0.1	0	0	0	0
Evergreen Forest	<0.1	0	0	0	0	0
Grasslands/Herbaceous	10.8	5.0	3.0	0.4	0.6	0
Open Water	0.5	<0.1	<0.1	0	0	0
Pasture/Hay	3.7	3.6	4.4	0.1	<0.1	0
Shrub/Scrub	23.1	18.4	14.0	41.3	7.9	5.2
Woody Wetlands	0.1	0	0	0	0	0
Applicant's Habitat Mapping[b]						
Agriculture Land	N/A	73.8	77.9	56.3	96.4	89.8
Developed/Disturbed	N/A	1.2	1.7	1.2	1.0	1.3
Total Grassland	N/A	16.9	13.9	18.0	2.5	8.3
Total Shrubland	N/A	8.1	6.5	24.5	0	0.6

[a] National Land Cover Data (MRLC n.d.)

[b] Calculations were completed using the spatial layers provided by the Applicant and were completed for each Project component independent of the others (Horse Heaven Wind Farm, LLC 2021b). Areas of overlap may occur between Project components (e.g., the Micrositing Corridor may extend into the Solar Siting Area). Total grassland and total shrubland were included rather than the Applicant's habitat subtypes to better align with the NLCD.

N/A = not applicable



Source: MRLC n.d.

Figure 3.5-2: Habitat Mapping in the Vegetation Assessment Area from the 2019 National Land Cover Database

3.5.2.3 Department of Natural Resources Land

The Lease Boundary is primarily sited on privately owned land; however, the Lease Boundary also overlaps with lands managed by the Washington State Department of Natural Resources (DNR). Five parcels of DNR-managed land overlap the Lease Boundary, which are shown in **Figure 3.5-3**.

Characterization of the five parcels of DNR land were provided by a representative of DNR in communication with the Washington Energy Facility Site Evaluation Council (EFSEC) (Unland 2022). The parcels of DNR land are labeled in **Figure 3.5-3** using the Parcel ID.

- Parcel 13686: The DNR land is located within the western end of the Lease Boundary. The area is predominantly agriculture land and invasive annual grassland. The Sellards Solar Field and Wind Energy Micrositing Corridor would intersect this parcel of DNR land.
- Parcel 13687: The DNR land is located within the western end of the Lease Boundary. The area is predominantly agriculture land. The Micrositing Corridor would intersect this parcel of DNR land.
- Parcel 11679: The DNR land is located within the central portion of the Lease Boundary, east of Interstate 82. The area is high in invasive species and of poor quality. The Micrositing Corridor would intersect this parcel of DNR land.
- Parcel 13679: The DNR land is located in the southeast end of the Lease Boundary. Some shrub-steppe habitat occurs within draws but is unlikely to interact with the Project. The Micrositing Corridor would intersect this parcel of DNR land.
- Parcel 11670: The DNR land is located within the eastern end of the Lease Boundary. High-quality shrub-steppe occurs within the draws of these areas, primarily in the northwest corner. The Micrositing Corridor would intersect this parcel of DNR land.

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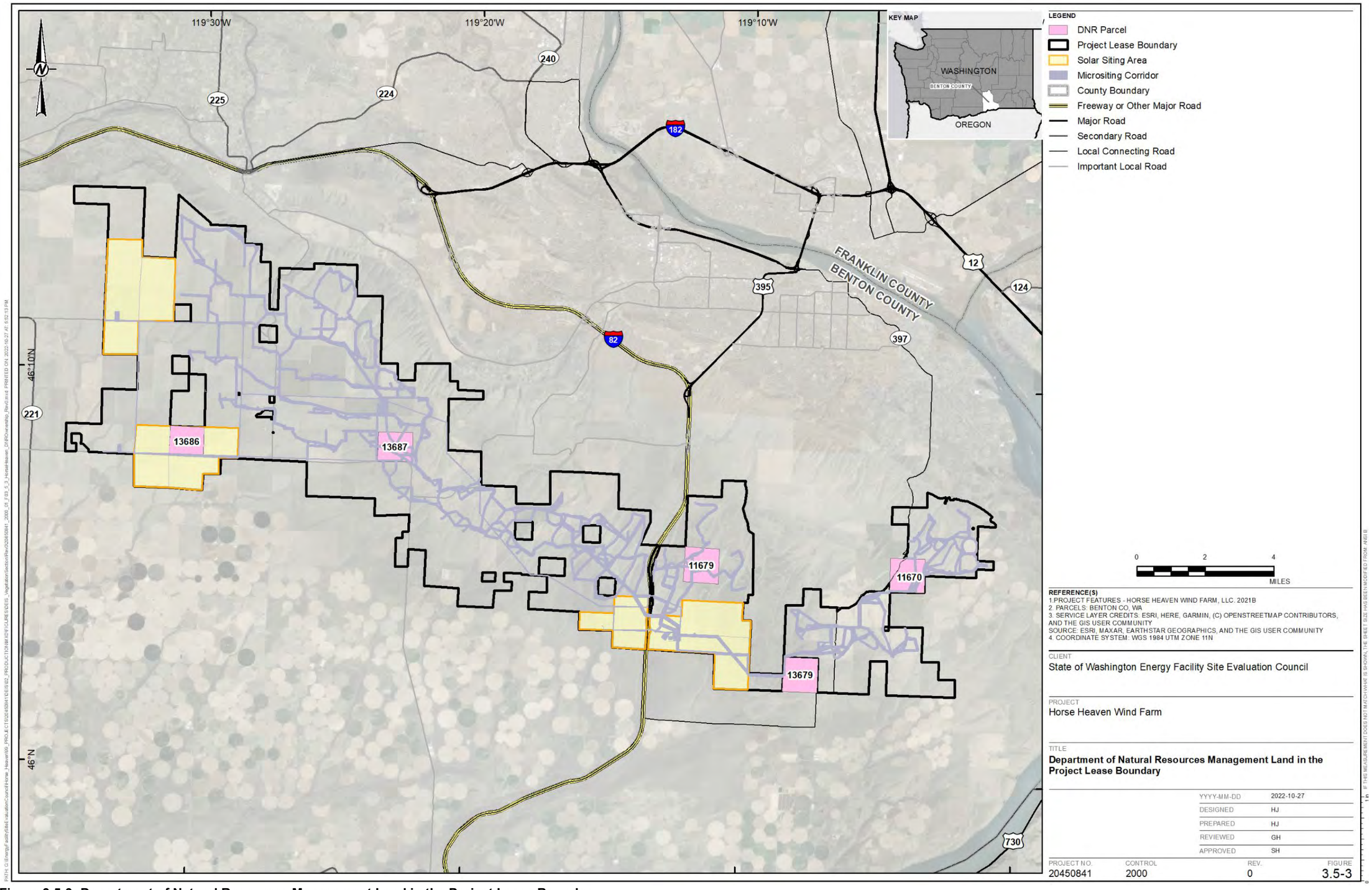

Figure 3.5-3: Department of Natural Resources Management Land in the Project Lease Boundary

3.5.2.4 Priority Habitat

Habitats that are prioritized for conservation and management by WDFW are called Priority Habitats. A Priority Habitat may refer to a unique vegetation association (e.g., shrub-steppe) or a particular habitat feature (e.g., cliffs) (WDFW 2008). Three habitat subtypes identified within the Lease Boundary are considered Priority Habitat. The dwarf shrub-steppe and sagebrush shrub-steppe are both Shrub-steppe Priority Habitat. Shrub-steppe Priority Habitat is a non-forested vegetation type characterized by a conspicuous shrub layer dominated by sagebrush and an understory layer dominated by native perennial bunchgrass (WDFW 2008). The areas classified as Eastside (interior) grassland by Johnson and O'Neil (2001) are synonymous with the Eastside Steppe Priority Habitat (WDFW 2008). Eastside Steppe Priority Habitat is characterized as a non-forested habitat dominated by native perennial bunchgrasses and forbs (WDFW 2008).

Shrub-steppe and Eastside Steppe Priority Habitats are presently limited in the Lease Boundary and surrounding VAA. Most areas suitable for agriculture have been converted to cropland in the vicinity of the Lease Boundary leaving minimal areas as native shrub-steppe or grassland. Native shrub-steppe and grasslands remaining are highly fragmented. Sagebrush shrub-steppe is one of the most at-risk ecosystems in the United States due to fragmentation (USFWS 2014). This trend is consistent for sagebrush shrub-steppe throughout eastern Washington, where sagebrush ecosystems are becoming increasingly fragmented by agriculture, urbanization, energy and natural resource development, and livestock grazing (Knick et al. 2003; USFWS 2014). Smaller areas of remnant ecosystems are less resilient against disturbance. For example, fragmentation that results from development of linear features such as road networks facilitates the introduction and spread of noxious weeds that change vegetation communities (Knick et al. 2003). In addition, the increasing need for energy development has resulted in habitat fragmentation of shrub-steppe. Shrub-steppe naturally has an unequal distribution of resources, and with increased fragmentation, wildlife species dependent on shrub-steppe require increasingly larger areas to obtain necessary food, water, and shelter for survival (USFWS 2014). Further loss of the limited remnant shrub-steppe patches can result in disproportionate impacts on species that require this ecosystem for survival (USFWS 2014).

Tables 3.5-1 and 3.5-2 show the acreage of Priority Habitat within the Lease Boundary and Project Component Areas and in each of the Solar Siting Areas; however, it is also important to understand the quality of the Priority Habitat as measured against reference conditions. Habitat quality is reduced by past and present disturbance but can be improved by activities such as restoration. **Table 3.5-4** provides detailed descriptions of the characteristic vegetation and conditions for Shrub-steppe and Eastside Steppe Priority Habitat types as reference ecosystem conditions, as well as common disturbance indicators, such as invasive plants, which occur in these Priority Habitats (WDFW 2008). This table also provides a detailed description of the Priority Habitats observed within the Lease Boundary, in addition to the disturbance observed on site during field surveys. The location of identified Priority Habitat is provided in **Figure 3.5-1** (Horse Heaven Wind Farm, LLC 2021a).

As shown in **Table 3.5-4**, most of the Priority Habitat areas observed in the Wind Energy Micrositing Corridor and Solar Siting Areas, where field surveys were conducted, are already fragmented by agriculture and have undergone some degree of impact from invasive plants. However, these areas are some of the only intact Shrub-steppe and Eastside Steppe ecosystems remaining within the vicinity of the Lease Boundary. Within the Lease Boundary, Priority Habitat is limited to the northern edge, draws and canyons, and areas around the East Solar Field, as shown in **Figure 3.5-1**. Within the VAA, potential Priority Habitat is limited to the northern slope of the Horse Heaven Hills, the central area near the East Solar Field, and small patches in the south, as shown in **Figure 3.5-2**.

Table 3.5-4: WDFW Priority Habitat Description for Reference Ecosystems and Corresponding Habitat Types in the Lease Boundary

WDFW Priority Habitat	Description of WDFW Priority Habitat[a]	ASC Priority Habitat Subtype and Location in the Lease Boundary	Description of Habitat Subtype in Lease Boundary Based on Conditions Observed on Site[b]	Disturbance Observed during Field Surveys in Priority Habitat on Site[b]
Shrub-steppe	▪ Dominated by bunchgrasses and a conspicuous layer of shrubs ▪ **Indicator shrubs:** big sagebrush (*Artemisia tridentata*), antelope bitterbrush (*Purshia tridentata*), threetip sagebrush (*Artemisia tripartita*), scabland sagebrush (*Artemisia rigida*), dwarf sagebrush (*Artemisia arbuscula*) ▪ **Indicator grasses:** bunchgrasses - Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Sandberg bluegrass (*Poa secunda*), Thurber's needlegrass (*Achnatherum thurberianum*), needle-and-thread grass (*Hesperostipa comata*) ▪ Forb layer variable depending on precipitation ▪ Disturbed sites have an increase of non-natives such as cheatgrass (*Bromus tectorum*) or crested wheatgrass (*Agropyron cristatum*)	**Dwarf shrub-steppe (rock buckwheat/ Sandberg bluegrass dwarf shrub)** ▪ Mapped within the Micrositing Corridor in the northwest corner of the Lease Boundary	▪ **Shrub layer:** rubber rabbitbrush (*Ericameria nauseosa*), green rabbitbrush (*Chrysothamnus viscidiflorus*), big sagebrush ▪ **Grass layer:** bluebunch wheatgrass and Sandberg bluegrass ▪ **Forb layer:** dominated by the native sub-shrub/dwarf shrub rock buckwheat (*Eriogonum sphaerocephalum*), with common yarrow (*Achillea millefolium*), rosy balsamroot (*Balsamorhiza rosea*), hoary aster *(Dieteria canescens*), Douglas' dustymaidens (*Chaenactis douglasii*), cushion fleabane (*Erigeron poliospermus*), narrowleaf goldenweed (*Nestotus stenophyllus*) ▪ **Lithosol soils** ▪ **Invasive species:** cheatgrass, cereal rye (*Secale cereale*), tall tumblemustard (*Sisymbrium altissimum*), yellow salsify (*Tragopogon dubius*)	▪ Invasive grasses (cheatgrass and cereal rye) indicated as dominant species in the dwarf shrub-steppe.
		Sagebrush shrub-steppe ▪ North-central and northeastern part of the Lease Boundary, mainly restricted to hillslopes and drainages that are too steep for agricultural production	▪ **Shrub layer:** big sagebrush dominant with spineless horsebrush (*Tetradymia canescens*), rubber rabbitbrush, green rabbitbrush ▪ **Grass layer:** bluebunch wheatgrass, Sandberg bluegrass, needle-and-thread grass ▪ **Forb layer:** Carey's balsamroot (*Balsamorhiza careyana*), common yarrow, long-leaf phlox (*Phlox longifolia*), low pussytoes (*Antennaria dimorpha*), shaggy fleabane (*Erigeron pumilus*), woolly plantain (*Plantago patagonica*), woollypod milkvetch (*Astragalus purshii*), sagebrush mariposa lily (*Calochortus macrocarpus* var. *macrocarpus*), wild blue flax (*Linum lewisii*) ▪ **Invasive species:** cheatgrass, redstem stork's bill (*Erodium cicutarium*), prickly lettuce (*Lactuca serriola*), yellow salsify, bulbous bluegrass (*Poa bulbosa*), cereal rye, Russian thistle (*Salsola tragus*), tall tumblemustard	▪ Habitat described as fragmented. ▪ Degraded from the high cover of non-native grass and forb species and/or grazing. ▪ Evidence of past wildfires was noted (presence of burned shrubs).

Table 3.5-4: WDFW Priority Habitat Description for Reference Ecosystems and Corresponding Habitat Types in the Lease Boundary

WDFW Priority Habitat	Description of WDFW Priority Habitat[(a)]	ASC Priority Habitat Subtype and Location in the Lease Boundary	Description of Habitat Subtype in Lease Boundary Based on Conditions Observed on Site[(b)]	Disturbance Observed during Field Surveys in Priority Habitat on Site[(b)]
Eastside Steppe	▪ Dominated by forbs and grasses ▪ Shrubs are absent or scattered ▪ **Indicator grasses:** bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, rough fescue, or needlegrass ▪ Disturbed sites have an increase of cheatgrass, spotted knapweed (*Centaurea stoebe*), yellow starthistle (*Centaurea solstitialis*), or Kentucky bluegrass (*Poa pratensis*)	**Eastside (interior) grassland** (Eastside Steppe) Mapped in three locations: East Solar Field, Badger Canyon, and an ephemeral drainage	▪ **Shrub layer:** rabbitbrush, green rabbitbrush (<5% cover) ▪ **Grass layer:** bluebunch wheatgrass, Great Basin wildrye (*Leymus cinereus*), needle-and-thread, Sandberg bluegrass ▪ **Forb layer:** Carey's balsamroot, lupine (*Lupinus* sp.), common yarrow, Spalding's milkvetch (*Astragalus spaldingii*), shaggy fleabane, fiddleneck (*Amsinckia* sp.), triternate biscuitroot (*Lomatium triternatum*), wild blue flax, common yarrow, woollypod milkvetch, woolly plantain ▪ **Invasive species:** cheatgrass, tall tumblemustard, bulbous bluegrass, cereal rye, prickly lettuce, yellow salsify, common stork's-bill	▪ The ephemeral drainage was degraded due to the high cover of invasive plants. ▪ The habitat quality on the east side of Badger Canyon was higher than the other Eastside (interior) grassland (Eastside Steppe) surveyed due to lower invasive plant cover and fewer evidence of cattle grazing). ▪ No young sagebrush observed in Badger Canyon except trace rubber rabbitbrush.

Sources:
(a) Description of Priority Habitat based on descriptions available from WDFW (2008).
(b) Description of the Priority Habitat subtypes obtained from Horse Heaven Wind Farm, LLC (2021a) and Tetra Tech (2021) based on the observed site conditions.

3.5.3 Special Status Species

The Applicant defined the term “special status plant” to include federally listed endangered, threatened, or candidate vascular plant species and state-listed endangered, threatened, and sensitive vascular plant species as defined by the Washington Natural Heritage Program (WNHP) (Tetra Tech 2021). In this Draft EIS, the term “special status” is expanded to include federally listed endangered, threatened, or candidate non-vascular plant species and lichen species and state-listed endangered, threatened, and sensitive non-vascular plant species and lichen species as defined by the WNHP (DNR 2021).

The Applicant conducted a background search for special status plant species. Twenty-nine special status plant species and one special status lichen species were identified as having the potential to occur within the Lease Boundary (Appendix K, Horse Heaven Wind Farm, LLC 2021a; Attachment A, Tetra Tech 2021). Surveys for special status vascular plants were conducted within the Wind Energy Micrositing Corridor and Solar Siting Areas in 2020 and 2021. No special status vascular plants were observed during the field surveys (Horse Heaven Wind Farm, LLC 2021a; Tetra Tech 2021). A complete list of vascular plants observed during field surveys is provided in Appendix K of the ASC (Horse Heaven Wind Farm, LLC 2021a) and Attachment B of the 2021 Botany and Habitat Survey Report for Horse Heaven Wind Farm (Tetra Tech 2021).

The background review identified one special status lichen species, woven spore lichen (*Texosporium sancti-jacobi*), as potentially occurring within the Lease Boundary. Four occurrences of woven spore lichen were documented within 3 miles of the Lease Boundary, with the closest occurrence documented approximately 0.4 miles north of the Lease Boundary (Tetra Tech 2021). Field surveys conducted by the Applicant focused on identifying vascular special status plants and did not include non-vascular plants or lichens. Woven spore lichen has not been reported on any of the DNR-managed land that overlaps the Lease Boundary (Unland 2022). Tetra Tech assessed the habitat types within the Wind Energy Micrositing Corridor and Solar Siting Areas to identify potentially suitable habitats for woven spore lichen as part of the 2021 Botany and Habitat Survey Report for Horse Heaven Wind Farm (Attachment C, Tetra Tech 2021). Based on the assessment, approximately 18.9 acres are rated as potentially suitable for woven spore lichen. The area of suitable habitat corresponds to 10.9 acres of dwarf shrub-steppe and 8.0 acres of sagebrush shrub-steppe, located within the Micrositing Corridor.

The WNHP is Washington’s primary source of information about rare and endangered plant species and threatened ecosystems. Data were obtained from the WNHP and queried to identify special status species within the VAA (WNHP 2022).

Based on the habitat characteristics and habitat types available within the Lease Boundary, the special status species with the potential to occur in the Wind Energy Micrositing Corridor and Solar Siting Areas are given a rating for the potential of occurrence. The following ratings and definitions were used to describe the potential for occurrence:

- **Negligible:** No known occurrences in the VAA and no suitable habitat within the Lease Boundary, may also be used to describe species presumed extirpated
- **Unlikely:** No known occurrence in the VAA but suitable habitat within the Lease Boundary
- **Potential:** Known occurrence in the VAA and suitable habitat within the Lease Boundary
- **Likely:** Known occurrence within the Lease Boundary and suitable habitat within the Lease Boundary

- **Confirmed:** Known occurrence in areas associated with the Wind Energy Micrositing Corridor or Solar Siting Areas

Three records of special status species were obtained from the WNHP that occur within the VAA. Two of the species are known only from historical occurrences. Two records of woven spore lichen, documenting four locations in the VAA, are known to occur from extant records. **Table 3.5-5** summarizes the records of special status species, including the state status, description of the habitat requirements, and potential to occur within the Lease Boundary. Distances are provided from the nearest Project component; however, locations of special status species are sometimes imprecise depending on record age or to obscure precise locations to protect the species.

Table 3.5-5: Special Status Plant Species Documented in the Vegetation Assessment Area

Scientific Name	Common Name	State Status[a]	Location[b]	Habitat Characteristics[c]	Potential to Occur within the Lease Boundary
Vascular Plants					
Astragalus kentrophyta var. *douglasii*[d]	thistle milkvetch	X	Record occurs east of the Lease Boundary approximately 0.3 miles from the Micrositing Corridor at the nearest point.	Species grow in sandy substrate, in sand dunes, or along riverbanks. Restricted to low elevations, up to 400 feet.	Negligible: species is presumed extirpated from Washington State and record in the VAA is historical (from 1883), no suitable habitat in the Lease Boundary.
Cryptantha leucophaea[d]	gray cryptantha	T	Record occurs east of the Lease Boundary approximately 0.5 miles from the Micrositing Corridor at the nearest point.	Found in sandy substrate, primarily sand dunes, from 300 to 2,500 feet in elevation. Associated with sagebrush shrub-steppe species. Record occurs near the Columbia River. This species is endemic to the Columbia and lower Yakima Rivers.	Unlikely: record in the VAA is historical (from 1922). Primarily occurs in sand dunes but suitable habitat may occur in sagebrush shrub-steppe.
Lichen					
Texosporium sancti-jacobi	woven spore lichen	T	All locations are located northwest of the Lease Boundary. The closest record is 0.6 miles north of the Micrositing Corridor.	Occurs in relatively undisturbed areas dominated by native plants such as sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata*), Idaho fescue (*Festuca idahoensis*), and bluebunch wheatgrass (*Pseudoroegneria spicata*). Analysis of the habitat on site identified 18.9 acres of potentially suitable habitat for woven sport lichen in dwarf shrub-steppe and sagebrush shrub-steppe habitat.	Potential: known occurrences in the VAA and suitable habitat in the dwarf shrub-steppe and sagebrush shrub-steppe habitats within the Lease Boundary.

[a] State Status obtained from WNHP (2021a) and WNHP (2011). State status definitions are provided below (WNHP 2021a):
X = Presume extirpated. Species have not been successfully relocated since 1978.
E = Endangered. A species, subspecies, or variety in danger of extinction throughout all or a significant portion of its range.
T = Threatened. A species, subspecies, or variety likely to become Endangered in the foreseeable future.
P = Proposed. A species, subspecies, or variety formally proposed for listed as Endangered or Threatened.
[b] Location information obtained from WDFW (n.d.).
[c] Sources for habitat characteristics: Tetra Tech (2021); WNHP (2021b, 2022)
[d] Historical record
VAA = Vegetation Area of Analysis

3.5.4 Noxious Weeds

The term “noxious weeds” refers to plants legally designated as such in Washington State and Benton County. Noxious weeds in Washington are categorized into one of three classes based on their distribution within the state and the requirements for treatment. The three classes of noxious weeds are described below.

- Class A noxious weeds are non-native species that have a limited distribution in Washington State. Objectives are to eradicate existing infestations and prevent new ones. Eradication is required by law. There are 38 species of non-native plants that are classified as Class A noxious weeds in Benton County and the State of Washington (BCNWCB n.d.; WSNWCB n.d.).
- Class B noxious weeds are non-native species that occur only in portions of Washington State. Mandatory control is required in regions where these species are not yet widespread, and the prevention of new infestations is the primary goal. There are 66 species of non-native plants that are classified as Class B noxious weeds in Benton County and the State of Washington (BCNWCB n.d.; WSNWCB n.d.).
- Class C noxious weeds are already widespread in Washington or are of special interest to the agricultural industry. A county can enforce control of Class C noxious weeds if it is beneficial to that county. There are 52 species of non-native plants that are classified as Class C noxious weeds in Benton County and the State of Washington (BCNWCB n.d.; WSNWCB n.d.).

Surveys for noxious weeds were completed in 2020 and 2021 within the Micrositing Corridor and Solar Siting Areas, covering approximately 21,076 acres (Horse Heaven Wind Farm, LLC 2021a; Tetra Tech 2021). An additional 604 acres within the Sellards Solar Siting Area have not been surveyed for noxious weeds (Tetra Tech 2021). A summary of noxious weeds documented during field surveys is provided in **Table 3.5-6**. The locations of noxious weeds observed during field surveys are available in Appendix K-17 of the ASC (Horse Heaven Wind Farm, LLC 2021a) and Figures 4a through 4i in Tetra Tech (2021).

Three noxious weeds are abundant throughout the Wind Energy Micrositing Corridor and Solar Siting Areas: kochia (*Bassia scoparia*), rush skeletonweed (*Chondrilla juncea*), and cereal rye (*Secale cereale*).

Table 3.5-6: Noxious Weeds Observed during Field Surveys Conducted in 2020 and 2021 in the Wind Energy Micrositing Corridor and Solar Siting Areas

Scientific Name	Common Name	State and County Status[(a)]	Frequency
Bassia (Kochia) scoparia	kochia	B	Abundant. Frequently observed throughout the Micrositing Corridor and Solar Siting Areas.
Centaurea sp.	knapweed	B	Frequently observed in the central portion of the Micrositing Corridor and Solar Siting Areas. Several occurrences in the eastern and western portion of the Micrositing Corridor and Solar Siting Areas.
Centaurea solstitialis	yellow starthistle	B	Observed at two locations in the central portion of the Micrositing Corridor and Solar Siting Areas. Not observed during 2021 surveys.

Table 3.5-6: Noxious Weeds Observed during Field Surveys Conducted in 2020 and 2021 in the Wind Energy Micrositing Corridor and Solar Siting Areas

Scientific Name	Common Name	State and County Status[(a)]	Frequency
Chondrilla juncea	rush skeletonweed	B	Abundant. Frequently observed throughout the Micrositing Corridor and Solar Siting Areas.
Convolvulus arvensis	field bindweed	C	Observed at two locations in the eastern portion of the Micrositing Corridor and Solar Siting Areas. Not observed during 2020 surveys.
Onopordum acanthium	Scotch thistle	B	Observed at seven locations in the Micrositing Corridor and Solar Siting Areas.
Secale cereale	cereal rye	C	Abundant. Frequently observed through the Micrositing Corridor and Solar Siting Areas.

Sources: Horse Heaven Wind Farm, LLC 2021a; Tetra Tech 2021

Notes:

[(a)] Class B noxious weeds: Non-native species presently limited to portions of Washington State. Species are designated for required control in regions where they are not yet widespread. Preventing new infestations in these areas is a high priority. In regions where Class B species are already abundant, control is decided at the local level, with containment as the primary goal (BCNWCB n.d.; WSNWCB n.d.).

Class C noxious weeds: Non-native species that are widespread in Washington State or are of special interest to the state's agricultural industry. The Class C status allows county weed boards to require control if locally desired, or they may choose to provide education or technical consultation (BCNWCB n.d.; WSNWCB n.d.).

Field surveys also identified non-native plants within the Wind Energy Micrositing Corridor and Solar Siting Areas, which are shown in **Table 3.5-7** (Horse Heaven Wind Farm, LLC 2021a; Tetra Tech 2021). A non-native plant is a species of plant that has been introduced to an area or occurs outside its native range. Similar to noxious weeds, non-native plants can exhibit characteristics that make them competitive against native plants; however, the species listed in **Table 3.5-7** are not legally designated.

Table 3.5-7: Non-native Plants Observed during Field surveys in 2020 and 2021 in the Wind Energy Micrositing Corridor and Solar Siting Areas

Scientific Name	Common Name	Lifeform
Agropyron cristatum	crested wheatgrass	Grass
Amaranthus blitoides	matweed, prostrate pigweed	Forb
Bromus arvensis	field brome/Japanese brome	Grass
Bromus hordeaceus	soft brome	Grass
Bromus tectorum	cheatgrass	Grass
Ceratocephala testiculata	burr buttercup	Forb
Chorispora tenella	blue mustard	Forb
Descurainia sophia	flixweed	Forb
Draba verna	spring whitlow-grass	Forb
Erodium cicutarium	redstem, common stork's-bill, crane's-bill	Forb
Holosteum umbellatum	jagged-chickweed	Forb
Hordeum murinum	mouse barley	Grass

Table 3.5-7: Non-native Plants Observed during Field surveys in 2020 and 2021 in the Wind Energy Micrositing Corridor and Solar Siting Areas

Scientific Name	Common Name	Lifeform
Lactuca serriola	prickly lettuce	Forb
Lappula longispina	long-spined stickseed	Forb
Poa bulbosa	bulbous bluegrass	Grass
Polygonum aviculare	prostrate knotweed	Forb
Polypogon monspeliensis	annual rabbit's-foot grass	Forb
Robinia pseudoacacia	black locust	Tree
Salsola tragus	prickly Russian thistle	Forb
Sisymbrium altissimum	tall tumblemustard	Forb
Taraxacum officinale	common dandelion	Forb
Tragopogon dubius	yellow salsify	Forb
Triticum aestivum	wheat	Grass
Vulpia bromoides	brome fescue	Grass

Sources: Horse Heaven Wind Farm, LLC 2021a; Tetra Tech 2021

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3.6 Wildlife and Habitat

This section describes the wildlife and supporting habitat in the proposed Horse Heaven Wind Farm (Project, or Proposed Action) Lease Boundary, including a 2-mile buffer (Wildlife Area of Analysis). Section 4.6 presents an analysis of the Project's potential impacts on wildlife and supporting habitat. The information provided herein is based on the detailed description of vegetation communities and habitat characteristics in Section 3.5 Vegetation.

Regulatory Setting

Regulations protecting special status species are presented in Section 3.6.2. A comprehensive list is presented in Section 4.6.2 and are listed in Table 4.5-3.

3.6.1 Relevant Data Sources

The description of the affected environment provided in Section 3.6.2 was developed based on information provided by Horse Heaven Wind Farm, LLC (Applicant), as well as government and publicly available literature. No field studies were conducted specifically for the development of this Draft Environmental Impact Statement (EIS). The Wildlife Area of Analysis is consistent with the analysis area used in Section 3.5, Vegetation, which encompasses approximately 202,289 acres and includes the Lease Boundary plus an additional 2-mile buffer. Habitat acreages were independently calculated for the Draft EIS from spatial data provided by the Applicant (Horse Heaven Wind Farm, LLC 2021b). These spatial data were used to assess each Project component independent of the others. A description of methods used to calculate affected habitats is provided in Section 3.5.

3.6.2 Affected Environment

3.6.2.1 Wildlife Habitat

Wildlife habitat in the Lease Boundary consists of a mix of natural (native shrub-steppe) and anthropogenically altered areas broadly characterized as native shrubland (e.g., dwarf shrub-steppe, sagebrush shrub-steppe, rabbitbrush), grassland that includes native steppe habitat, and agricultural/disturbed land (e.g., developed land). The Applicant mapped habitat types based on habitat descriptions provided in Washington Department of Fish and Wildlife (WDFW) (2009) and Johnson and O'Neil (2001). **Table 3.6-1** summarizes the composition of vegetation communities in the Project Lease Boundary. The distribution of these communities is depicted in **Figure 3.6-1.**

Table 3.6-1: Lease Boundary Habitat Composition

Habitat Type/Subtype	Lease Boundary (acres)[a]	Wind Energy Micrositing Corridor (acres)[a]	Solar Siting Areas (acres)[a]	Substation Areas (acres)[a]	BESS Areas (acres)[a]	Percentage of Habitat Type Available in Lease Boundary within Project Component Areas
Agriculture land	53,450.1	9,219.3	8,409.0	36.6	18.1	33.0%
Developed/disturbed	835.7	206.5	128.8	0	0	40.1%
Grassland						
Eastside (interior) grassland (Eastside Steppe)[b]	173.5	56.8	153.3	0	0	100%
Non-native grassland	1,635.5	656.5	451.4	1.6	0	67.7%
Planted grassland	4,338.3	934.1	519.4	0	0	33.5%
Unclassified grassland[c]	6,125.2	0	0	0	0	0%
Shrubland						
Dwarf shrub-steppe[b]	23.2	20.8	0	0	0	89.7%
Rabbitbrush shrubland	3,037.7	560.3	1,024.9	0	0	52.2%
Sagebrush shrub-steppe[b]	1,372.0	190.1	67.9	0	0	18.8%
Unclassified shrubland[c]	1,436.6	0	<0.1	0	0	0%
Total	**72,427.9**	**11,844.5**	**10,754.7**	**38.2**	**18.1**	

Sources: Horse Heaven Wind Farm, LLC 2021b; Tetra Tech 2021a

Notes:

[a] Calculations of areas were completed independently using spatial data provided by the Applicant. (Horse Heaven Wind Farm, LLC. 2021b). Areas of overlap may occur between Project components (e.g., the Wind Energy Micrositing Corridor may extend into the Solar Siting Areas).

[b] Priority Habitats in the State of Washington (WDFW 2008).

[c] Unclassified grassland and unclassified shrubland habitat subtypes include the areas mapped during surveys conducted in 2018 or using National Land Cover Database data that were not further classified into subtypes (e.g., planted grassland, sagebrush shrub-steppe) during the 2020 and 2021 field surveys or 2020 desktop analysis.

BESS = battery energy storage facility

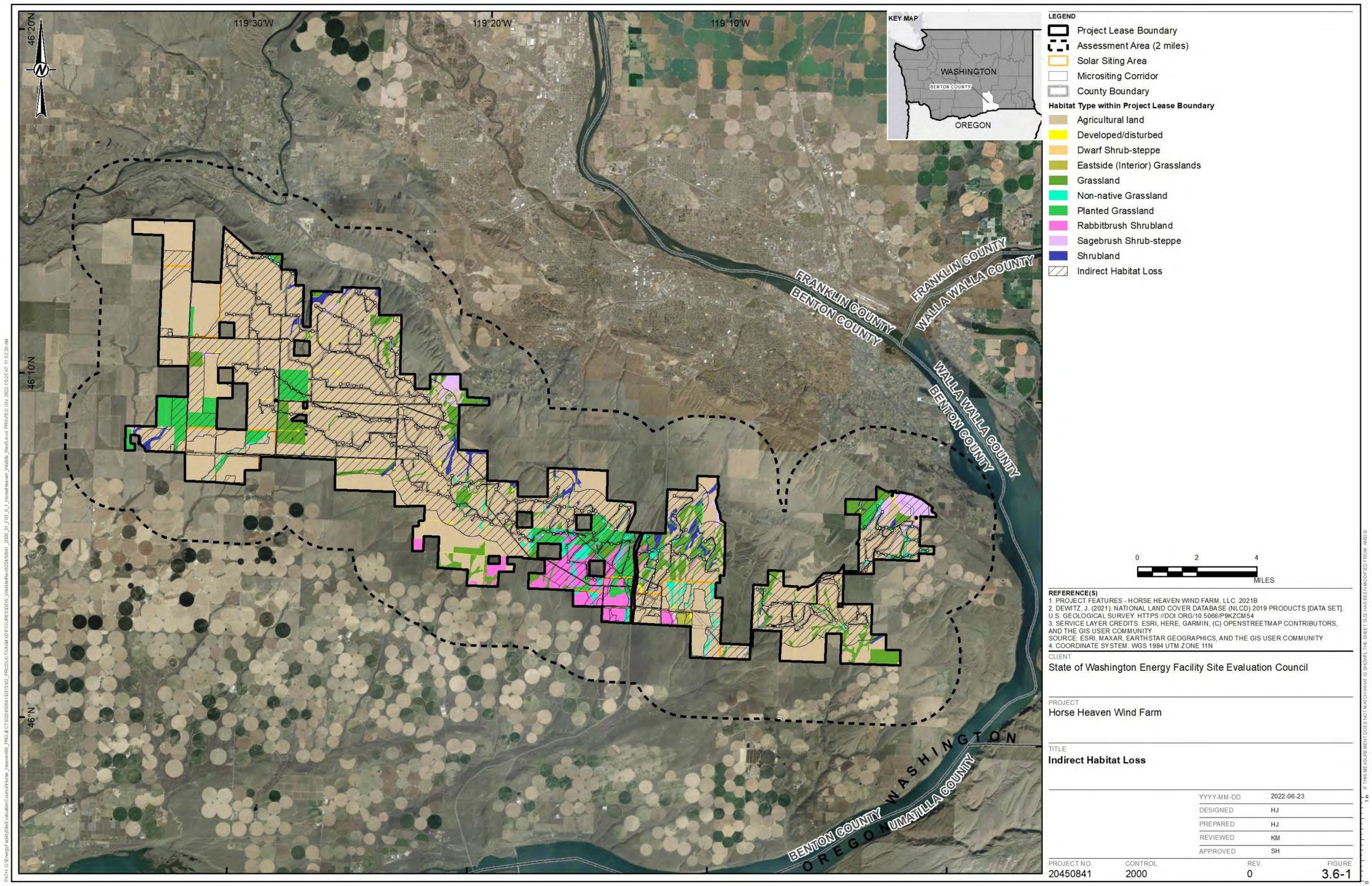

Figure 3.6-1: Indirect Habitat Loss

Agricultural land accounts for the majority (approximately 74 percent) of the Lease Boundary and consists of active and fallow wheat fields (Horse Heaven Wind Farm, LLC 2021a). Agricultural lands are distributed throughout the Lease Boundary.

Developed and disturbed areas within the Lease Boundary are generally unvegetated and include roads, buildings, gravel pits, and other structures. Developed areas are distributed throughout the Lease Boundary and include linear features (e.g., roadways) or small polygons (developed areas less than 30 acres).

Grassland is the second most common habitat type in the Lease Boundary (approximately 17 percent) and includes Eastside (interior) grassland, non-native grasslands, planted grasslands, and unclassified grasslands. Eastside (interior) grassland is dominated by native perennial grasses, including bluebunch wheatgrass (*Pseudoroegneria spicata*), Sandberg's bluegrass (*Poa secunda*), and Great Basin wildrye (*Leymus cinereus*), with a diverse herb layer (e.g., forbs such as flowering plants). This habitat type was mapped in small areas within the portion of the Micrositing Corridor that crosses Badger Canyon and within the East Solar Field (Tetra Tech 2021a). Non-native grasslands are areas dominated by non-native grass species, such as cereal rye (*Secale cereale*) and cheatgrass (*Bromus tectorum*), with lesser amounts of native species. This habitat type was more frequently mapped on the hilltop and draws in the Lease Boundary (Horse Heaven Wind Farm, LLC 2021a). Planted grasslands are areas that may be included in the U.S. Department of Agriculture Conservation Reserve Program (CRP) and are characterized as planted areas dominated by native or non-native grass species. Some of the planted grassland also included dense areas of rabbitbrush. Planted grasslands were predominantly mapped in the western (north of the proposed Webber Canyon substation) and central (north of the Bofer Canyon substation) portions of the Lease Boundary. Unclassified grasslands are areas mapped as herbaceous land; however, these were not further classified into one of the other grassland subtypes (Horse Heaven Wind Farm, LLC 2021b). This classification is used for the portion of the Lease Boundary that lies outside the Wind Energy Micrositing Corridor and Solar Siting Areas, where field data are limited. This habitat type is frequently mapped along hills and draws but also occurs elsewhere in the Lease Boundary.

Shrubland habitat is described as areas where shrubs account for a minimum of 5 percent of vegetation cover. Shrubland is further refined into dwarf shrub-steppe, rabbitbrush shrubland, and sagebrush shrub-steppe, based on background and field data, or unclassified shrubland where further classification was not possible (Horse Heaven Wind Farm, LLC 2021a). Dwarf shrub-steppe habitat was mapped in one polygon (23 acres) on a ridgetop in the northwest corner of the Lease Boundary. Rabbitbrush was reported to typically occur in areas understood to be former agricultural lands and could have been, or are, enrolled in the CRP. This habitat type was recorded in the central-eastern portion of the Lease Boundary near Prospect Canyon and Bofer Canyon (2,517 acres). Sagebrush shrub-steppe (1,261 acres) was mapped in the north-central and northeastern portions of the Lease Boundary, often associated with ridges and canyons. Unclassified shrubland (1,719 acres) includes shrublands that could not be further classified from background resources and are mapped as shrub/scrub by the National Land Cover Database.

One wetland, approximately 0.03 acres in size, has been recorded in Badger Canyon within the Lease Boundary. The wetland is in a draw approximately 240 feet west of the Micrositing Corridor.

Three of the habitat types documented in the Lease Boundary—sagebrush shrub-steppe, dwarf shrub-steppe,[5] and Eastside (interior) grassland[6]—are considered priority habitat by Washington State. These are described further in Section 3.5.2.

3.6.2.2 Wildlife

Wildlife presence and use of the Lease Boundary was assessed using background resources (e.g., databases maintained by Washington State) and field-based data collected by the Applicant.

General Wildlife

Amphibians

Three amphibian species—Woodhouse's toad (*Anaxyrus woodhousii*), Great Basin spadefoot (*Spea intermontana*), and Pacific treefrog (*Pseudacris regilla*)—have ranges that overlap the Lease Boundary and Wildlife Area of Analysis based on the Gap Analysis[7] Predicted Distribution mapping produced by the Washington NatureMapping Program (NatureMapping n.d.). Woodhouse's toads are associated with sagebrush, riparian areas, and prairie fields along the Snake and Columbia Rivers (NatureMapping n.d.). Woodhouse's toad is considered a species of greatest conservation need under the State Wildlife Action Plan (SWAP) (WDFW 2015). Great Basin spadefoots are associated with natural and anthropogenic permanent and temporary aquatic habitats such as ponds, ditches, dugouts, and vernal pools. Pacific treefrogs occur in most habitats with access to breeding sites, and the Lease Boundary is within the core habitat for this species (NatureMapping n.d.). The Applicant reports that suitable natural or anthropogenic breeding habitats are not available in the Lease Boundary, although wetland habitat has been recorded in Badger Canyon, approximately 790 feet (240 meters) west of the Micrositing Corridor, which may provide breeding habitat if wetted during the breeding season (spring to early summer).

Reptiles

Five snakes (common garter snake [*Thamnophis sirtalis*], gopher snake [*Pituophis catenifer*], western racer [*Coluber constrictor*], striped whipsnake [*Masticophis taeniatus*], and western rattlesnake [*Crotalus oreganus*]) and three lizards (sagebrush lizard [*Sceloporus graciosus*], pygmy short-horned lizard [*Phrynosoma douglasii*], and side-blotched lizard [*Uta stansburiana*]) have ranges that overlap with the Lease Boundary. Two of these species, striped whipsnake and sagebrush lizard, are candidates for listing as endangered, threatened, or sensitive in Washington State and are discussed further in subsequent sections (WDFW 2021a). Side-blotched lizard and pygmy short-horned lizard are also listed as a species of greatest conservation need under the SWAP (WDFW 2015).

In general, regionally occurring snake and reptile species exhibit a patchy distribution and are associated with shrubland, grassland, and canyons with access to suitable hibernacula (winter shelter used for hibernation) or hibernation habitat (e.g., loose soils for burrowing). In the Lease Boundary, it is expected that suitable reptile living habitat is available in native shrub and grassland areas, as well as planted grasslands. Reptiles may also

[5] Sagebrush shrub-steppe and dwarf shrub-steppe are part of the Shrub-steppe Priority Habitat in Washington State (WDFW 2008).

[6] The areas identified by the Applicant as Eastside (interior) grassland are considered Eastside Steppe Priority Habitat in Washington State (WDFW 2008).

[7] Gap Analysis is a process of identifying areas of high conservation priority. It is designed to be a proactive approach to conservation. Gap relies on information from current landcover and terrestrial vertebrates to identify habitat types and species that are poorly represented on reserves (NatureMapping n.d.).

occur in agricultural areas and along roadways if suitable basking and shelter habitat is available for thermoregulation.

Birds

A total of 66 bird species were reported in the Lease Boundary from field-based studies conducted by the Applicant, including 29 small bird species and 37 large bird species. The Applicant reports that the species recorded during surveys are typical of species occurring in regional arid shrub-steppe, agriculture, and grassland habitats. Horned lark (*Eremophila alpestris*) was the most common small bird species observed (5.3 observations per 100-meter [328-foot] plot per 10-minute survey) in both the eastern and western portions of the Lease Boundary and was most commonly observed in the fall and winter (Horse Heaven Windfarm, LLC 2021a).

Snow goose (*Anser caerulescens*) was the most common large bird species observed overall (12.96 observations per 800-meter [2,625-foot] plot per 60-minute survey) and the species most commonly observed in the eastern portion of the Lease Boundary. Snow geese were most frequently observed during the winter. Sandhill crane (*Antigone canadensis*) was the most frequently observed large bird species in the western portion of the Lease Boundary and was most frequently documented during the fall.

Thirteen species of raptor were recorded in the Lease Boundary, with the northern harrier (*Circus hudsonius*) most frequently observed and occurring most often in the fall. Golden eagle (*Aquila chrysaetos*) and bald eagle (*Haliaeetus leucocephalus*) have been recorded in the Lease Boundary. All bald eagle observations were recorded in the winter and spring.

Thirteen special status bird species were recorded in the Lease Boundary and are discussed below. One species, peregrine falcon (*Falco peregrinus*), is listed as a species of greatest conservation need under the SWAP (WDFW 2015), but is not considered a special status species based on the definition provided below. Eleven special status species were recorded on the western side of the Lease Boundary, and eight in the eastern portion. Raptor nest surveys were completed by the Applicant from 2017 to 2019 and recorded 44 nests within 2 miles (3.2 kilometers) of the Lease Boundary. Nesting habitat includes trees and areas along cliffs and rock outcrops.

Surveys conducted in 2017 documented 21 nests within 10 miles of the Lease Boundary, including 10 occupied nests within 2 miles of the Lease Boundary: two ferruginous hawk (*Buteo regalis*), four red-tailed hawk (*Buteo jamaicensis*), two great horned owl (*Bubo virginianus*), one Swainson's hawk (*Buteo swainsoni*), and one common raven (*Corvus corax*).

A survey conducted in 2018 documented 36 nests within 10 miles of the Lease Boundary, 24 of which were occupied. Occupied nests recorded within 2 miles of the Lease Boundary included eight red-tailed hawk, six Swainson's hawk, three great horned owl, and one ferruginous hawk. Active bald eagle nests were reported beyond 2 miles of the Lease Boundary.

Surveys conducted in 2019 for the Four Mile Wind Project recorded 13 occupied nests, including five red-tailed hawk, two Swainson's hawk, two common raven, and one ferruginous hawk within 2 miles of the Lease Boundary. Three of the nests (two raven and one Swainson's hawk) were located within the Lease Boundary. Six occupied bald eagle nests were recorded between 2 and 10 miles from the Lease Boundary. Surveys conducted for the Badger Canyon Project documented 13 occupied nests, including five Swainson's hawk, three red-tailed hawk, three common raven, and two great horned owl nests. Four of these nests are within the Lease Boundary. In addition, two active bald eagle nests were documented within 10 miles of the Lease Boundary. **Table 3.6-2**

summarizes raptor stick nests recorded by the Application for Site Certification (ASC) (Horse Heaven Wind Farm, LLC 2021a).

Table 3.6-2: Raptor Stick Nest Survey Results[(a)]

Species[(b)]	2017	2018	2019
Common raven *(Corvus corax)*	1	1	5
Ferruginous hawk (*Buteo regalis*)	2	1	1
Great horned owl (*Bubo virginianus*)	2	2	3
Red-tailed hawk (*Buteo jamaicensis*)	4	8	14
Swainson's hawk (*Buteo swainsoni*)	1	6	7
Unoccupied	10	14	14
Total	**20**	**32**	**44**

Notes:
[(a)] Nests recorded within 2 miles of the Lease Boundary
[(b)] Nests were active during surveys except for those identified as "Unoccupied."

Mammals

Most of the habitat in the Lease Boundary has been historically modified by agricultural practices; however, it is expected that portions of the modified habitat and remnant patches of shrub and grassland habitat support small and medium-sized mammals. The Washington NatureMapping Program shows rodent (e.g., mice), insectivore (e.g., shrews), lagomorph (e.g., rabbits), and mustelid (e.g., weasel) species with ranges that overlap the Lease Boundary (NatureMapping n.d.). Medium and large carnivores are not expected to occur regionally, except for species adapted to modified habitat, such as coyotes (*Canis latrans*). Three species of ungulate—mule deer[8] (*Odocoileus hemionus*), white-tailed deer[9] (*O. virginianus*), and pronghorn antelope[10] (*Antilocapra americana*)—have ranges that overlap the Lease Boundary. The Applicant has reported observations of ground squirrels, coyotes, mule deer, and pronghorn antelope in the Lease Boundary.

Bats

Twelve bat species are reported to occur regionally (NatureMapping n.d.), and the Applicant reported observations of eight species of bats in the Lease Boundary during field base surveys:

- California myotis (bat) (*Myotis californicus*)
- Canyon bat (*Parastrellus hesperus*)
- Little brown bat (*Myotis lucifugus*)

[8] Habitat mapped as patches of core breeding habitat (NatureMapping n.d.)

[9] Habitat mapped as marginal habitat (NatureMapping n.d.)

[10] No predictive habitat mapping available (NatureMapping n.d.)

- Long-legged myotis (bat) (*Myotis volans*)
- Western long-eared bat (*Myotis evotis*)
- Big brown bat (*Eptesicus fuscus*)
- Hoary bat (*Lasiurus cinereus*)
- Silver-haired bat (*Lasionycteris noctivagans*)

Silver-haired bat was the most common species detected, followed by hoary bat and big brown bat. Silver-haired and hoary bats are listed as species of greatest conservation need under Washington's SWAP (WDFW 2015). Bat activity recorded in the Lease Boundary peaked in September.

Bats are expected to forage over the Lease Boundary during summer months and migrate over the area in spring and fall. Surveys for hibernacula have not been conducted; however, the Applicant reports that suitable hibernacula sites (e.g., farm outbuildings, caves) are not available in the Lease Boundary. No bat hibernacula, bat concentration areas, cliffs, caves, or talus have been reported in Priority Habitats and Species (PHS) data within 3 miles of the Four Mile Wind Project area and Badger Canyon Wind Project area (Horse Heaven Wind Farm, LLC 2021a). Most bat species recorded during the multi-year acoustic studies conducted in the Lease Boundary are migratory species that would not overwinter in the Lease Boundary.

Migration Routes and Habitat Connectivity

The Project would be located along the Pacific flyway bird migration route. The Pacific flyway extends from Alaska to Patagonia and connects summer and winter grounds along the western portion of the continent. In Washington State, the Pacific flyway extends from the Pacific Ocean to the Rocky Mountain Range. The Applicant reports that cropland, shrubland, and grassland in the Lease Boundary provide suitable stopover habitat for raptors, songbirds, waterfowl, and shorebirds.

Bat migratory routes are poorly understood; however, bat acoustic data collected by the Applicant suggest that bats migrate over the Lease Boundary during spring and fall. Silver-haired bat and hoary bat were the two species most frequently detected during acoustic surveys. Silver-haired bats are recorded in Washington State from April through November, while hoary bats are typically recorded in Washington State from June through October (Cryan 2003).

Disturbance associated with the Project would not overlap big game migration routes (Horse Heaven Wind Farm, LLC 2021a), although the Lease Boundary overlaps areas modeled as wildlife movement corridors (WHCWG 2013). The Washington Wildlife Habitat Connectivity Working Group (WHCWG) developed a statewide habitat connectivity tool that models potential wildlife movement corridors in the landscape. Corridors were modeled based on an aggregate of habitat data for selected focal species. The model considers parameters such as habitat (e.g., habitat concentration area), landscape integrity (e.g., areas with limited human impact), and existing barriers to wildlife movement. These factors were considered to rate areas that facilitate wildlife movement. These areas are rated as very high (areas characterized as low-cost for wildlife movement) to low (areas characterized as a high-cost for wildlife movement) by WHCWG (2013). One modeled movement corridor rated as Medium to High runs in an east-west orientation along the northern perimeter of the Lease Boundary (shown in yellow and orange in **Figure 3.6-2**), and another rated as Medium to High runs in a north-south orientation parallel to Highway 395 (shown in yellow and orange in **Figure 3.6-2**). The north-south corridor connects the Hanford Site and Rattlesnake Hills to a habitat concentration area (HCA) in Oregon.

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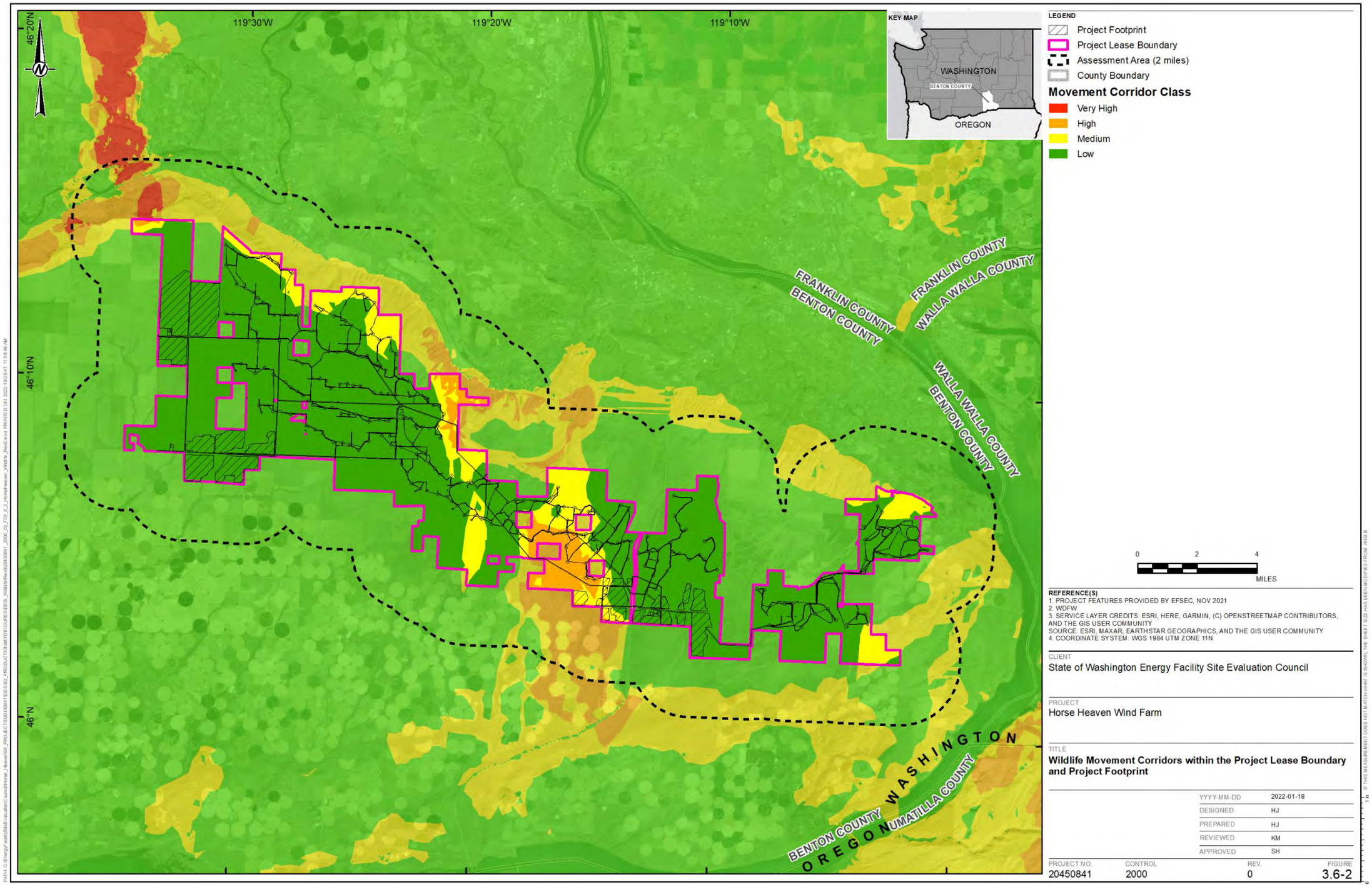

Figure 3.6-2: Wildlife Movement Corridors within the Project Lease Boundary and Project Footprint

Special Status Wildlife Species

For the purpose of this Draft EIS, the definition of "special status wildlife species" is consistent with the definition provided in the ASC—i.e., that special status wildlife species are one or more of the following:

- Listed under the federal Endangered Species Act
- Listed by Washington State as endangered, threatened, sensitive, or candidate species
- Listed by WDFW as priority species[11]
- An eagle species

In addition to species classified as special status using the definition above, this section also discusses pronghorn antelope, which is understood to be of specific importance to the Yakama Nation and is part of a regional re-introduction program. While discussed in this section, pronghorn antelope is not considered a special status species.

The Applicant has identified 20 special status species with potential to occur in the Lease Boundary. No species listed, or candidates for listing, under the federal Endangered Species Act are predicted to occur in the Lease Boundary. Data on special status species presence were collected from background resources (e.g., WDFW PHS data) and field-based data collected by the Applicant. It is noted that data collected and maintained by WDFW may not include private property; therefore, the lack of PHS data on species presence does not indicate species' absence. **Table 3.6-3** summarizes the 20 special status species with potential to occur within the Lease Boundary; each special status species is described in the text following **Table 3.6-3**.

[11] WDFW defines Washington priority species as those species "that are State listed as Endangered, Threatened, Sensitive, and Candidate Species; vulnerable animal groups; and vulnerable species of recreational, commercial, or tribal importance." (WDFW 2022)

Table 3.6-3: Summary of Special Status Species with Potential to Occur in the Project Lease Boundary

Species	Habitat	Abundance	Abundance in Washington State[1]	Short-term Trends	Long-term Trends	Threats
Sagebrush lizard *Sceloporus graciosus*	▪ Shrublands ▪ Grasslands ▪ Deserts ▪ Open coniferous forests ▪ Sand dunes	100,000 Individuals (globally)	NA	Stable or declining	Unknown	▪ Habitat loss ▪ Fragmentation of habitat ▪ Degradation from non-native plant
Striped whipsnake *Coluber taeniatus*	▪ Shrub-steppe ▪ Hibernacula sites in basalt outcrops	>100,000 Individuals (globally)	NA	Stable or declining	Variable	▪ Habitat loss ▪ Road mortality
American white pelican *Pelecanus erythrorhynchos*	▪ Islands in freshwater ▪ Migration inland, along rivers	>100,000 Individuals, (globally)	NA	Increasing	Declining	▪ Human encroachment on breeding sites ▪ Degradation of aquatic foraging habitat ▪ Pesticide use
Bald eagle *Haliaeetus leucocephalus*	▪ Proximity to foraging habitat (large fresh water and marine systems)	100,000 Individuals (North America)	3,000 to 4,000 Individuals	Stable or increasing	Stable or declining	▪ Disturbance ▪ Habitat loss ▪ Biocide contamination ▪ Food supply ▪ Illegal hunting
Burrowing owl *Athene cunicularia*	▪ Open grassland ▪ Steppe ▪ Desert	>100,000 Individuals (globally)	NA	Declining	Declining	▪ Decline in denning locations ▪ Habitat loss

Table 3.6-3: Summary of Special Status Species with Potential to Occur in the Project Lease Boundary

Species	Habitat	Abundance	Abundance in Washington State[1]	Short-term Trends	Long-term Trends	Threats
Ferruginous hawk *Buteo regalis*	▪ Grassland ▪ Sagebrush ▪ Canyons	<83,000 Individuals (U.S.)	NA	Declining	Declining	▪ Mortalities from collisions with wind turbines, transmission lines roads and highways ▪ Habitat loss ▪ Reduction of prey abundance ▪ Pesticides/contaminants ▪ Climate change ▪ Nest disturbance
Golden eagle *Aquila chrysaetos*	▪ Shrubland ▪ Grassland	<100,000 Individuals (North America)	NA	Stable to declining	stable	▪ Mortality from collisions with powerlines and wind turbines ▪ Consumption of poisons ▪ Habitat degradation ▪ Disturbance of nest sites
Great blue heron *Ardea herodias*	▪ Lakeshore, coastal water, streams ▪ Pasture, fields, fallow areas	124,500 (*Herodias* subspecies North America)	NA	Stable to increasing	Stable to increasing	▪ Contamination of food sources ▪ Alteration of foraging habitat ▪ Disturbance of nesting sites
Loggerhead shrike *Lanius ludovicianus*	▪ Shrubland ▪ Grassland	6,000,000 Individuals (globally)	NA	Declining	Declining	▪ Pesticide use ▪ Decline in food availability ▪ Loss and degradation of breeding habitat

Table 3.6-3: Summary of Special Status Species with Potential to Occur in the Project Lease Boundary

Species	Habitat	Abundance	Abundance in Washington State[1]	Short-term Trends	Long-term Trends	Threats
Prairie falcon *Falco mexicanus*	▪ Arid environments ▪ Coastal (overwinter)	<9,000 Individuals (North America)	200 Individuals	Stable	NA	▪ Disturbance ▪ Habitat loss and degradation ▪ Collisions with infrastructure
Ring-necked pheasant *Phasianus colchicus*	▪ Open environments ▪ Coastal areas	NA	NA	Stable	Declining	▪ Hunting ▪ Food contamination ▪ Mortality from collision with machinery ▪ Habitat degradation
Sagebrush sparrow *Artemisiospiza nevadensis*	▪ Sagebrush ▪ Bunch grass shrub-steppe	NA	NA	Stable to declining	Stable to declining	▪ Habitat loss and degradation ▪ Changes in fire regimes
Sage thrasher *Oreoscoptes montanus*	▪ Shrub-steppe	>1,000,000 Individuals (globally)	NA	Declining	Declining	▪ Habitat loss and degradation
Sandhill crane *Antigone canadensis*	▪ Sunnyside-Snake River Wildlife Area ▪ Marsh, wetland, and bog habitat ▪ Wet meadows ▪ Grain fields	8,000 Individuals (Central Valley population)	8,000 Individuals (Central Valley population)	Stable	NA	▪ Habitat loss ▪ Collisions with infrastructure ▪ Nest predation
Tundra swan *Cygnus columbianus*	▪ Freshwater system ▪ Marine systems ▪ Fields	<170,000 Individuals (North America)	NA	Stable	NA	▪ Hunting on winter grounds ▪ Consumption of spent lead shots and fishing leads

Table 3.6-3: Summary of Special Status Species with Potential to Occur in the Project Lease Boundary

Species	Habitat	Abundance	Abundance in Washington State[1]	Short-term Trends	Long-term Trends	Threats
Vaux's swift *Chaetura vauxi*	▪ Access to roost sites (trees, snags, chimneys)	<300,000 Individuals (North America)	NA	Declining	Declining	▪ Loss of old trees and snags ▪ Change in chimney availability ▪ Pesticides
Townsend's big-eared bat *Corynorhinus townsendii*	▪ Coniferous forests ▪ Riparian habitat ▪ Shrub-steppe ▪ Open fields	<100,000 Individuals (globally)	NA	Stable to declining	Declining	▪ Disturbance and destruction of hibernacula and maternity colonies ▪ Loss of roosting and foraging habitat
Townsend's ground squirrel *Urocitellus townsendii*	▪ Shrub-steppe ▪ Grasslands ▪ Pastures ▪ Orchards ▪ Highway margin, and canal banks	NA	NA	Stable to Declining	Declining	▪ Habitat loss and degradation
Black-tailed jackrabbit *Lepus californicus*	▪ Sagebrush ▪ Rabbitbrush ▪ Grassland	NA	NA	Declining	Stable	▪ Habitat loss ▪ Mortality from persecution ▪ Disease
White-tailed jackrabbit *Lepus townsendii*	▪ Open bunchgrass habitat ▪ Sagebrush	<1,000,000 Individuals (globally)	NA	NA	NA	▪ Loss and degradation of habitat
Pronghorn antelope *Antilocapra americana*	▪ Grassland ▪ Shrubland	NA	<300 Individuals	Increasing	NA	▪ Previously extirpated from Washington State

Notes:
Source: Citations for sources of information provided under species-specific sections
NA = Not available

Sagebrush Lizard

Sagebrush lizard (*Sceloporus graciosus*) occurs across the arid areas of the central western United States, extending northward into Washington State. In Washington State, the species occurs in semi-desert and steppe areas throughout the Columbia Basin, including Benton County (NatureMapping n.d.). The species is associated with shrublands, grasslands, deserts, open coniferous forests, and sand dunes where open ground with low-lying shrubs is available. Suitable habitat generally has limited grass and leaf cover. The species has a small home range size of approximately 1.2 acres (0.5 hectares) (NatureServe 2021).

Local population estimates and trends are not available; however, NatureServe (2021) estimates the global population to be approximately 100,000 individuals. Short-term trends may be stable or decreasing, and long-term trends are unknown (WDFW 2021b). Threats to the species include habitat loss and fragmentation (e.g., roadways), as well as habitat degradation from non-native plant species, such as cheatgrass, and loss of sagebrush (WDFW 2021b). The species is a candidate for state listing and is a state priority species.

Shrubland, including sagebrush and rabbitbrush habitat, within the Lease Boundary is expected to provide suitable habitat for this species. Washington's NatureMapping Program reports suitable core sagebrush lizard habitat along the northern and southern perimeter of the Lease Boundary (NatureMapping n.d.). Sagebrush lizard has not been documented within the Lease Boundary, though species-specific surveys have not been conducted (WDFW 2021c; Horse Heaven Wind Farm, LLC 2021a).

Striped Whipsnake

Striped whipsnake (*Coluber taeniatus*) occurs across the western and southwestern United States, from Washington State south to California and east to Texas. The desert striped whipsnake subspecies (*C. t. taenatus*) occur in Washington State, where it is verified as occurring in two locations in Grant County (WDFW 2021d). The species is a shrub-steppe obligate, occurring in areas where it can access suitable hibernacula sites in basalt outcrops (WDFW 2021d). Movements between hibernacula and summer range are estimated to average 2,950 feet (900 meters) for females and 4,920 feet (1,500 meters) for males (NatureServe 2021).

Local population estimates and trends are not available; however, NatureServe (2021) estimates that the global population exceeds 100,000 individuals. Population trends are expected to be variable across the species' range and are broadly considered to be stable or declining globally (NatureServe 2021). Striped whipsnake has likely always been uncommon in Washington State, which is at the northern end of its range. Striped whipsnake is a candidate for listing in Washington State and is a state priority species in Washington State due to conversion of shrub-steppe habitat to agricultural or land development purposes and destruction of hibernacula sites (WNHP et al. 2009).

Striped whipsnake has historically been recorded in Benton County, and core habitat occurs along the northern perimeter of the Lease Boundary (NatureMapping n.d.). It is expected that shrub-steppe habitat in the Lease Boundary provides suitable summer habitat for the species; however, the Applicant reports that the area does not contain basalt outcrops, which are required for hibernacula. While the species has historically been reported in Benton County, PHS data do not report occurrences of the species within 2 miles (3.2 kilometers) of the Lease Boundary **(Figure 3.6-3**), and striped whipsnake was not recorded within the Lease Boundary during field surveys, though species-specific surveys have not been conducted (Horse Heaven Wind Farm, LLC 2021a; WDFW 2021d).

American White Pelican

American white pelicans (*Pelecanus erythrorhynchos*) occur across most of North America, breeding in Canada, the north-central United States, and western United States and overwintering in the southern United States and Central America. In Washington State, American white pelicans breed on Badger Island in the Columbia River (WDFW 2021e) and migrate over the eastern portion of the state (Knopf and Evans 2020). Breeding occurs on islands in freshwater systems protected from humans and predation (WDFW 2021e). Migration occurs inland, often along rivers, with access to aquatic stopover areas (Knopf and Evans 2020).

Local population estimates and trends are not available; however, NatureServe (2021) estimates that the global population exceeds 100,000 individuals. WDFW (2015) reports that approximately 1,000 pairs of American white pelican breed at Badger Island in the Columbia River. American white pelicans have undergone historical population declines, but populations appear to have increased since 1980 (Knopf and Evans 2020). The species is vulnerable to human encroachment on breeding sites, changes and degradation of aquatic foraging habitat, pesticide use, and continues to exhibit effects from hunting in the past (Knopf and Evans 2020). The species is state listed as sensitive and is a state priority species.

Suitable nesting and foraging habitat does not occur within the Lease Boundary; however, American white pelicans were recorded during field surveys flying over the Lease Boundary when moving to and from the Badger Island breeding colony and during migration. The Badger Island breeding colony is located approximately 4 miles (6.5 kilometers) east of the Lease Boundary and is one of the largest breeding colonies in the United States. The Applicant recorded 887 birds (76 groups) flying over the Lease Boundary during field surveys (Horse Heaven Wind Farm, LLC 2021a). Most of the observations were recorded during the summer (724 individuals) followed by fall (111 individuals) and spring (52 individuals).

Bald Eagle

Bald eagles occur across most of North America and breed in Canada, the western and southeastern United States, and patches of central and east coastal United States and are year-round residents in most of Washington State. Breeding typically occurs in trees within 1.2 miles of water, although breeding locations and substrate can vary. Bald eagles may congregate outside of the breeding period in areas with access to foraging habitat (e.g., large rivers) and roosting sites (Buehler 2020).

Local population estimates and trends are not available; however, Buehler (2020) reports that the North American population may be as high as 100,000 individuals, and WDFW (2015) reports that approximately 3000 to 4000 individuals occur in Washington State. Bald eagle populations have increased since 1972 due to bans of dichlorodiphenyltrichloroethane (DDT), and populations in Washington State may be approaching carrying capacity (Buehler 2020). Threats to bald eagle include disturbance, habitat loss, biocide contamination, food supply, and illegal hunting (NatureServe 2021). Bald eagle is a state priority species and is protected under the federal Bald and Golden Eagle Protection Act.

Bald eagles are year-round residents in Benton County and nest along the Columbia River (Horse Heaven Wind Farm, LLC 2021a). Bald eagles were observed flying over the Lease Boundary during field surveys, including six observations over the western portion of the Lease Boundary and 10 over the eastern portion of the Lease Boundary. In the west, the observations were grouped around Bing and Coyote Canyons. Bald eagles were observed predominantly in the winter and spring months (Horse Heaven Wind Farm, LLC 2021a). Seven bald eagle nests were recorded during field surveys, none of which were within the Lease Boundary (**Table 3.6-4**).

Table 3.6-4: Bald Eagle Nests Recorded within 10 Miles of the Lease Boundary

Nest Location	Nest Status[(a)]	Distance to Nearest Proposed Turbine (miles)
Prosser	Active 2019	10.7
Yakima River Mouth	Active 2017 Active 2018 Inactive 2019	8.1
Port of Pasco	Active 2019	6.5
Peavine island	Active 2019	3.7
McNary NWR	Active 2019	7.8
Sand Station	Active 2019	9.2

Source: Horse Heaven Wind Farm, LLC 2021a
Notes:
[(a)] Only includes years the nest location was surveyed
NWR = National Wildlife Refuge

Burrowing Owl

Burrowing owls (*Athene cunicularia*) occur across central and southern United States. In Washington State, burrowing owl breeding habitat occurs in arid areas in the southern-central part of the state. Benton County is located in the center of the mapped core habitat for this species in Washington State (NatureMapping n.d.). Suitable breeding habitat includes open grassland, steppe, and desert ecosystems, where the species typically occurs in gently sloped areas with sparse vegetation (Poulin et al. 2020). Burrowing owls can occur in anthropogenically modified landscapes such as agricultural fields, and roadway rights-of-way. Abandoned mammal burrows are used for nesting and are an important feature in suitable habitat.

National and regional populations are poorly understood, and likely vary across the species' range. In Washington State, populations are estimated to have declined by approximately 1.5 percent annually between 1968 and 2005 (Poulin et al. 2020). The species is considered uncommon outside of Benton, Franklin, Grant, and Adams Counties (WDFW 2021f). Risks to burrowing owls in Washington State are understood to include decline in small mammals, resulting in a reduction of denning locations and loss of habitat from alteration of landscape to agriculture and developed areas (WDFW 2021f). Burrowing owl is a candidate species for state listing and is a state priority species.

The Lease Boundary is classified as core habitat for burrowing owls, and PHS data report 32 burrowing owl nests or burrows within 2 miles of the Lease Boundary (**Figure 3.6-3**), including four within the Lease Boundary (NatureMapping n.d.). Suitable habitat for burrowing owls may exist in grasslands, shrublands, and fallow agricultural fields, and along roadways. Burrowing owls were not recorded in the Lease Boundary during the field surveys conducted by the Applicant; however, species-specific surveys were not conducted.

Ferruginous Hawk

Ferruginous hawk range extends across open portions of western North America, extending into southeastern Washington State. Benton County is located in core habitat for this species in Washington State and, along with Franklin County, supports the majority of nesting territories (Hayes and Watson 2021; NatureMapping n.d.). Habitat generally consists of grassland and sagebrush ecosystems, as well as canyons with cliffs and rock outcrops that provide nesting sites (Ng et al. 2020). In Washington State, nests are typically placed at lower elevations and heights less than 33 feet (10 meters) (Ng et al. 2020). Preferred nesting locations include rock

outcrops and juniper trees with southern and western exposures (Ng et al. 2020). Additionally, nesting sites require access to prey sources that include small mammals, such as ground squirrels. Ferruginous hawk core habitat is estimated to extend 2 miles (3.2 kilometers) from the nest site, and the home range is estimated to encompass approximately 6 miles (10 kilometers) from the nest site (Ritter 2022; Watson 2022a). These distances were derived from telemetry data collected in south-central and north-central Washington State (Watson 2022a).

Ng et al. (2020) report that the North American population was estimated to be approximately 5,842 to 11,330 individuals in the early 1990s. More recent estimates, based on breeding bird surveys, estimated the North American population to be upwards of approximately 83,000 individuals, but within Washington State, the species has been in decline. Statewide ferruginous hawk territory occupancy trends are presented in Hayes and Watson (2021), who report that the breeding population in Washington State has shown sustained declines: "Between 1974 and 2016, there have been significant declines in nesting territory occupancy, nest success, and productivity." Specific to Benton County, which is part of the Washington State core breeding range for this species, Hayes and Watson (2021) report substantial declines in the percentage of nesting territories supporting breeding pairs.

Threats to ferruginous hawk include mortalities from collisions with wind turbines, transmission lines, roads and highways, loss of foraging habitat as native habitats are converted to agricultural land or developed, reduction of prey abundance, indirect mortality from pesticides/contaminants, climate change, and nest disturbance (Ng 2020; Hayes and Watson 2021). Ferruginous hawks are state listed as endangered and are a state priority species, partially due to the continued contraction in breeding pairs statewide, as well as the lack of improvement in habitat conditions and primary threats to the species.

Shrub-steppe and grassland habitat in the Lease Boundary where small mammals occur may provide suitable ferruginous hawk foraging habitat, while canyons provide suitable nesting substrate. Portions of the Lease Boundary are classified as core habitat for ferruginous hawk (NatureMapping n.d.). PHS data show 41 ferruginous hawk nests within 2 miles of the Lease Boundary, including 10 within the Lease Boundary. Known ferruginous hawk nest locations (both active and inactive) are generally concentrated northwest of the Lease Boundary, between Interstate 82 and the northwestern edge of the Lease Boundary, near mapped ground squirrel concentration areas. Three nest sites are recorded along the southern edge of the Lease Boundary, and east of Interstate 82.

The Applicant reported that nine ferruginous hawk nests, documented during surveys conducted between 2017 and 2019, occur within 2 miles of the proposed turbine locations, including two that were occupied at least once during the study period (Horse Heaven Wind Farm, LLC 2021a). Nests were predominantly recorded along canyons, including Webber, Sheep, and Badger Canyon (Horse Heaven Wind Farm, LLC 2021a). It is understood that the area may represent up to 16 historical territories (Ritter 2022; Watson 2022b). Ferruginous hawk observations were recorded four times during point count surveys near the nest with activity recorded during field surveys.

Golden Eagle

Golden eagle (*Aquila chrysaetos*) range extends across North America. In Washington State, core breeding habitat is generally in arid environments located in the central portion of the state. Suitable habitat is variable but includes shrubland and grassland. Nesting may occur in trees or on cliffs.

North American populations are estimated at up to 100,000 individuals, with approximately 190 breeding pairs in Washington State (Katzner et al. 2020). Western North American populations appear to be stable or in slight decline. Historically, golden eagles were threatened by eradication campaigns; current threats include mortality from collisions with powerlines and wind turbines; consumption of poisons (e.g., rodenticide); habitat change, including reduction of prey items; and disturbance of nest sites (Katzner et al. 2020). Golden eagle is a candidate species for state listing, a state priority species, and protected under the Bald and Golden Eagle Protection Act.

Open grassland, shrubland, and agricultural areas in the Lease Boundary provide suitable foraging habitat for golden eagles. Six golden eagles were recorded in the western portion of the Lease Boundary, and one was documented in the east during field surveys conducted by the Applicant (Horse Heaven Wind Farm, LLC 2021a). Most observations were documented during the fall. No golden eagle nests were recorded in or within 10 miles of the Lease Boundary, though suitable nesting habitat is available along cliffs associated with the Columbia River (Horse Heaven Wind Farm, LLC 2021a).

Great Blue Heron

Great blue heron (*Ardea herodias*) range extends across most of North America and Central America. In Washington State, the species' breeding range generally extends along the coast and the central-eastern part of the state, with the *herodias* subspecies occurring in eastern Washington. Great blue heron is adaptable and uses a variety of habitat for foraging, including aquatic (e.g., lakeshore, coastal water, streams) and upland (e.g., pasture, fields, fallow areas) areas (Vennesland and Butler 2020). Nesting occurs in trees, in bushes, on the ground, or on artificial structures, typically near water (Vennesland and Butler 2020).

The *herodias* subspecies population is estimated at 124,500 individuals, although local population estimates are not available (Vennesland and Butler 2020). Long- and short-term trends suggest that great blue heron populations are stable or increasing; however, the populations were historically impacted by hunting (NatureServe 2021). Threats to the species include contamination of food sources, alteration of foraging habitat (e.g., draining wetlands), and disturbance of nesting sites. Great blue heron is a state priority species.

The Lease Boundary is not expected to provide suitable nesting habitat for great blue heron; however, grassland, agricultural fields, and shrubland may provide foraging habitat (Horse Heaven Wind Farm, LLC 2021a). Nesting may occur along adjacent watercourses, such as the Yakima River (Horse Heaven Wind Farm, LLC 2021a). The Lease Boundary overlaps areas of core breeding habitat (NatureMapping n.d.). One great blue heron was recorded flying over grassland area of the Lease Boundary during the winter (Horse Heaven Wind Farm, LLC 2021a).

Loggerhead Shrike

Loggerhead shrike (*Lanius ludovicianus*) range extends across most of the United States, including portions of southern Canada. In Washington State, core breeding habitat for loggerhead shrike is predominantly located in the central portion of the state along the Columbia Basin (NatureMapping n.d.). Breeding habitat generally consists of undisturbed patches of shrub-steppe and grass areas, although abundance appears to be correlated with active pasture lands in portions of the species' range, suggesting that access to perches and short grass may be important (Yosef 2020). Loggerhead shrike is a candidate for state listing and is a state priority species.

The global population of loggerhead shrike is estimated to be six million individuals; however, local population estimates are not available (NatureServe 2021). Species declines have been noted in most states, and current population decreases are estimated at 3.5 to 5 percent per year. Threats to the species include pesticide use,

decline in food (e.g., invertebrate) availability, and loss and degradation of breeding habitat through loss of sagebrush steppe habitat (NatureServe 2021; Yosef 2020).

Shrubland, abandoned homesteads, and hedgerows in the Lease Boundary provide suitable nesting habitat for loggerhead shrike (Horse Heaven Wind Farm, LLC 2021a). Shrubland and agricultural fields provide foraging habitat for the species (Horse Heaven Wind Farm, LLC 2021a). The Lease Boundary overlaps core loggerhead shrike breeding habitat. PHS data report seven loggerhead shrike occurrences within 2 miles of the Lease Boundary (**Figure 3.6-3**), three of which are nest sites. Five of the loggerhead shrike occurrences are reported from within the Lease Boundary, two of which are nest locations. A loggerhead shrike nest was recorded within the Lease Boundary in 1990, and a second was recorded approximately 350 feet from the Lease Boundary (Horse Heaven Wind Farm, LLC 2021a). One loggerhead shrike was recorded during summer field surveys in the eastern portion of the Lease Boundary (Horse Heaven Wind Farm, LLC 2021a). The Applicant reports that this bird may have been nesting when observed (Horse Heaven Wind Farm, LLC 2021a).

Prairie Falcon

Prairie falcon (*Falco mexicanus*) range extends across most of western United States and northern Mexico. In Washington State, the species is a year-round resident in the central and eastern portions of the state and may overwinter in coastal areas (Steenhof 2020). Core breeding habitat has been identified in central Washington State (NatureMapping n.d.). PHS data report 12 occurrences of prairie falcon within 2 miles of the Lease Boundary (**Figure 3.6-3**), though none within the Lease Boundary. Prairie falcon habitat consists of arid open environments, including steppe, with cliffs, bluffs, and canyons that provide nesting sites (Steenhof 2020). Access to prey species, including horned lark, meadowlark (*Sturnella neglecta*), and ground squirrel, is an important component of prairie falcon habitat (Steenhof 2020).

The breeding population of prairie falcon in North America is estimated at 8,546 individuals, while the population in Washington State was estimated at 200 individuals (circa 1971) (Steenhof 2020). Lack of long-term population data has resulted in imprecise population trends; however, Steenhof (2020) reports that populations in western North America may be declining. Prairie falcon is a state priority species.

In the Lease Boundary, suitable prairie falcon nesting habitat occurs on bluffs and canyons, and foraging habitat occurs in shrubland and grassland habitat (Horse Heaven Wind Farm, LLC 2021a). The Lease Boundary may overlap core breeding habitat (NatureMapping n.d.), although the central Columbia Basin, which includes Benton County, supports the largest wintering population of prairie falcon in Washington State (Horse Heaven Wind Farm, LLC 2021a). Prairie falcons (30 observations) were recorded in cropland and grassland within the Lease Boundary during all seasons, though observations were reported to be lower in spring and summer (Horse Heaven Wind Farm, LLC 2021a).

Ring-necked Pheasant

Ring-necked pheasant (*Phasianus colchicus*) is an introduced gamebird that originates from Asia. The species now occupies habitat across most of northern and central United States and southern Canada. In Washington State, core breeding habitat includes most open habitats in eastern Washington, as well as coastal areas. The species is adaptable and occupies a variety of habitat types although generally requires areas with cover, such as dried grasses, for nesting and roosting, roosting perch sites (e.g., trees or shrubs), and crowing areas.

Reliable population estimates are not available for North America and estimates are often variable. Harvest data maintained by WDFW suggest that ring-necked pheasant populations have declined since the early 1980s (WDFW 2021g). In Washington State, WDFW releases pen-raised ring-necked pheasants to supplement wild

populations (WDFW 2021h). Local and national population trends are not known, as reliable population data are not available. Giudice and Ratti (2020) report declines in the Rocky Mountain states; however, it is expected that populations are stable given state management of the species. Ring-necked pheasants are hunted, and hunting pressures represent a primary threat to populations. Additional threats may include contamination of food sources from insecticides, mortality from agricultural machinery and road vehicles, and degradation of habitat from increased industrial farming (Giudice and Ratti 2020). Ring-necked pheasant is a state priority species.

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 pheasant (Horse Heaven Wind Farm, LLC 2021a). Ten observations of ring-necked pheasant were recorded during field surveys, primarily in cropland and grassland (Horse Heaven Wind Farm, LLC 2021a). PHS data report 10 occurrences of ring-necked pheasants within 2 miles of the Lease Boundary (**Figure 3.6-3**).

Sagebrush Sparrow

Sagebrush sparrow (*Artemisiospiza nevadensis*) range consists of western states from Washington to northern Mexico, where the species is associated with shrub-steppe habitat. In Washington State, it occurs primarily in the sagebrush and bunch grass shrub-steppe ecosystems of the Columbia Basin. Sagebrush sparrows are associated with semi-open habitat with evenly spaced shrubs, and with sagebrush (Martin and Carlson 2020).

Regional population estimates are not available for sagebrush sparrows, although, WDFW (2021i) reports that populations in Washington State are stable. Martin and Carlson (2020) report that breeding bird survey data suggest declines of 1 to 2 percent in western states, including Washington State. Threats to the species are primarily reported to be from habitat loss and degradation. Changes in fire regimes (e.g., suppression and increased frequency of high intensity fires) have changed patterns of plant succession and composition (Martin and Carlson 2020). The species is a candidate for listing in Washington State and is a state priority species.

Sagebrush habitat in the Lease Boundary provides suitable breeding and living habitat for sagebrush sparrow. The Lease Boundary overlaps limited core breeding habitat (NatureMapping n.d.). One sagebrush sparrow was recorded during spring 2018 field-based surveys (Horse Heaven Wind Farm, LLC 2021a). PHS data report one occurrence of sagebrush sparrow within 2 miles of the Lease Boundary (**Figure 3.6-3**).

Sage Thrasher

Sage thrasher (*Oreoscoptes montanus*) breeding range includes the western United States, extending into southern Canada, while winter range includes the southern states and northern Mexico. In Washington State, the species' core breeding range extends along the Columbia Basin to Okanogan County (NatureMapping n.d.). Sage thrashers require shrub-steppe habitat in their breeding range, generally using expansive areas of sagebrush, although they may use smaller fragments in agricultural areas (WDFW 2021j).

Washington population estimates are not available but are considered stable (Reynolds et al. 2020; WDFW 2021j). Density estimates for Washington counties published by Dobler et al. (1996, as reported by Reynolds et al. 2020) were 0.204 and 0.212 birds per hectare, while Stephens (1985, as reported by Reynolds et al. 2020) reported densities of 0.725 birds per hectare. Degradation and loss of habitat are considered the primary threat to sage thrashers. Sage thrasher is a candidate species for state listing and is a state priority species.

Shrub-steppe habitat in the Lease Boundary provides suitable breeding habitat for sage thrashers, and the Lease Boundary overlaps core breeding habitat (NatureMapping n.d.). Three occurrences of sage thrasher were recorded during field surveys—one during the spring and two during the fall (Horse Heaven Wind Farm, LLC

2021a). The individuals were using bushes and fences in grassland areas (Horse Heaven Wind Farm, LLC 2021a).

Sandhill Crane

Sandhill crane (*Antigone canadensis*) breeding range extends across most of the northern United States and Canada, with overwintering range in the southern United States. In Benton County, the Sunnyside-Snake River Wildlife Area provides an important stopover area for migrating sandhill cranes. Some nesting of greater sandhill cranes occurs in Yakima County. Breeding occurs in marsh, wetland, and bog habitat, as well as wet meadows (Gerber et al. 2020). Grain fields and aquatic habitat (shallow ponds, sloughs) are used during migration stopovers (Gerber et al. 2020).

The Central Valley population of sandhill crane, which winters in Central Valley, California, is estimated to be 8,000 individuals, while the Pacific flyway population is estimated at 25,000 individuals (Gerber et al. 2020). Over 35,000 sandhill cranes move along the Columbia Basin annually, making stopovers near Benton County (WDFW 2021k). Approximately 30 pairs of sandhill cranes breed in Washington State (WDFW 2015). In general, short-term trends show that sandhill crane populations appear stable (Gerber et al. 2020). Sandhill cranes are state listed as endangered and are a state priority species.

Transient birds could forage in agricultural fields, shrubland, and grassland habitat in the Lease Boundary; however, the Lease Boundary is not expected to provide nesting or substantial foraging habitat. Important stopover locations do occur in Benton County, though outside of the Lease Boundary. Sandhill crane was the most frequently observed large bird species over the western portion of the Lease Boundary (28 percent of large bird observations) (Horse Heaven Wind Farm, LLC 2021a). The Applicant reports 3,050 individuals in 27 groups moving over the Lease Boundary, predominantly in fall (Horse Heaven Wind Farm, LLC 2021a). No sandhill cranes were recorded perched or on the ground (Horse Heaven Wind Farm, LLC 2021a).

Tundra Swan

In North America, tundra swans (*Cygnus columbianus*) breed in northern Canada and Alaska and overwinter in patches of habitat in the western United States and the east coast. Overwintering habitat includes tidal and freshwater systems and agricultural fields (Limpert et al. 2020).

The North American population of tundra swan is estimated at 169,300 individuals. Western wintering swan populations appear to be decreasing at a rate of 2.3 percent per year (Limpert et al. 2020). Threats to tundra swan populations include hunting on winter grounds, as well as mortality due to consumption of spent lead shots and fishing leads (Limpert et al. 2020). Tundra swans are a state priority species.

Tundra swans may forage in agricultural areas in the Lease Boundary during migration stopovers. One group of 35 individuals was recorded flying over the Lease Boundary during spring surveys (Horse Heaven Wind Farm, LLC 2021a). This group had been incidentally observed in agricultural fields (Horse Heaven Wind Farm, LLC 2021a).

Vaux's Swift

Vaux's swift (*Chaetura vauxi*) range extends from the Yukon through the western United States to northern South America (Schwitters et al. 2021). In Washington State, breeding habitat is predominantly in the western and northeastern portion of the state (NatureMapping n.d.). Habitat used during migration includes access to roost locations that may include trees, snags, and industrial and residential chimneys (Schwitters et al. 2021).

The North American Vaux's swift population is estimated between 200,000 and 300,000 individuals (Schwitters et al. 2021); however, local population estimates are not available. Short-term trend estimates declines of 10 to 30 percent (NatureServe 2021), while long-term trends suggest that populations may have decreased by 50 percent from 1970 levels (Schwitters et al. 2021). Vaux's swift is a state priority species.

The Lease Boundary does not provide suitable nesting or roosting habitat for Vaux's swift; however, Vaux's swifts may migrate over the Lease Boundary. Large numbers of Vaux's swifts move through the Walla Walla River Important Bird Area, approximately 2 miles east of the Least Boundary (Horse Heaven Wind Farm, LLC 2021a). Vaux's swifts were not recorded during field surveys.

Townsend's Big-eared Bat

Townsend's big-eared bat (*Corynorhinus townsendii*) range extends across most of western and central United States into southern British Columbia (NatureServe 2021). Most of Washington State provides core habitat for the species, except along the coastal mountain range (NatureMapping n.d.). Habitat is variable and includes coniferous forests, riparian habitat, shrub-steppe, and open fields. Suitable habitat includes access to suitable maternity and hibernation sites, which include caves, mines, buildings, tunnels, and bridges (WDFW 2021m).

The global abundance is estimated between 10,000 and 1,000,000 individuals; however, local estimates are not available (NatureServe 2021). Long-term trends are estimated to be declines of 10 to 50 percent, while short-term trends may be stable or declining slightly (NatureServe 2021). Threats to the species include disturbance and destruction of hibernacula and maternity colonies, as well as timber harvesting that reduces suitable roosting and foraging habitat (NatureServe 2021). Townsend's big-eared bat is a candidate species for state listing and is a state priority species.

The Lease Boundary overlaps core habitat (NatureMapping n.d.); however, the area lacks microhabitat features, such as roosting or hibernacula sites (Horse Heaven Wind Farm, LLC 2021a). Townsend's big-eared bats were not recorded during acoustic bat surveys conducted in the Lease Boundary (Horse Heaven Wind Farm, LLC 2021a)

Townsend's Ground Squirrel

Townsend's ground squirrel (*Urocitellus townsendii townsendii*) range is limited to southeastern Washington State, south of the Yakima River, west and north of the Columbia River in Benton, Yakima, and Kittitas Counties (NatureServe 2021; WDFW 2021n). The species occurs in natural habitats such as shrub-steppe and grasslands, as well as modified habitat such as pastures, orchards, highway margin, and canal banks (WDFW 2021n). Townsend's ground squirrels provide an important prey source for predators, including ferruginous hawk, as well as affecting soil structure and providing burrows to other species (WDFW 2021n).

Comprehensive population studies have not been conducted; however, long-term trends estimate declines of more than 70 percent (NatureServe 2021). The dominant threat to the species is habitat loss to agriculture and degradation of shrub-steppe habitat from cheatgrass and other invasive plants (WDFW 2021n). Townsend's ground squirrel is a candidate species for state listing and a state priority species.

Townsend's ground squirrel HCAs have been mapped along the ridge located adjacent to the northern perimeter of the Lease Boundary, extending into the Lease Boundary at a few locations. The Lease Boundary overlaps an HCA on the southern perimeter, west of Highway 395. While mapped HCAs are predominantly adjacent to the Lease Boundary, shrubland, grassland, fallow agricultural areas, and road margins may provide habitat for Townsend's ground squirrel. Data presented by Washington's NatureMapping Program indicate that the Lease

Boundary overlaps core Townsend's ground squirrel habitat (NatureMapping n.d.). Two Townsend's ground squirrel colonies occur in the northwest portion of the Lease Boundary, and another colony was documented within 350 feet of the Lease Boundary (Horse Heaven Wind Farm, LLC 2021a). However, field surveys were limited to a 25-acre parcel of agricultural private land in the southwestern portion of the Lease Boundary and did not cover shrub-steppe or grassland habitat. PHS data report nine occurrences of Townsend's ground squirrel within 2 miles of the Lease Boundary (**Figure 3.6-3**).

Black-tailed Jackrabbit

Black-tailed jackrabbit (*Lepus californicus*) range extends across most of western United States, with Washington State representing the northern edge of its range. In Washington State, core habitat is associated with arid steppe zones in the Columbia Basin (NatureMapping n.d.). Suitable habitat includes sagebrush and rabbitbrush dominated landscapes, as well as mixed shrub and grassland areas, where the species tends to select areas with higher shrub cover to obtain shelter (WDFW 2021l).

Population estimates are not available, and the species is considered common across much of its range in the United States (NatureServe 2021). Long-term trends are suggested to be stable across most of its range; however, localized declines in population are expected due to changes in habitat (NatureServe 2021). Threats to the species include habitat loss and mortality from persecution and disease (NatureServe 2021). Black-tailed jackrabbit is a candidate species for state listing and is a state priority species.

Black-tailed jackrabbits could occur in sagebrush and rabbitbrush habitat in the Lease Boundary. The Lease Boundary overlaps core black-tailed jackrabbit habitat (NatureMapping n.d.), although the Applicant reports that the species is uncommon within the Lease Boundary (Horse Heaven Wind Farm, LLC 2021a). Black-tailed jackrabbit was not recorded during field studies; however, species-specific surveys were not conducted (Horse Heaven Wind Farm, LLC 2021a). PHS data report five occurrences of black-tailed jackrabbit within 2 miles of the Lease Boundary **(Figure 3.6-3**).

White-tailed Jackrabbit

White-tailed jackrabbit (*Lepus townsendii*) range extends across much of western United States, north into southern Canada. In Washington State, the species' range generally consists of arid habitat within the Columbia plateau (WDFW 2021o). Suitable white-tailed jackrabbit habitat includes open bunchgrass habitat, often on hills and plateaus in summer and lower elevation sagebrush valleys in the winter (WDFW 2021o).

Local population estimates are not available; however, global populations are estimated at 10,000 to 1,000,000 individuals. Population trends are not available. Threats to the species include conversion of natural grassland and shrub habitat to agricultural land. White-tailed jackrabbit is a candidate species for state listing, and a state priority species.

Grassland and shrubland within the Lease Boundary could provide suitable habitat for white-tailed jackrabbit. Washington NatureMapping Program mapping identifies marginal habitat in the Lease Boundary (NatureMapping n.d.). White-tailed jackrabbits have not been recorded in the Lease Boundary, though species-specific surveys have not been conducted.

Pronghorn Antelope

Pronghorn antelope range extends across the western United States into southern Canada and northern Mexico. In Washington State, the species was extirpated in the 20th century; however, it was reintroduced on the Yakama

Reservation in 2011. Pronghorn antelope inhabit grasslands and shrublands. In winter, herds occupy areas with less snow cover (WDFW 2021p).

The current pronghorn antelope population around the Lease Boundary is estimated at 248 individuals (Fidorra et al. 2019). The population has increased since introduction in 2011, partially due to introduction of additional adults in 2017 and 2019 (Fidorra et al. 2019). Pronghorn antelopes are not listed in Washington State but have been included in this special status species section because of the species' importance to the Yakama Nation and recent re-introduction to the region.

Shrubland, grassland, and agricultural fields in the Lease Boundary provide suitable habitat for pronghorn antelopes. Winter surveys conducted by Fidorra and Peterson (2021) documented groups of pronghorn antelope (approximately three groups, including one larger group) in the Lease Boundary (Tetra Tech 2021b). Pronghorn antelope were recorded in Yakima, Klickitat, and Benton Counties, with larger groups (13 to 24) recorded in several locations in Benton County (Fidorra and Peterson 2021). Tetra Tech (2021b) reports that the majority of groups observed during the 2015 and 2016 survey conducted by Yakama Nation were recorded in rangeland, followed by cropland, then CRP land. Pronghorn antelopes were reported by the Applicant in the Lease Boundary during field surveys (Horse Heaven Wind Farm, LLC 2021a).

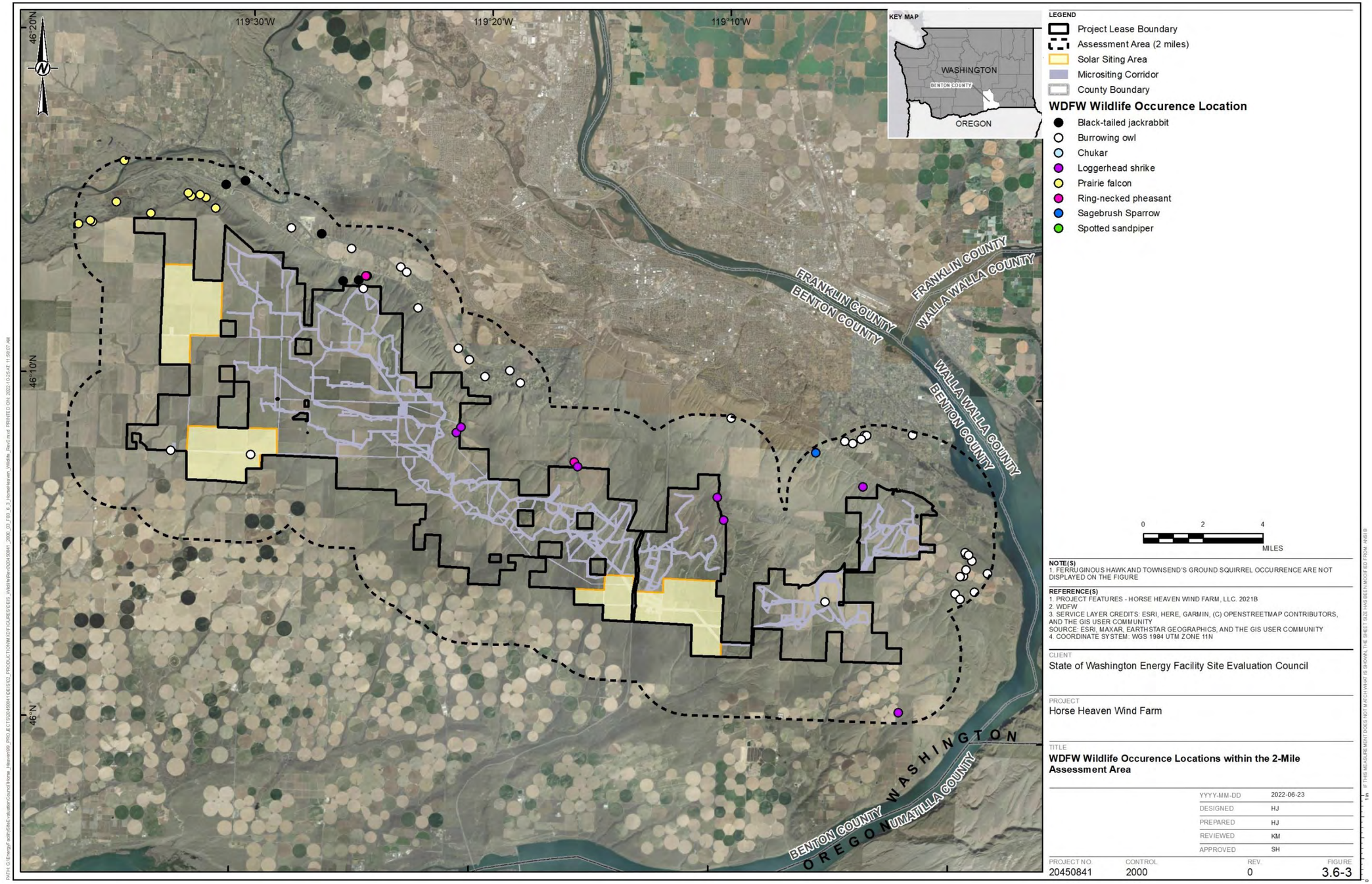

Figure 3.6-3: WDFW Wildlife Occurrence Locations within the 2-Mile Assessment Area

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3.7 Energy and Natural Resources

This section characterizes the availability of existing energy and natural resources within the vicinity of the Lease Boundary for the proposed Horse Heaven Wind Farm (Project, or Proposed Action) and in the State of Washington. Section 4.7 discusses the Project's impact on energy and natural resource availability within the vicinity of the Lease Boundary and in Washington State. This evaluation of energy and natural resources is in accordance with Washington Administrative Code (WAC) 463-60-342 as it considers the impact of the Project's consumption of non-renewable and renewable resources.

3.7.1 Affected Environment

Benton County is in southeastern Washington State. The Columbia River bounds Benton County to the north, east, and south, while Klickitat and Yakima Counties bound Benton County to the west. The county is predominantly rural and agricultural in nature, with unincorporated areas making up most of the jurisdiction. The Lease Boundary is south of the Tri-Cities: Kennewick, Pasco, and Richland, Washington.

3.7.1.1 Power Generation and Demand

Regional Power Generation

Natural resources that contribute to power generation in Washington State can be broken into two categories: renewable and non-renewable, also referred to as conventional. Non-renewable supplies of energy are limited to the amounts that can be mined or extracted from the earth. Renewable energy, by contrast, is power from sources that are naturally replenishing. There are currently 106 conventional and renewable energy power plants operating in Washington. Washington's energy providers maintain the capacity to produce upwards of 92,366 thousand megawatt (MW) hours per year (DOE n.d.). In addition to its power-generating capacity, the State of Washington also contains five crude oil refineries that can process almost 652,000 barrels of crude oil per day (EIA 2022). This section provides a general summary of Washington's current power generation portfolio.

Non-Renewable Energy

Non-renewable energy sources include petroleum, hydrocarbon gas liquids, natural gas, coal, and nuclear energy. Currently, 21 conventional power plants operate in Washington. The "nameplate" generating capacity of Washington's conventional power plants is 6,990 MW (DOE n.d.). Nameplate capacity is the amount of electricity a generator can produce when running at its maximum designed output. Washington's non-renewable electricity-generating portfolio includes the following:

- **Natural Gas:** In 2019, natural gas was the second-largest source of in-state net power generation and was responsible for producing 15 percent of Washington's total electricity. In 2019, electricity produced by natural gas increased 9 percent from 2018. Washington's utilities and energy producers import natural gas because the state maintains no petroleum or natural gas reserves (EIA 2021).
- **Nuclear:** Nuclear power supplied about 8 percent of Washington's net electricity generation in 2019. The Columbia Generating Station nuclear power plant in south-central Washington is the state's fifth-largest power-producing facility by capacity and has been in operation since 1984. By resource, nuclear power represents Washington's third-largest source of energy (EIA 2021).
- **Coal:** Energy produced from coal represents Washington's fourth-largest source of energy. The TransAlta Centralia coal-fired power plant is the state's third-largest electricity-producing facility by capacity. In 2019, the facility produced less than 7 percent of Washington's electricity. In 2020, TransAlta Centralia retired one of its two coal-fired units, and the company plans to retire its last remaining operational unit in 2025. Although

Washington has upwards of 700 million tons of recoverable coal reserves, the last coal mine in the state closed in 2006 (EIA 2021).

Renewable Energy

Currently, 85 renewable power plants operate in Washington, with a combined generating nameplate capacity of 23,443 MW. Other than hydroelectric power, renewable resources account for almost 8 percent of the state's electricity generation in 2019 (EIA 2021). The following describes the status of renewable energy production in Washington:

- **Hydroelectric:** Washington is the nation's largest producer of hydroelectric power. Hydroelectric power typically accounts for more than 66 percent of Washington's electricity generation. Eight of the 10 highest electricity-producing facilities in Washington are hydroelectric power plants (EIA 2021).
- **Wind:** In 2019, wind accounted for about 80 percent of the state's nonhydroelectric renewable electricity. Wind has contributed 6 percent or more to the state's electricity production since 2013 (EIA 2021).
- **Solar:** Electricity generation from solar energy in Washington remains small. Almost all of the electricity produced from solar energy comes from rooftop and other small-scale (less than 1 MW) photovoltaic power installations (EIA 2021).
- **Biofuels:** Biofuels are transportation fuels such as ethanol and biomass-based diesel fuel that are made from biomass materials (EIA 2020). Washington has several biogas and biofuel projects, such as:
  - Anaerobic digesters that capture methane from dairy cow waste to fuel electricity generation
  - Production of 114 million gallons of biodiesel fuel per year from two biofuel facilities. This equals about 20 percent of Washington's annual consumption of diesel fuel (EIA 2021)

Energy Infrastructure within the Project Vicinity

The following is a summary of the existing energy infrastructure within the vicinity of the Lease Boundary:

- The Nine Canyon Wind Project is just southeast of Kennewick in south-central Benton County. The Nine Canyon Wind Project is less than 1 mile from the Lease Boundary at its nearest point. The project includes 63 wind turbines constructed in three phases between 2002 and 2008. The wind farm has a nameplate generating capacity of 95.9 MW of electricity (Energy Northwest n.d.).
- Two Bonneville Power Administration high-voltage transmission lines intersect the Lease Boundary. The McNary-Franklin No. 2 Transmission Line runs northeast to southwest through the east-central portion of the Lease Boundary. The McNary-Badger Canyon No. 1 Transmission Line runs north to south, adjacent to the western portion of the Lease Boundary (Horse Heaven Wind Farm, LLC 2021).
- There are numerous existing transmission lines and substations located north of the Lease Boundary that traverse the area south of the Tri-Cities east to west (Horse Heaven Wind Farm, LLC 2021).

Local Energy and Natural Resource Providers

Horse Heaven Wind Farm, LLC (Applicant) has identified the following utilities and suppliers as potential providers of energy and natural resources for the Project:

- **Public Utility District (PUD) No. 1 of Benton County**: Benton PUD's business operations include energy purchases, generation, transmission, distribution, and sale of electricity. Benton PUD's operations cover

approximately 939 square miles of Benton County. Benton PUD's properties include 37 substations, approximately 91 miles of 115-kilovolt transmission line, and 1,590 miles of distribution lines (Benton PUD 2021).

- **Benton Rural Electric Association (REA)**: Benton REA is a not-for-profit, consumer-owned electric cooperative. Benton REA currently serves more than 11,000 members in Benton, Yakima, and Lewis Counties in Washington. The Lease Boundary is located within Benton REA District 3 (Benton REA 2018).
- **City of Kennewick Utility Services Division of Public Works**: Kennewick is responsible for providing public water service, utility management, and water system development within its water service boundary. Kennewick provides water service to approximately 80,986 people throughout its water service area boundary, extending beyond its corporate limits (City of Kennewick 2017).

Regional Energy Demand

Washington benefits from access to abundant, low-cost energy originating from renewable energy resources. Washington's net generation often exceeds the state's electricity demand. This allows energy producers to send excess power to the Western Interconnection (EIA 2021). Western Interconnection is a network consisting of approximately 136,000 miles of transmission lines. It spans 1.8 million square miles in all or part of 14 states, the Canadian provinces of British Columbia and Alberta, and the northern part of Baja California in Mexico and serves over 80 million people (Western Electricity Coordinating Council 2021).

Table 3.7-1 shows the forecast electricity demand for the four states (Washington, Oregon, Idaho, and Montana) that make up the Northwest Power and Conservation Council, compared to 2021's expected use. The Northwest Power Act of 1980 authorized the establishment of the Northwest Power and Conservation Council with the intent of conserving natural resources and assuring reliable access to energy throughout the region. As shown in the table, the region's energy needs in 2041 are anticipated to be 21,532 to 27,304 average MW for the entire year (Northwest Power and Conservation Council 2021). This suggests that by 2041, the region could see anything from a reduction in demand for electricity to a 22.5 percent increase in demand.

Table 3.7-1: Pacific Northwest Forecast Range of Electricity Use in Average Megawatts by Sector

Sector	Expect 2021 Use	2041 Forecast (Low Estimate)	2041 Forecast (Medium Estimate)	2041 Forecast (High Estimate)
Residential	8,148	8,674	8,860	9,049
Commercial	5,938	5,833	6,202	6,673
Industrial	6,186	4,147	5,892	7,541
Transportation	67	733	816	904
Street Lighting and Water Services	271	252	280	303
Irrigation	1,016	941	1,164	1,465
Data Centers	657	952	1,179	1,369
Total	22,283	21,532	24,393	27,304

Source: Northwest Power and Conservation Council 2021

3.7.1.2 Water Utilities and Demand

Sections 3.4 and 4.4 evaluate the Project's potential impacts on water resources. There are no public water supply wells within the Lease Boundary (Horse Heaven Wind Farm, LLC 2021). The Applicant has indicated that the City of Kennewick would supply water for the Project's construction stage. The Kennewick Utility Services Division of Public Works is responsible for the city's water treatment plant, wastewater treatment plant, wastewater collection, and water distribution programs within its jurisdiction.

Since 2007, Kennewick has experienced decreasing per-capita water demand. Between 2007 and 2014, Kennewick's water service area population increased by more than 19 percent, but the volume of water supplied to the system only increased by approximately 5 percent. Kennewick has attributed the decrease in demand to water use efficiency practices and the repair of water system leaks.

Overall, water demand within Kennewick's system is expected to increase by approximately 33 percent by the end of 2035. Kennewick's existing water sources are sufficient to meet the projected demands of the system through 2025. Beyond 2025, additional source capacity will be needed to meet Kennewick's water demands.

Kennewick completed construction of an aquifer storage and recovery (ASR) well in 2014. Ongoing testing of the ASR well and the aquifer's storage capacity has been performed since the well was constructed. If the ASR well becomes fully developed and receives approval from regulatory agencies, it may provide a maximum of 2,080 gallons per minute. Even with the addition of the ASR well, however, Kennewick is projected to have a slight source capacity deficiency by 2035 (City of Kennewick 2017).

Water Rights

Revised Code of Washington 90.03 establishes water rights appropriation standards and procedures. The State of Washington does not require a water rights permit if the water originates from a permitted utility (Ecology n.d.).

3.7.1.3 Construction Aggregate Resources and Demand

Sand, gravel deposits, and bedrock may be mined or quarried to produce raw materials known as aggregates. Aggregates are necessary for making ready-mixed concrete, asphalt, and many other building materials. Aggregates are required to build and maintain infrastructure such as:

- Roads, highways, and bridges
- Homes, buildings, and schools
- Public works projects

Construction aggregate is a non-renewable resource composed of sand and gravel. In 2017, the State of Washington was listed among the top 10 producers of construction aggregate. Mines within Washington produced 33,300 thousand metric tons of construction sand and gravel from 206 active pits and dredging operations (USGS 2020). In 2020, demand for aggregate in Washington exceeded 500 million tons, and forecasts predict that by 2030, aggregate demand could exceed 1,500 million tons (DNR 2022).

Concrete is also a non-renewable resource that is usually a mixture of aggregates and paste. The aggregates are sand and gravel or crushed stone, and the paste consists of water and cement. Typically, concrete is a mixture of about 10 to 15 percent cement, 60 to 75 percent aggregate, and 15 to 20 percent water. There are several active aggregate mining operations within the vicinity of the Lease Boundary. The nearest quarry to the Lease Boundary is in Kennewick, Washington. Ash Grove in Seattle, Washington, is the only cement plant within the state. Ash

Grove makes 33 percent of all the cement used in Washington. In 2015, the State of Washington consumed 1.8 million metric tons of cement (Portland Cement Association 2016, 2019).

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3.8 Land and Shoreline Use

This section describes existing land use and shoreline resources, as well as the regulatory setting, for the proposed Horse Heaven Wind Farm (Project, or Proposed Action) vicinity. 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 Project's alignment with relevant land use documents and ordinances and adopted state, county, and local plans, goals, and policies is presented in **Appendix 3.8-1**. An evaluation of proposed changes to existing land use is presented in Section 4.8.

Regulatory Setting

Comprehensive land use plans specify the types of present and future land development that can occur within a specified area. In most cases, the preparation of comprehensive land use plans occurs through a public participation process. Once the plans are finalized, publicly elected officials approve them. The intent of this process is to capture local values and attitudes toward future development. Within the State of Washington, land use regulations and zoning ordinances vary by local government jurisdiction. For instance, Benton County, Washington's, comprehensive land use plan and zoning ordinances only apply to the unincorporated areas and communities within its geographical boundaries. Similarly, the comprehensive land use plans prepared by the incorporated communities only apply to land use management within their jurisdictional boundaries.

The Washington State Growth Management Act (GMA) (Revised Code of Washington [RCW] 36.70A.040) requires that cities and counties adopt comprehensive, long-term land use plans for physical development within their jurisdictions. The comprehensive land use plans include a land use element that establishes the desired pattern of appropriate land use, as well as policies and guidelines for the development of those uses. The land use element designates the proposed general distribution and general location and extent of the uses of land, where appropriate, for the following purposes:

- Agriculture and timber production
- Housing
- Commerce and industry
- Recreation and open spaces
- General aviation airports
- Public utilities and facilities
- Other land uses

Local governments and their resource managers use local zoning ordinances, specific plans, and maps to implement the land use element within a comprehensive land use plan.

Similar to the State of Washington's requirements for comprehensive land use plans, the Shoreline Management Act (SMA) of 1971 (RCW 90.58) requires all counties and most towns and cities with shorelines in Washington to develop and implement Shoreline Master Programs (SMP). The SMA applies to all 39 Washington counties and about 250 towns and cities with stream, river, lake, or marine shorelines. Under the SMA, SMPs must contain a public access element, including provisions for public access to publicly owned areas. The SMA also requires that applicable communities include an element for preserving and enlarging recreational opportunities. The

Washington State Department of Ecology has adopted the Shoreline Master Program Guidelines (Chapter 173-26 Washington Administrative Code), which require local government review and updates of SMPs.

3.8.1 Affected Environment

Benton County is in southeastern Washington State. The Columbia River bounds Benton County to the north, east, and south, while Klickitat and Yakima Counties bound Benton County to the west. Benton County is located at the confluence of the Columbia, Yakima, and Snake Rivers. The Yakima River runs through the middle of the county to its confluence with the Columbia River in Richland, Washington. The county also features several mountains and ridges such as Horse Heaven Hills, Rattlesnake Mountain, Badger Mountain, and Candy Mountain (Benton County 2021a).

Benton County comprises a total of 1,115,673 acres. The U.S. Department of Energy's Hanford Reservation occupies 24 percent of the landmass in Benton County. The unincorporated areas of the county are predominantly rural and agricultural in nature, with unincorporated areas making up most of the county. Unincorporated communities fall under the county government's jurisdiction. The incorporated cities within Benton County include Benton City, Kennewick, Prosser, Richland, and West Richland (Benton County 2021a). **Table 3.8-1** illustrates the distribution of land use types in Benton County. Several unincorporated communities fall under the county government's jurisdiction.

Table 3.8-1: Land Use Types and/or Designation and Distribution in Benton County

Land Use Type and/or Designation	Corporation	Acres	Square Miles	Percentage
Cities and Urban Growth Areas	Incorporated	72,245	113	6.58
Hanford Site	Federal Lands (Not Applicable)	266,351	416	24.27
Hanford Reach	Federal Lands (Not Applicable)	12,443	19	1.13
GMA Agriculture	Unincorporated	647,107	1,011	58.96
Open Space Conservation	Unincorporated	2,108	3	0.19
Public	Unincorporated	15,163	24	1.38
Rural Lands 1	Unincorporated	1,182	2	0.11
Rural Lands 1–3	Unincorporated	318	0	0.03
Rural Lands 5	Unincorporated	74,039	116	6.75
Rural Lands 20	Unincorporated	1,813	3	0.17
Community Center	Unincorporated	500	1	0.05
Community Commercial	Unincorporated	26	0	0.00
Interchange Commercial	Unincorporated	325	1	0.03
General Commercial	Unincorporated	202	0	0.02
Light Industrial	Unincorporated	1,333	2	0.12
Heavy Industrial	Unincorporated	2,344	4	0.21
Total Unincorporated Area	Not Applicable	746,460	1,166	68.01
Total County Area	Not Applicable	1,097,499[(a)]	1,715	100

Source: Benton County 2021a
Note:
[(a)] An acreage discrepancy exists in Benton County Comprehensive Plan for Total County Area
GMA = Washington State Growth Management Act

Project Geography

The Project would consist of a renewable energy generation facility within the Horse Heaven Hills area of unincorporated Benton County, Washington. The Project's Lease Boundary is located approximately 4 miles south of the Tri-Cities urban area, along the Columbia River. The cities of Kennewick, Pasco, and Richland, Washington, make up the Tri-Cities area. The geographical extent of the Project would be as follows:

- The Lease Boundary encompasses approximately 72,428 acres.
- The Project's Wind Energy Micrositing Corridor encompasses 11,850 acres and consists of the area where the turbines and supporting facilities would be located.
- The Solar Siting Areas encompass 10,755 acres located within the Lease Boundary.
- Approximately 908 acres within the Project's Wind Energy Micrositing Corridor and Solar Siting Areas overlap.
- The elevation of the Lease Boundary ranges from 604 to 2,051 feet above mean sea level (Horse Heaven Wind Farm, LLC 2021).

The topography within the Lease Boundary is dominated by rolling hills bisected by meandering canyons, some of which contain ephemeral (seasonal) or intermittent drainages. There are no major rivers or other perennial streams within the Lease Boundary (Heaven Hills Wind Farm, LLC 2021).

3.8.1.1 Land Ownership within Study Area

The Lease Boundary serves as the primary study area for land ownership; however, land uses adjacent to the Lease Boundary can provide context for consistency evaluations. Existing land use within 1 mile of the Lease Boundary predominantly comprises agricultural lands, agricultural support facilities, and the Nine Canyon Wind Project. In the Application for Site Certification (ASC) for the Project, Appendix F presents a comprehensive list of Lease Boundary parcels, owners, and acres and a legal description of affected lands. The 72,428-acre Lease Boundary equates to approximately 6.5 percent of Benton County's territory and 11 percent of the land use designation "GMA Agriculture." The ASC indicates that Turbine Option 1 would involve more land disturbance than Turbine Option 2. The Project's total land disturbance of 6,869 acres under Turbine Option 1 is equal to approximately 1 percent of Benton County's lands designated as GMA Agriculture and 0.6 percent of the county's total territory.

According to the ASC, most of the Lease Boundary (approximately 69,556 acres) is privately owned and actively managed for dryland agriculture and livestock grazing. Among the private lands that make up the Lease Boundary, multiple parcels have been enrolled in the U.S. Department of Agriculture's Conservation Reserve Program (CRP). The acreage currently enrolled in the CRP within the Lease Boundary is unknown. Additionally, the Lease Boundary includes 2,739 acres in the state trust system managed by the Washington State Department of Natural Resources (DNR). The Lease Boundary includes all or part of five DNR-managed parcels that are state trust lands. The Applicant proposes the following actions on DNR-managed parcels:

- Three of the DNR-managed parcels would include turbines and supporting facilities
- One DNR-managed parcel would be used for supporting facilities
- One DNR-managed parcel is a possible site for the Project's County Well Road solar component (Horse Heaven Wind Farm, LLC 2021)

Conservation Reserve Program Lands

The CRP is a federally funded voluntary program that contracts with agricultural producers so that environmentally sensitive agricultural land is not farmed or ranched but instead devoted to conservation benefits. The U.S. Department of Agriculture Farm Service Agency provides participants with rental payments and cost-share assistance. Contract duration is between 10 and 15 years (USDA 2019). The Agricultural Act of 2014 (Public Law 113-79) allows landowners the opportunity to opt out of their CRP contracts unless the land is supporting enhanced wildlife habitat, is protecting sensitive aquatic and environmental resources, or has specifically been contracted in a manner to prevent a landowner from opting out.

State-managed Lands

The Washington Commissioner of Public Lands guides DNR's management of state-owned lands. DNR's land policies come from numerous sources, such as the federal Organic Enabling Act of 1889, the state constitution, state statutes, and various boards, councils, and commissions. The lands that the DNR manages on behalf of Washington State citizens and beneficiaries fall into three main categories: state trust lands, state-owned aquatic lands, and state natural areas (DNR 2021).

State Trust Lands

State trust lands managed by the DNR are different from other publicly managed lands in that they must be used to generate revenue for their designated beneficiaries, such as public schools, universities, and correctional institutions. The DNR currently manages 3 million acres of these federally granted trust lands. Classes of actions that the DNR approves for revenue-generating activities include:

- Harvesting timber, biomass byproducts, and other forest products
- Leasing lands for agricultural purposes, such as orchards and vineyards, irrigated agriculture, dryland crops, and grazing
- Leasing communications sites, mining and mineral leases, wind farms and energy production, commercial properties, and rights-of-way (DNR 2021)

In addition to earning income, activities on trust lands are managed to protect habitat for native plant and animal species, provide clean and abundant water, and offer diverse public recreation opportunities. **Figure 3.8-1** illustrates the location of DNR-managed state trust lands within the Lease Boundary and Project vicinity, as well as other publicly owned lands within the region.

3.8.1.2 Benton County Comprehensive Plan

Planning in Benton County's unincorporated and urban areas is guided by the Benton County Comprehensive Plan. In addition to providing planning guidance for unincorporated areas, the plan addresses regional planning issues and coordinates growth among all jurisdictions. It also coordinates land use, transportation, and capital facilities by focusing planning, scheduling, financing, and construction provisions to provide the identified levels of service in advance of development or upon demand.

All development regulations in Benton County are required to be consistent with the Benton County Comprehensive Plan. These include, but are not limited to, the zoning code, subdivision code, Critical Areas Ordinance, SMP, and permit review processes. For instance, all codes related to traffic and utilities implement the comprehensive land use plan's goals and policies.

The Benton County Comprehensive Plan's purpose and intent is to provide for local needs relating to the use of land and infrastructure, including the protection of property and water rights and, in so doing, meet the state's minimum planning law requirements. In accordance with RCW 36.70A.070, the comprehensive land use plan includes the following required elements: land use, rural, housing, transportation, capital facilities, and utilities.

The land use element presents the framework within which future growth and development will occur consistent with community objectives and the requirements of law. Consistent with GMA requirements, the land use element designates the proposed general distribution, location, and extent of land uses for agriculture, timber production, housing, commerce, industry, recreation, open spaces, general aviation airports, public utilities, public facilities, and other functions, as applicable, and describes development densities and projections for future population growth (Benton County 2021a).

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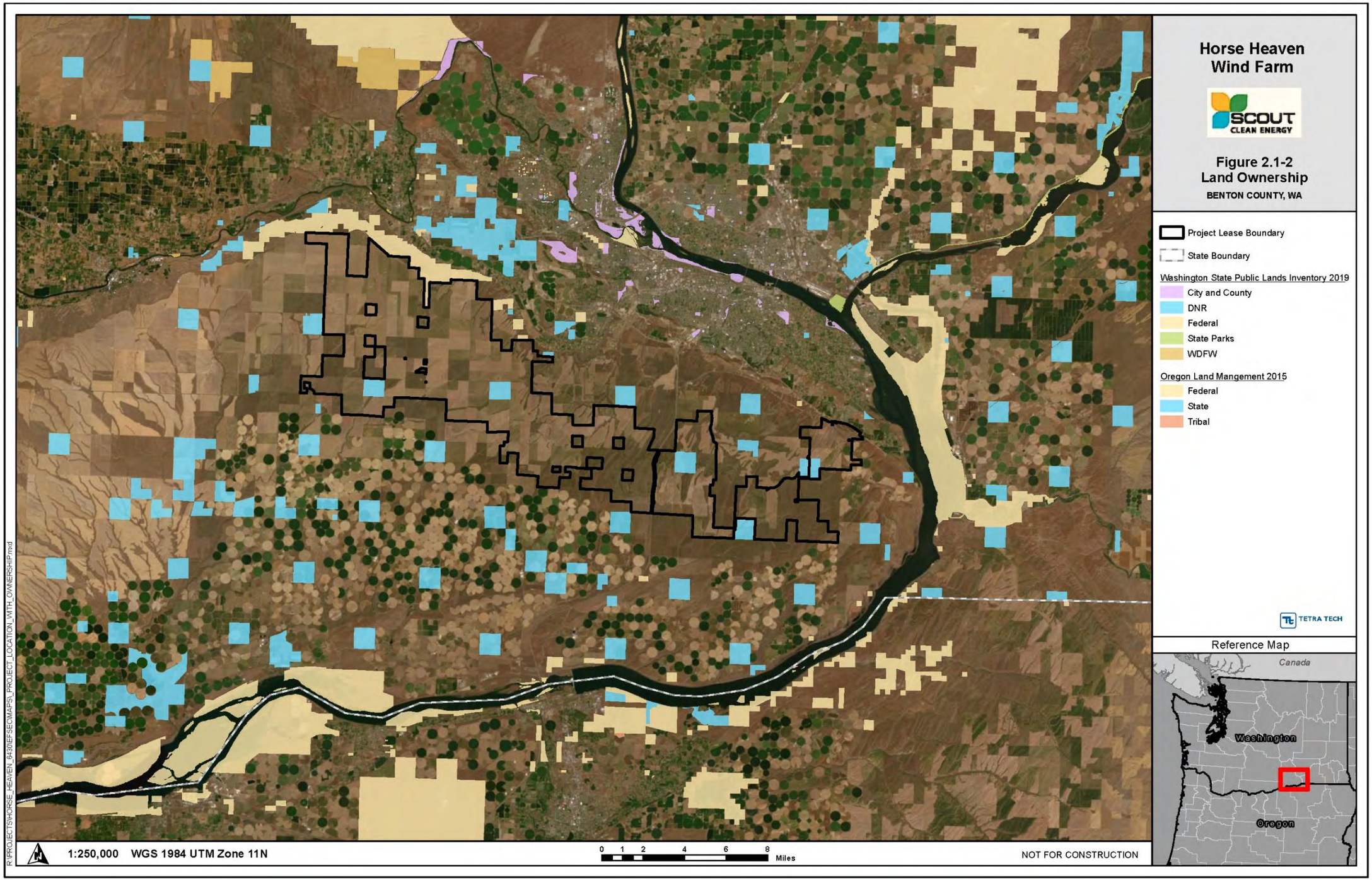

Source: Horse Heaven Wind Farm, LLC 2021

Figure 3.8-1: Land Ownership within Project Vicinity

3.8.1.3 Benton County Shoreline Management Program

Benton County adopted an SMP update in 2021 pursuant to the SMA. Benton County prepared the SMP to align with the goals and policies outlined in the Benton County Comprehensive Plan. The SMP is a set of goals, policies, and regulations pertaining to shoreline development in the county. The SMA encourages reasonable and appropriate development of shorelines, with an emphasis on water-oriented uses that require a shoreline location and support economic development. The SMP's intent is to protect "the natural character of the shorelines, the land, vegetation, wildlife, and shoreline environment" (Benton County 2021b). Finally, the SMP "promotes public access and provides opportunities to enjoy views and recreational activities in shoreline areas" (Benton County 2021b).

Benton County's shoreline jurisdiction encompasses 330 miles of the Columbia and Yakima Rivers. The total acreage of upland shorelands regulated by Benton County's SMP is 14.93 square miles (Benton County 2021b). In accordance with the SMA, the Benton County SMP addresses the following:

- The Yakima and Columbia Rivers
- Land within 200 feet of the ordinary high-water mark of the Yakima and Columbia Rivers
- The Yakima and Columbia River floodways
- The contiguous 100-year floodplain extending up to 200 feet inland of the Yakima and Columbia River floodways
- Wetlands associated with the Yakima and Columbia Rivers (Benton County 2021b)

Fifty-eight percent of Benton County's shorelands occur along the Columbia River, and the remaining 42 percent occur along the Yakima River. Both the Columbia and the Yakima Rivers within Benton County are classified as Shorelines of Statewide Significance. This means that, under Washington State law, Benton County must apply specific shoreline management preferences and priorities to the Yakima and Columbia Rivers. Federal lands make up approximately 35 percent of the area within the county's shoreline jurisdiction (Benton County 2021b).

The Yakima River passes north of the western portion of the Lease Boundary, approximately 1.5 miles away at its closest location to the Project site. The Yakima River flows eastward to its confluence with the Columbia River near Richland, Washington. The Columbia River passes north, east, and south of the eastern portion of the Lease Boundary. At its closest location, the Columbia River is approximately 1.3 miles from the Lease Boundary. The Columbia River bends around the eastern portions of the Lease Boundary and ultimately flows west toward the Pacific Ocean (Horse Heaven Wind Farm, LLC 2021).

3.8.1.4 Specific Land Uses within the Study Area

Land use designations are property-specific and identify the type and intensity of land uses that a comprehensive land use plan allows. The Benton County Comprehensive Plan (2020 update) identifies 13 designations within unincorporated Benton County. Of the 13 land use designations, the entire Lease Boundary occurs within the GMA Agriculture designation and the corresponding zoning ordinance GMA Agriculture. **Table 3.8-2** provides a description of land use designation and corresponding zoning ordinance. **Figure 3.8-2** shows the Lease Boundary and the Benton County Comprehensive Plan land use designations for the Project vicinity.

Benton County has adopted zoning ordinances and maps necessary to bring the county's zoning code into compliance with the goals and policies of the adopted Benton County Comprehensive Plan. Benton County

prepared its zoning ordinances and zoning maps to implement the community vision and future as expressed by the public in the Benton County Comprehensive Plan. **Figure 3.8-3** illustrates the zoning ordinances for the Lease Boundary and Project vicinity. Benton County Code zoning ordinances and maps classify land into "Districts" according to the land use designations in the adopted comprehensive plan. The effect of zoning is to provide stability and certainty for future development by:

- Implementing land use maps by grouping compatible land uses and excluding incompatible land uses
- Identifying areas of investment and assisting economic sector planning
- Enabling government to assess the need for and fund capital and public service projects
- Enabling public utilities to calculate potential demand and plan capital facilities
- Providing assurances to homeowners that their property values will be protected

Table 3.8-2: Lease Boundary Land Use Designations and Corresponding Zoning Ordinance

Land Use Designation	Description	Corresponding Zoning Ordinance	Zoning Ordinance
GMA Agriculture	This land use includes agricultural land such as dryland and irrigated land identified by Benton County based on the criteria established by the GMA. A GMA Agricultural District zone conserves agricultural lands by establishing a 20-acre minimum parcel size and limits the range of other land uses to those dependent on, supportive of, ancillary to, or compatible with agricultural production as the principal land use.	GMA Agriculture District	Benton County, Washington Code 11.17.030 through 11.17.070 specifies wind farms and major solar-generating facilities as land uses that may be permitted for lands zoned GMA Agricultural District with approval of a conditional use permit by the Hearings Examiner.

Sources: Benton County 2021a, 2021c
GMA = Washington State Growth Management Act

Agriculture – Benton County

Benton County contains agricultural lands of long-term commercial significance. RCW 36.70A.030(3) characterizes agricultural lands of long-term commercial significance as land with the following characteristics:

- Growing capacity
- Productivity
- Soil composition of the land for long-term commercial production

Washington Administrative Code 365-190-050(3) states that "lands should be considered for designation as agricultural resource lands based on three factors:"

- Land specifically is not characterized by urban growth
- Land is used or is capable of being used for agricultural production

- Land has long-term commercial significance for agriculture

Benton County's agricultural economy is diverse in crops grown and livestock raised. The largest crop type is in wheat and wheat fallow, while other extensive crop types include corn, grapes, potatoes, apples, and onions. Benton County ranks third in Washington State by market value of agricultural products sold (crops and livestock), totaling about $923.2 million in value (Benton County 2017).

Table 3.8-3 shows the breakdown of lands designated as GMA Agriculture in Benton County. Agricultural lands in Benton County are primarily used for dryland agriculture (47 percent), with the remaining areas used for irrigated agriculture (40 percent) and rangelands (13 percent). When considering rural "other," agricultural land type by percentage changes slightly with the amount of rangeland increasing and dryland agriculture decreasing. The rural "other" land use includes a mix of agricultural and non-agricultural uses (BERK 2016). The following describes the three main agricultural land uses in Benton County:

- **Dryland Agriculture**: Dryland agriculture occurs in geographic areas where biological productivity is normally limited by available soil moisture. Farmers overcome the lack of soil moisture through management techniques such as summer fallow. The widespread practice of summer fallow stores moisture for two years for use by a single crop. Farmers alternate between crop and non-crop years, and control weeds during the non-crop years through either mechanical or chemical methods (WSU 1992).
  - Within Benton County, dryland agriculture primarily occurs in the Horse Heaven and Rattlesnake Hills areas.
  - Economically viable dryland agriculture typically requires thousands of acres (Benton County 2021a).
- **Irrigated Agriculture**: The purpose of irrigation is to supplement natural precipitation so that the moisture requirements of crops are met. Limited water resources prevent irrigation development in large areas of Washington State (WSU 1992).
- **Rangeland**: Range and pasture lands are diverse types of land where the primary vegetation produced is herbaceous plants and shrubs. These lands provide forage for beef cattle, dairy cattle, sheep, goats, horses and other types of domestic livestock. Also, many species of wildlife, ranging from big game such as elk to butterflies and nesting song birds such as meadowlarks, depend on these lands for food and cover. Native prairies are also considered part of these landscapes (NRCS n.d.).

Table 3.8-3: GMA Agriculture Type and Designated Acreage in Benton County

GMA Agriculture Land Type	Countywide Total Acres	Percentage of Total[(a)]
Dryland	304,839	39.65
Irrigated	296,432	38.56
Rangeland	112,190	14.59
Rural "other"	55,275[(b)]	7.19
Total Agriculture	768,736	

Sources: BERK 2016; Benton County 2021a
Notes:
(a) Minor discrepancies in the total sum are due to rounding
(b) Includes agricultural and non-agricultural uses
GMA = Growth Management Act

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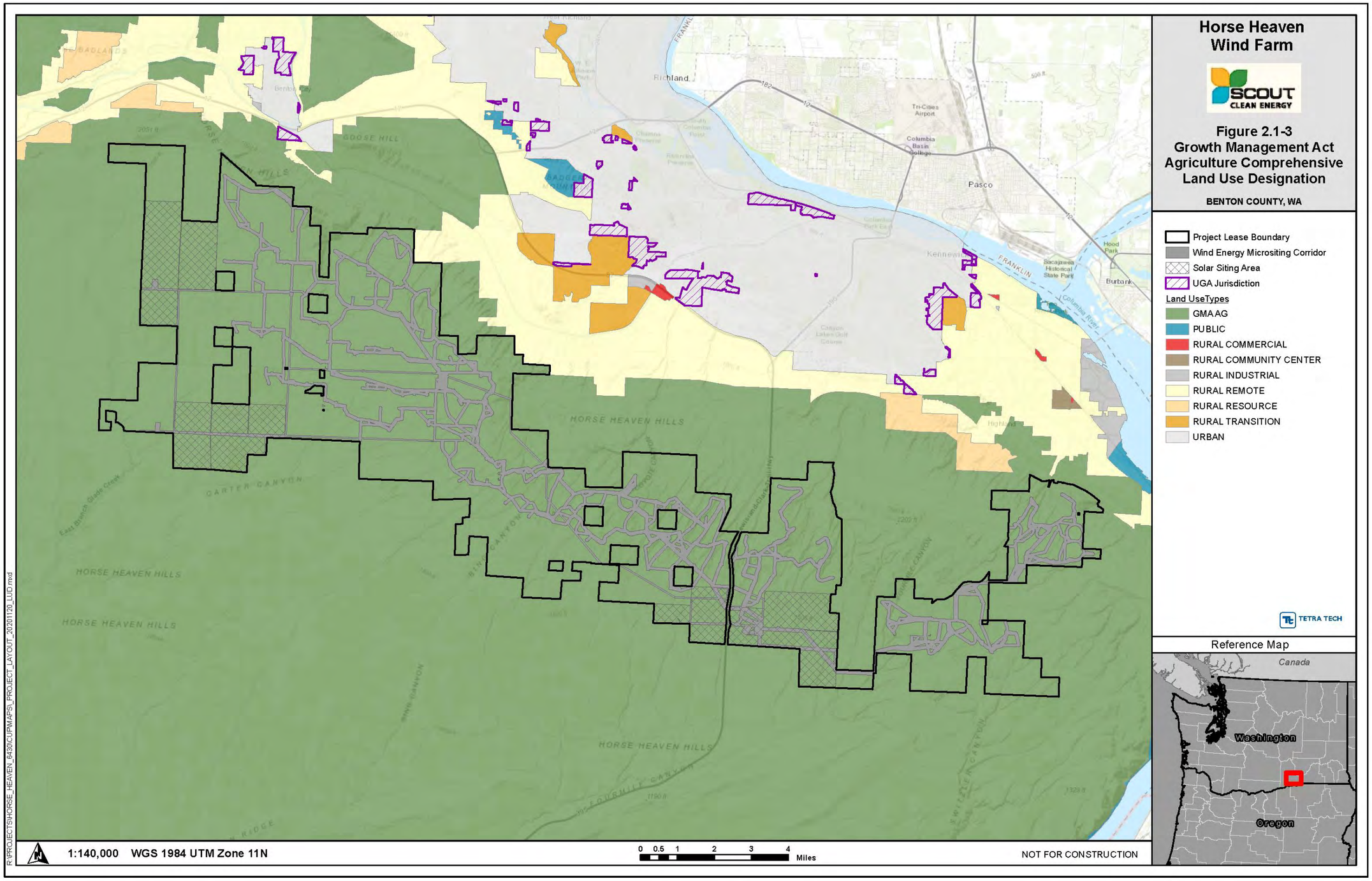
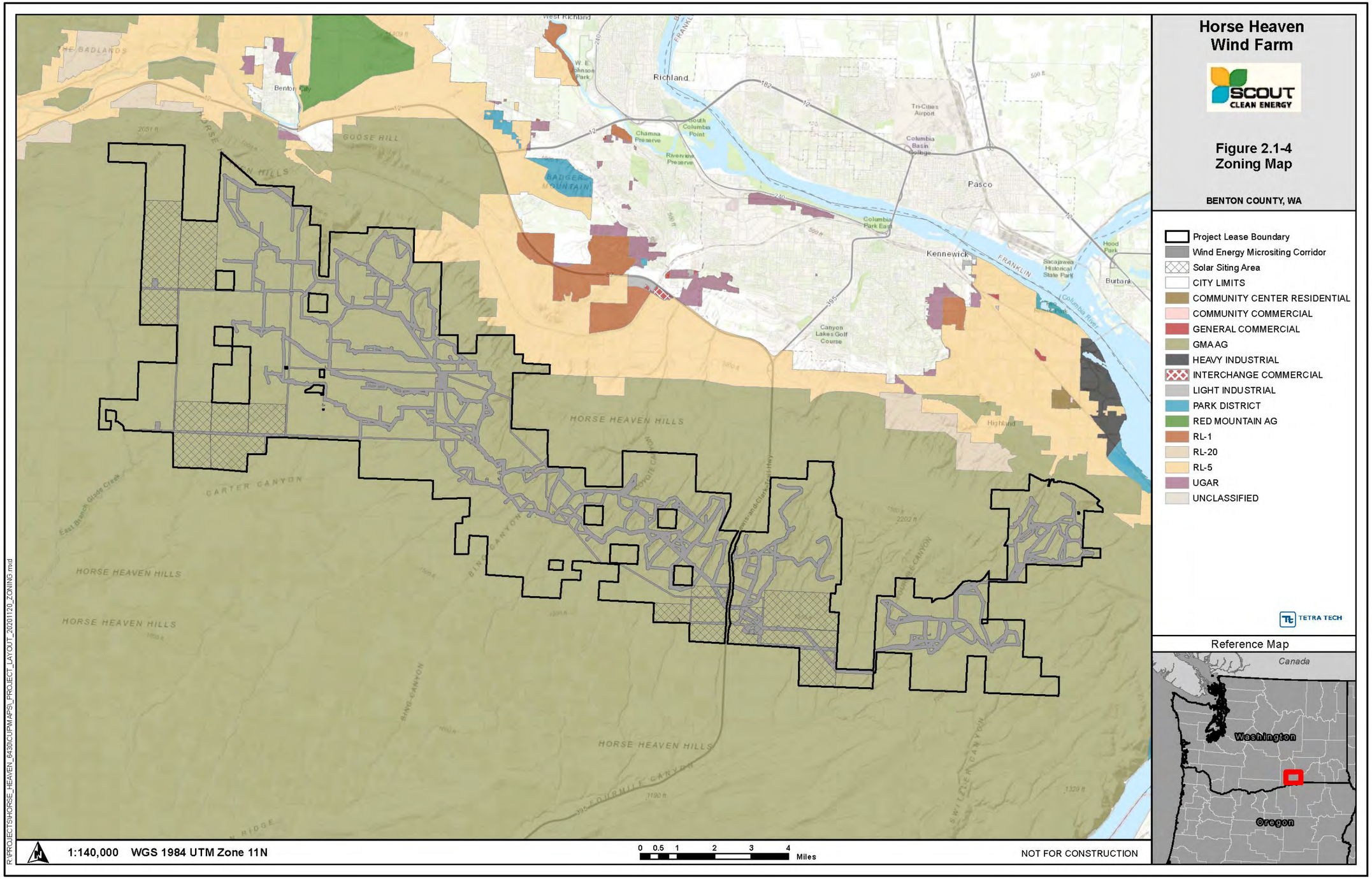


Source: Horse Heaven Wind Farm, LLC 2021

Figure 3.8-2: Benton County, Washington Comprehensive Plan Land Use Designations



Source: Horse Heaven Wind Farm, LLC 2021

Figure 3.8-3: Benton County, Washington Project Vicinity Zoning Ordinance Map

3.8.2 Land Use Goals and Policies

Goals are broad statements of intent and philosophy expressing countywide values and attitudes. Goals are used as a general guide for action by the county. Policies provide the basis for decision-making and specific courses of action, which move the county toward attaining its adopted goals. Policies have a major influence because decisions, actions, and programs should neither conflict nor be inconsistent with adopted policy. **Table 3.8-4** lists the Benton County Comprehensive Plan goals and policies that are relevant to the Project.

Table 3.8-4: Applicable Benton County Comprehensive Plan Policies and Goals

Comprehensive Plan Element	Goal/Policy
Land Use	Goal 1: Ensure that land uses are compatible with surrounding uses that maintain public health, safety, and general welfare.
Land Use	Goal 1 Policy 1: Maintain a mix of land uses that supports the character of each rural community.
Land Use	Goal 1 Policy 3: Maximize the opportunities for compatible development within land use designations to serve a multitude of compatible uses and activities.
Land Use - Rural Lands	Goal 6: Preserve rural lifestyles outside UGAs and incorporated areas while accommodating new population growth consistent with the protection of rural character.
Land Use - Rural Lands	Goal 6 Policy 2: Development in rural areas is typified by large lots and less dense development. Favoring development that is less dense and has larger lots helps maintain the rural character of designated rural areas and supports the protection of ground and surface water.
Land Use - Rural Lands	Goal 6 Policy 3: Designated rural areas will be utilized to reduce the inappropriate conversion of agricultural lands, prevent sprawling low-density development and assure that rural development is compatible with surrounding rural and agricultural areas.
Land Use - Rural Lands	Goal 6 Policy 14: Support and encourage the use of and application of Firewise principles and other fire risk reduction measures consistent with the Benton County Natural Hazard Mitigation Plan and Community Wildfire Protection Plan to reduce fire risk for urban development, urban subdivisions, rural subdivisions and large rural developments susceptible to wildfires. Encourage the implementation of the Firewise principles, or similar best management measures, applicable to individual lots on all lots at risk from wildfires.
Land Use - Rural Lands	Goal 6 Policy 15: Encourage new rural development away from the 100-year floodplain, and as guided in the County’s Flood Damage Prevention Ordinance, CAO, and SMP.
Natural Resources	Goal 1: Conserve and maintain agricultural land of long-term commercial significance as the local natural resource most essential for sustaining the County's agricultural economy.
Natural Resources	Goal 1 Policy 1: Conserve areas designated "GMA Agriculture" in the Comprehensive Plan for a broad range of agricultural uses to the maximum extent possible and protect these areas from the encroachment of incompatible uses.
Natural Resources	Goal 1 Policy 3: Recognize that only uses related or ancillary to, supportive of, complementary to, and/or not in conflict with agricultural activities are appropriate in areas designated GMA Agriculture.
Water Resources	Goal 1: Conserve, maintain, and manage existing ground and surface water resources to meet existing and future water supply needs for cities, farms, industry, and rural growth.
Water Resources	Goal 4: Protect and enhance surface water resources to support rivers, streams, and wetlands that support fish and wildlife species and associated habitats.

Table 3.8-4: Applicable Benton County Comprehensive Plan Policies and Goals

Comprehensive Plan Element	Goal/Policy
Critical Areas	Goal 1: Protect the functions and values of critical areas within the county with land use decision-making and development review.
Critical Areas	Goal 1 Policy 1: Apply standards, regulations, and mitigation strategies to development during the permitting and development approval process that protects critical areas functions and values.
Critical Areas	Goal 2: Protect life and property and avoid or mitigate significant risks to public and private property and to public health and safety that are posed by frequently flooded and geologic hazard areas.
Critical Areas	Goal 2 Policy 1: Limit developments in areas with higher risk for natural disaster or geologic hazard unless it can be demonstrated by the project proponent that the development is sited, designed, and engineered for-long term structural integrity and that life and property on- and off-site are not subject to increased risk as a result of the development.
Critical Areas	Goal 3: Protect the County's natural areas, shorelines, and critical areas as unique assets to the community.
Critical Areas	Goal 3 Policy 1: Use the CAO, SMP, SEPA, and other ordinances, as applicable, to designate and protect critical areas and the natural environment.
Critical Areas	Goal 5: Achieve balance among economic uses of land and critical areas protection.
Critical Areas	Goal 5 Policy 1: Work with state, federal, and local agencies and other County stakeholders regarding the application of environmental protection laws and regulations.
Economic Development	Goal 2: Expand employment opportunities in unincorporated Benton County.
Economic Development	Goal 3: Provide areas for the location of light and environmentally acceptable heavy industrial uses, while minimizing impacts on surrounding rural uses.
Economic Development	Goal 3 Policy 2: Do not locate non-agricultural related industry on "GMA Agriculture" designated land.
Parks, Recreation, Open Space, and Historic Preservation	Goal 3: 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.
Parks, Recreation, Open Space, and Historic Preservation	Goal 3 Policy 1: Identify and preserve historically significant structures and sites whenever feasible.
Parks, Recreation, Open Space, and Historic Preservation	Goal 4: Preserve significant historic structures, districts, and cultural resources that are unique to Benton County.
Parks, Recreation, Open Space, and Historic Preservation	Goal 4 Policy 1: Coordinate with local tribes to protect historic and cultural resources.
Parks, Recreation, Open Space, and Historic Preservation	Goal 4 Policy 2: Preserve archaeologically significant sites by siting and designing development to avoid or mitigate impacts.

Table 3.8-4: Applicable Benton County Comprehensive Plan Policies and Goals

Comprehensive Plan Element	Goal/Policy
Parks, Recreation, Open Space, and Historic Preservation	Goal 5: Achieve balance among economic uses of land and critical areas protection.
Parks, Recreation, Open Space, and Historic Preservation	Goal 5 Policy 1: Work with state, federal, and local agencies and other County stakeholders regarding the application of environmental protection laws and regulations.
Utilities Element	Goal 2: Maintain public and private household water and sewer systems that are consistent with the rural character of the County.
Utilities Element	Goal 3: Facilitate efficiency in utility land use and development.
Utilities Element	Goal 3 Policy 2: Encourage multiple uses, including passive recreational use, in utility corridors where practical.
Utilities Element	Goal 3 Policy 3: Facilitate maintenance and rehabilitation of existing utility systems and facilities and encourage the use of existing transmission/distribution corridors.

Source: Benton County 2021a
CAO = Critical Areas Ordinance; GMA = Growth Management Act; SMP = Shoreline Management Program;
SEPA = Washington State Environmental Protection Act; UGA = Urban Growth Area

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3.9 Historic and Cultural Resources

This section describes documented historic and cultural resources for the proposed Horse Heaven Wind Farm (Project, or Proposed Action) vicinity. Section 4.9 presents an analysis of the Project's potential impacts on historic and cultural resources. The Project Lease Boundary is situated within the Horse Heaven Hills and comprises 72,428 acres of land approximately 4 miles south-southwest of Kennewick and the Tri-Cities urban area, alongside the Columbia River in Benton County, Washington. The Area of Analysis for historic and cultural resources is the proposed Project footprint and comprises the proposed Wind Energy Micrositing Corridor of approximately 10,972 acres (of predominantly linear features including the turbines, support infrastructure, etc.) and the Solar Siting Areas, which encompass approximately 10,755 acres.

Background

Historic and cultural resources include locations of past human activities, sites of occupation, and sites of usage that contain tangible materials (archaeological artifacts or single "isolates") or structural components (historic sites). They may also include landscapes used, built, or modified by people and associated with a specific ethnic or tribal group for longstanding cultural purposes, entwined with belief systems that may not continue to the present. For the purposes of this impact assessment, historic and cultural resources for the Project are more specifically defined as follows:

- **Archaeological Resources:** According to Washington Administrative Code (WAC) 25-48-020(10), archaeological resources are, "any material remains of human life or activities which are of archaeological interest, including all sites, objects, structures, artifacts, implements, and locations of prehistorical or archaeological interest, whether previously recorded or still unrecognized." Archaeological resources include precontact and historic-period sites.
  - Precontact period archaeological resources include lithics (modified stone artifacts—e.g., bifaces, flake tools, projectile points, cores, and debitage); groundstones produced by grinding food (e.g., pestle and mortar); camps (short-term occupation sites); villages (clusters of dwellings); house pits (dwellings partially dug into the ground); trails associated with significant destinations (routes or pathways); cairns or rock piles that may mark a burial or other feature; and burials containing human remains and funerary objects (DAHP 2003).
  - Historic-period archaeological resources include homesteads, debris scatter, townsites, roads, cemeteries, religious property, and agricultural features (DAHP 2003).
- **Historic Archaeological Resources:** These are properties that are listed in or eligible for listing in the Washington State Register of Historic Places (Revised Code of Washington [RCW] 27.34.220) or the National Register of Historic Places (NRHP), per WAC 25-48-020(11). Historic properties are typically 50 years of age or older (Wilkerson et al. 2004). They can include archaeological sites, architectural resources, and traditional cultural properties (TCPs).
- **Architectural Resources:** These include extant elements of the built environment, such as buildings, structures, sites, districts, and objects. Architectural resources are distinct from historic features that are in ruin (DAHP 2022). For the Lease Boundary, these may include farmsteads and associated structures (e.g., grain towers) and roads, railways, or other historic-period infrastructure (e.g., transmission lines).
- **Traditional Cultural Properties:** TCPs include features of tribal significance and cultural and/or religious importance and may present as natural features entwined with cultural values. A TCP, broadly defined by the

Washington State Department of Archaeology and Historic Preservation (DAHP), may be "a distinctive natural site, such as a mountaintop, or a historic environment, such as an ethnic neighborhood, or it may simply be a place with significant historic value to a specific ethnic or cultural group…based upon historic cultural beliefs, customs, or practices which may or may not continue to the present" (Wilkerson et al. 2004). A TCP may also include a viewshed and associated landscape elements. Examples of TCPs (as adapted from the National Register Bulletin 38) include:

- A significant location associated with the traditional beliefs of a tribe in relation to its origin or cultural belief system
- A long-term, rural community whose land usage reflects longstanding cultural traditions
- An urban neighborhood that is the traditional home of a particular cultural group and that reflects its beliefs and practices
- A location where religious practitioners have historically gone, and are known to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice
- A place where a community has traditionally carried out economic, artistic, or other cultural practices important in maintaining its historic identity (NPS 1992)

Methodology

Horse Heaven Wind Farm, LLC's (the Applicant's) consultant, Historic Research Associates, Inc. (HRA), completed several cultural resources studies for the Project during 2020 and 2021 to identify historic and cultural resources (including cultural landscape elements) (Davis, Burk-Hise, and Henderson 2020; Davis and Ragsdale 2020, 2021; Davis, Jones, et al. 2021; Davis, Tuck, et al. 2021). These included archival and records research, archaeological survey (pedestrian field survey), and architectural survey. In addition, HRA conducted tribal outreach, which consisted of requesting information via phone call, letter, and email from affected Tribes (the Confederated Tribes and Bands of the Yakama Nation [Yakama Nation], Confederated Tribes of the Umatilla Indian Reservation [CTUIR], the Nez Perce Tribe [Nez Perce], and the Wanapum Tribe) concerning the Project's Area of Analysis. By definition, formal government-to-government tribal consultation is not within the purview of Horse Heaven Wind Farm, LLC, or its cultural resources consultant, and none of HRA's tribal outreach activities should be considered consultation that fulfills government agency responsibilities to consult under federal or state cultural resource regulations.

Cultural resources studies, including those conducted by HRA for the Project in 2020 and 2021, employ a variety of investigative techniques to identify cultural resources. Archaeological methods used for resource identification include visual surface inspection (pedestrian survey) and subsurface testing (shovel testing). It should be noted that no archaeological technique is wholly comprehensive. Archaeological methods rely on sampling that can produce a bias in results. Systematic pedestrian surveys and subsurface testing are designed to limit bias and increase the amount of area surveyed. Nonetheless, biased results can still arise due to differences in how materials are preserved over time, unintentional preferences for the types of cultural resources that are identified, and the ease of access to some cultural resources over others.

Prior to the commencement of the pedestrian survey phases, HRA reviewed the Lease Boundary and the available Project description to refine areas to be targeted for pedestrian field surveys (within the Area of Analysis). This included a review of local geomorphological and hydrological conditions; the precontact, ethnographic, and historic contexts of the landscape; previously recorded cultural resources; and the likelihood

that recent disturbance has impacted cultural resources (e.g., through agriculture and construction activities). HRA also considered the predictive model developed by DAHP, which uses environmental variables to create areas of high, moderate, and low potential for cultural resources (Kauhi and Markert 2009). DAHP's statewide predictive model maps much of the Lease Boundary as Low Risk. However, there are several limited areas shown as Low to Moderate, Moderate, or High Risk, particularly along the periphery of the Lease Boundary to the northeast and northwest (Davis, Tuck, et al. 2021). High Risk areas are considered the most archaeologically sensitive, with a higher potential for identifying archaeological sites during the course of development (Kauhi and Markert 2009).

It should be noted that the DAHP predictive model is based on a number of variables, including elevation, level landforms, and proximity to water. For this reason, the settings for certain cultural resource types, such as rock cairns and talus features that are found on slopes far from water resources, are not captured as High Risk areas by the predictive model. As with sampling limitations of archaeological methods, discussed above, the DAHP predictive model cannot predict the location or existence of all cultural resource types. Neither the predictive model nor the archaeological methods should be interpreted as the definitive way to identify the presence of cultural resources within the Project Area of Analysis.

Informed by the results of the initial archival research dialogue with the affected Tribes, HRA conducted targeted pedestrian surveys within the Area of Analysis (Davis, Burk-Hise, and Henderson 2020; Davis and Ragsdale 2020; Davis, Jones, et al. 2021). The coverage of these pedestrian surveys is the Lease Boundary. These field investigations involved systematic pedestrian survey along transects spaced at 66-foot (20-meter) intervals (Davis, Jones, et al. 2021). Where features of historic and cultural interest were identified, more intensive survey and inspection was conducted to delineate the resource boundaries and record artifacts and/or features where present. The sites identified during HRA's pedestrian survey are summarized in Section 3.9.2. Approximately 122 acres (less than 1 percent) of the area targeted during the pedestrian survey were not accessible; this included lands that were too steep or had restricted access. These locations were areas of limited archaeological potential, and no additional surveys were recommended. Five unpublished, confidential reports detail the results of these studies on Washington State Department of Natural Resources (DNR) land (Davis, Burk-Hise, and Henderson 2020; Davis and Ragsdale 2020, 2021) and private land (Davis, Jones, et al. 2021; Davis, Tuck, et al. 2021). Davis, Jones, et al. (2021) is a finalized report for cultural resources surveys on private land and replaces an earlier draft (Davis, Jones, et al. 2020).

HRA completed its cultural resources investigations of the Project Area of Analysis in April 2021 (Davis and Ragsdale 2021; Davis, Tuck, et al. 2021). In total, HRA recorded 41 archaeological resources, including 29 sites and 12 isolates (Davis, Tuck, et al. 2021, p. ii). Ten isolates and two sites date to the historic period and have been recommended as not eligible for the NRHP (Davis, Jones, et al. 2021; Davis, Tuck, et al. 2021). Two isolates date to the precontact period. The remaining 27 archaeological sites are unevaluated for the NRHP (Davis, Tuck, et al. 2021, p.ii).

RCW 27.53.060 (Archaeological Sites and Resources) states that a DAHP permit may be required in the event of archaeological resource alteration/disturbance on private or public land. All precontact period sites and multi-component sites with precontact cultural materials require DAHP-issued permits prior to any disturbance, regardless of their NRHP eligibility. As such, all precontact sites are protected by RCW 27.53. A permit is required for any disturbance to historic-era sites that are eligible for listing on national, state, or local registers.

Shovel testing at two precontact isolates (**45BN2146** and **45BN2092**) within the Area of Analysis confirmed these resources as isolated finds, Although RCW 27.53.060 does not protect isolates, the Yakama Nation has

requested avoidance of this find. Consultation between the Energy Facility Site Evaluation Council (EFSEC), DAHP, and Tribes is recommended in the event of unavoidable impacts to precontact isolates.

Davis, Tuck, et al. (2021, p. ii) report that two precontact sites (**45BN261** and **45BN2090**) and one precontact component at Site **45BN2153** are located within the Area of Analysis. For these three precontact resources, NRHP evaluation is not appropriate under the applicable regulatory context. Consultation between EFSEC, DAHP, and Tribes, and a DAHP permit would be necessary in the event of unavoidable impacts to precontact sites.

The Proposed Action plans to avoid the 24 historic-period sites and historic-period components (Davis, Tuck, et al. 2021, p. ii). If the 24 historic-period resources cannot be avoided, archaeological investigations (completed under a permit issued under RCW 27.53.060) would be necessary to evaluate their significance and integrity under the NRHP, to assess potential Project impacts, and/or to develop appropriate treatment measures. Consultation between EFSEC, DAHP, and Tribes may be necessary in lieu of, or in conjunction with, archaeological investigation.

To be eligible for the NRHP, cultural resources must be significant under one or more of the following criteria, as defined in the National Historic Preservation Act of 1966, as amended. Recommendations for eligibility for listing a resource in the NRHP are based on the following criteria codified in Title 36 Code of Federal Regulations Part 60.4, which states that resources are eligible:

> *A. That are associated with events that have made a significant contribution to the broad patterns of our history; or*
>
> *B. That are associated with the lives of persons significant in the past; or*
>
> *C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant or distinguishable entity whose components may lack individual distinction; or*
>
> *D. That have yielded, or are likely to yield, information important in prehistory or history.*

In addition to being found significant under at least one of the criteria listed above, a resource also must possess integrity to be eligible for listing in the NRHP (NPS 1997; Hardesty and Little 2000). Integrity is assessed after a property's significance is evaluated and includes seven aspects: location, design, setting, materials, workmanship, feeling, and association (NPS 1997).

RCW 27-44.040(1) (Indian Graves and Records) states, "Any person who knowingly removes, mutilates, defaces, injures, or destroys any cairn or grave of any native Indian, or any glyptic or painted record of any tribe or peoples is guilty of a class C felony." Further, RCW 27-44.040(2) mandates that inadvertent grave disturbance through construction or other activities requires re-interment under supervision of the appropriate Indian tribe.

3.9.1 Affected Environment

This section summarizes the historic and cultural context applicable to the Area of Analysis and surrounding Lease Boundary. The cultural chronology of the region is broadly characterized by changing settlement patterns and subsistence strategies, evidenced in material cultural remains from the precontact period through the historic period.

3.9.1.1 Precontact Background

The Project would be located in the Columbia Basin physiographic province, comprising the south-central portion of the larger Columbia Plateau (Plateau) that encompasses much of the Pacific Northwest region. The chronological sequence of precontact history in the Lease Boundary includes the Palaeoarchaic period (pre-11,000 to 8000 before present [B.P.[12]]), Early Archaic period (8000 to 5000 B.P.), Middle Archaic period (5000 to 2000 B.P.), and Late Archaic period (2000 to 250 B.P.). Precontact resources are protected by the RCW (see Section 3.9.1). These chronological sequences are summarized below.

Palaeoarchaic Period

This period is represented by diagnostic lithic tools. In the Columbia Basin region, these are primarily associated with either the Western Clovis Complex (defined as a projectile with a prominent “flute” or flake scar at its base) or the Western Stemmed Tradition (large lanceolate, stemmed and shouldered bifaces) (Davis, Burk-Hise, and Henderson 2020). The socioeconomic structure of Palaeoarchaic people of the interior Plateau was likely centered around a mobilized subsistence strategy, including fishing, gathering, and hunting of large game.

Early Archaic Period

This period is largely represented by a greater variety of projectile point artifacts (including dart points, leaf-shaped or lanceolate Cascade Points, bone needles, harpoons, and awls). Cobble choppers, bola stones, beads, multi-faced burins, milling stones (manos), and knives (including ovate bifaces, crescents, and scrapers) are also associated and reflective of developing technologies in support of highly mobilized (and seasonal) hunter-gatherer groups, exploiting an increasingly wider resource base.

Middle Archaic Period

This period is represented by shell beads, hopper mortars, pestles, and an absence of cores and edge-ground cobbles, reflective of increased sedentism (i.e., living in one place for an extended time) and trading opportunities. During this transitional period, habitation sites become larger, located near locations with dense and reliable subsistence resources, with more intensive food processing and storage mechanisms (Hicks and Morgenstein 1994; Ames et al. 1998; as cited in Davis, Jones, et al. 2021).

Late Archaic Period

This period is represented by cobble tools, fishing equipment (net weights and composite harpoons), and mortars and pestles, but relatively low frequencies of projectile points. Pithouses provide evidence of widespread sedentism and social stratification, with an increasing reliance on riverine resources observed through the faunal assemblage and land use pattern in the region.

3.9.1.2 Ethnographic Background

As described, the Horse Heaven Hills and surrounding region have long been inhabited, with the hills and watercourses providing natural boundaries between distinctive tribal groups. The exact customary and ancestral boundaries of Indigenous groups, however, are not always clearly defined, with neighboring groups utilizing the landscape within the Project vicinity for hunting, fishing, gathering, and longstanding cultural purposes.

Among the many tribal groups that utilized the Project vicinity historically are the Yakama, Umatilla, Cayuse, Walla Walla, and Nez Perce Tribes, who spoke various dialects of the Sahaptin language-group (Davis, Burk-

[12] Before present, with present set at 1950 by convention.

Hise, and Henderson 2020). Due to their geographic location, the Yakama, Umatilla, Walla Walla, Cayuse, and Nez Perce resided in the center of a great trade network for thousands of years, stretching from the Pacific Ocean to the Great Plains, and south to the Great Basin. Like most Plateau and Columbia Basin groups, the Umatilla, Walla Walla, Cayuse, Yakama, and Nez Perce hunted terrestrial game, fished from the rich waterways, and gathered both edible and medicinal plants on a seasonal round basis. The introduction of the horse transformed the interactions of many Indigenous groups in the Plateau area. As trading grounds became more accessible and trading more regular, the traditional seasonal round was gradually altered. “For example, the Walla Walla, Cayuse, Yakama, and Umatilla, who had only occasionally ventured into the Great Plains, began to join Nez Perce hunting parties to the east” (Haines 1970, p. 61; Stern 1998; Walker 1998; as cited in Davis, Jones, et al. 2021).

Ethnographic research has identified several places within the Area of Analysis and its vicinity that have been associated with the Yakama, Umatilla, Cayuse, Walla Walla, and Nez Perce Tribes. These places include riverine village sites, fishing locations, and areas where groups gathered to trade and socialize. Native communities also identified significant places that could be used for grazing horses, resource gathering, and wayfinding by means of prominent landscape features. The names of significant places often describe important past events or communicate information about resources or dangers associated with certain areas (Davis, Jones, et al. 2021).

3.9.1.3 Recent Historic Background

The Horse Heaven range is referenced in William Clark’s journal of 1805, when the Lewis and Clark expedition moved into the region, camping near the confluence of the Snake and Columbia Rivers (Davis, Burk-Hise, and Henderson 2020). Early European settlement in the Washington area was primarily driven by the expansion of the fur trade, with the first wave of emigrants journeying across the Oregon Trail in the 1840s. In the mid-19th century, non-native settlements were further developed through the arrival of Presbyterian missionaries, continuing into the 1880s.

The impact of these newly arrived emigrants on the Indigenous population and their settlement of Native American land was a cause of tension, resulting in U.S. government-prepared treaties to provide land for consolidated tribal populations and expand the areas of non-native settlement. Treaty negotiations between the United States and the Plateau tribes took place at Camp Stevens in 1855. In the Treaty of June 9, 1855, the Cayuse, Umatilla, and Walla Walla ceded 6.4 million acres of land (including the entirety of the land included in the Lease Boundary) and reserved about 500,000 acres on which to live (Davis, Burk-Hise, and Henderson 2020). The Treaty with the Yakama Nation was also signed on June 9, 1855 (ratified March 8, 1859), ceding nearly 11 million acres of land.

The Nez Perce Tribe signed a treaty on June 11, 1855, that reduced their territory from 13 million acres to a 7-million-acre reservation. Another treaty with the Nez Perce in 1863 (at Lapwai, Idaho) further reduced the reservation to 757,000 acres. The Lapwai Treaty became known as the “thief” or “steal” treaty, creating animosity that eventually led to armed clashes between the Nez Perce and U.S. Army in 1877 (NPS 2020). Reserved lands were nevertheless opened for nonnative settlement in 1895 and this, along with other factors, including the discovery of gold, reduced Nez Perce land further to less than 100,000 acres by the late 19th century. As part of these treaty agreements, the tribes agreed to relinquish title to their lands while maintaining their traditional rights to hunt, fish, gather roots and berries, and pasture their animals on lands outside reservation land (Lahren 1998, p. 488; Schuster 1998, p. 343; as cited in Davis, Burk-Hise, and Henderson 2020). Tribal access to public lands under treaties is a complex issue; the maintenance of continued safe access to cultural sites (during Project activities) is considered in Chapter 4.9.

Nonnative settlers also had devastating impacts on the local tribal population in the Columbia River valley area through the transmission of new diseases that wiped out many of the elder tribe members more susceptible to illness; with their demise, links to traditional cultural practices were severed. Spurred by the lack of treaty enforcement (and treaty violations), native groups throughout the Plateau region began to fight against outside intrusion, resulting in the Indian Wars of 1855 to 1858 (Beckham 1998; Hunn 1990; as cited in Davis, Jones, et al. 2021). Conflicts between native people, settlers, and the U.S. government lasted until the 1870s in the American West and were confined, for the most part, to the years 1855 to 1858 in the area comprising the Project vicinity (Davis, Burk-Hise, and Henderson 2020).

In the mid-19th century, low cattle stock prices meant that ranching was unprofitable, and tribal conflict was high. The development of the Northern Pacific railroad, however, from the Midwest to the Pacific Ocean in the 1870s, opened the area up to more intensive emigration, and the population increased rapidly through to the end of the century (Davis, Burk-Hise, and Henderson 2020). Agriculture, irrigation, and infrastructure services were developed in support of the growing farming community. A number of related features, including farmsteads, farm equipment, and a grain tower, have been located in the Area of Analysis. In 1937, the Bonneville Power Administration (BPA) was created, and public power was provided to residents in the Pacific Northwest. Two BPA transmission lines extend a survey area built in 1948 (altered to its current alignment in 1975), and another survey area built in 1955 (Brannan and Clark 2007, as cited in Davis, Burk-Hise, and Henderson 2020). In the mid- to late 20th century, nonnative settlement increased dramatically in the region, in response to the development of the Hanford nuclear facility. The nuclear production site was built in 1944, comprising nine former plutonium reactors in the vicinity of Hanford, a small farming community. People from all over the United States came to Hanford, forming a 51,000-person workforce (U.S. Department of Energy 2022). The reactors ceased in 1987, with large scale land remediation ongoing to the present day (U.S. Department of Energy 2022).

3.9.1.4 Applicant Communications with Tribes and Agencies

Table 1.12-2 in the Horse Heaven Wind Farm Application for Site Certification (ASC) identifies the dates, participants, and topics discussed during Applicant outreach to Tribes and applicable agencies (Horse Heaven Wind Farm, LLC 2021). All communications between the Applicant, Tribes, and agencies pre-date the submission of the ASC, which was submitted in February 2021. Formal government-to-government consultation between EFSEC and the Tribes and other government agencies has not been initiated. Informal staff-to-staff communication began on March 9, 2021, with a notice of public meeting sent to the Tribes.

Applicant outreach to the Tribes began in 2018 by Scout Clean Energy LLC (Scout), the indirect owner of 100 percent of Horse Heaven Wind Farm, LLC. Communication with DAHP began in 2019. **Table 3.9-1** is adapted from the ASC (Horse Heaven Wind Farm, LLC 2021, Table 1.12-1) and outlines tribal outreach and agency communication conducted by the Applicant for the Project.

Table 3.9-1: Applicant Outreach and Communication to Tribes and Agencies for Horse Heaven Wind Farm Project

Date	Tribe(s)/Agency Contacted	Nature of Communication and Participants(a)	Topics Discussed
6/1/2018	Yakama Nation	Letter from Snyder/Scout to Lally/Yakama	Project Introduction.
7/27/2018	Yakama Nation	Email exchange between Lally/Yakama and Snyder/Scout	Project information request and follow up.
8/9/2018	Yakama Nation	Meeting between Snyder/Scout and Lally, Meninick/Yakama	Project status, tribal approach to impact avoidance, areas of concern to Yakama.
9/12/2018	Yakama Nation	Meeting between Penry, Snyder/Scout and Lally, Meninick/Yakama	Project status updates, tribal approach, Scout staff transition.
1/14/2019	Yakama Nation	Phone call between T Ozbun/AINW (on behalf of Scout) and Lally/Yakama	Discuss approach to surveys and areas of concern to Yakama.
1/18/2019	Yakama Nation	Transmittal of Draft Record Search and Literature Review to Lally/Yakama	Request comment from the Yakama.
2/22/2019	Yakama Nation	Email exchange between Lally/Yakama, Kobus/Scout, Lawson/Tetra Tech, Ozbun/AINW	Provide status of permitting and agency contacts.
2/25/2019	Yakama Nation	Emailed letter from Meninick/Yakama to Kobus/Scout	Provide comments on preliminary record search.
9/3/2019	DAHP	Meeting between Kobus/Scout, Wardlaw and Hanson/DAHP, and Lawson/Tetra Tech	Provide scope and approach for cultural studies and applicable regulations at the Project site.
2/5/2020	Yakama Nation, CTUIR, Nez Perce, Wanapum	Letters and phone calls from Applicant cultural consultant, Ragsdale/HRA, to Yakama, CTUIR, Nez Perce, and the Wanapum Tribe	Describe updated Project and offer opportunity to participate in site surveys and provide information on resources to be assessed.
5/1/2020 to 5/12/2020	Yakama Nation	Emails from Ragsdale/HRA to Lally/Yakama	Request comments on archaeological survey report for DNR lands.
5/5/2020	Yakama Nation, CTUIR, Nez Perce	Transmittal of Draft Report to Baird/Nez Perce, CTUIR, and Lally/Yakama	Results of the survey on private lands provided to the Tribes in the form of a draft report.
5/14/2020	Yakama Nation, CTUIR, Nez Perce, Wanapum, DAHP	Transmittal of Final Report to Lally/Yakama, CTUIR, Baird/Nez Perce, Buck/Wanapum, Unland/DNR, and Hanson/DAHP	Submitted the final archaeological survey report for DNR lands.

Table 3.9-1: Applicant Outreach and Communication to Tribes and Agencies for Horse Heaven Wind Farm Project

Date	Tribe(s)/Agency Contacted	Nature of Communication and Participants(a)	Topics Discussed
5/26/2020	DAHP	Email between Hanson/DAHP and Wendt/County	DAHP letter of concurrence on HRA's recommendations in the DNR survey report.
5/26/2020	Nez Perce	Email between Ragsdale/HRA and Baird-Williamson/Nez Perce	Offer for CTUIR to complete a TCP study, offer to give a presentation of the Project via a virtual meeting.
5/28/2020 – 7/6/2020	CTUIR	Emails between Ragsdale/HRA and CTUIR	Invite participation in upcoming surveys.
7/6/2020 – 7/8/2020	Yakama Nation	Phone calls and emails between Ragsdale/HRA and Lally/Yakama	Invite participation in upcoming surveys.
8/12/2020	Yakama Nation, CTUIR, Nez Perce	Email between Ragsdale/HRA, Lally/Yakama, CTUIR, and Baird/Nez Perce	Provide an update on the status of resources identified during surveys, as well as to inform the Tribes of an additional survey planned in late August/early September 2020.
8/28/2020	CTUIR	Emails between Ragsdale/HRA and CTUIR	Invite participation in upcoming surveys.
9/29/2020	CTUIR	Phone call between Ragsdale/HRA and CTUIR	Update regarding the status of the upcoming survey reports (for work on private land and DNR land); discussion of precontact resources identified in the private lands report.
10/16/20	Yakama Nation, CTUIR, Nez Perce	Transmittal of Draft Report to Lally/Yakama, CTUIR, and Baird/Nez Perce	Draft report for review and comment provided to the Tribes.
10/19/2020	CTUIR	Email from Steinmetz/CTUIR to Ragsdale/HRA	Comments on private lands report.
10/12/2020 to 10/28/2020	CTUIR	Emails from Ragsdale/HRA and CTUIR	Offer of a subcontract crew position for the upcoming pedestrian cultural surveys.
10/30/2020	Yakama Nation, Nez Perce	Email from Ragsdale/HRA to Lally/Yakama and Baird/Nez Perce	Notification of upcoming survey of the solar parcels.
10/19/2020	Yakama Nation	Email from Lally/Yakama to Ragsdale/HRA	Comments on private lands report.

Table 3.9-1: Applicant Outreach and Communication to Tribes and Agencies for Horse Heaven Wind Farm Project

Date	Tribe(s)/Agency Contacted	Nature of Communication and Participants(a)	Topics Discussed
11/20/2020	CTUIR, Nez Perce	Email from Ragsdale/HRA to CTUIR and Baird/Nez Perce	Notification that surveys of a portion of the solar parcels have been completed; overview of the resources identified during the surveys provided.

Source: adapted from Horse Heaven Wind Farm, LLC 2021, Table 1.12-2
Notes:
(a) See Horse Heaven Wind Farm, LLC (2021) for more information on participants.
AINW = Archaeological Investigations Northwest, Inc.; CTUIR = Confederated Tribes of the Umatilla Indian Reservation; DAHP = Washington State Department of Archaeology and Historic Preservation; DNR = Washington State Department of Natural Resources; HRA = Historical Research Associates, Inc.; Nez Perce = Nez Perce Tribe; Scout = Scout Clean Energy LLC; Tribes = Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and the Wanapum Tribe; Yakama = Confederated Tribes and Bands of the Yakama Nation

3.9.1.5 Previous Surveys within the Lease Boundary

Given the large geographic extent of the Lease Boundary, very little of the area has been subject to historic and cultural resources survey prior to HRA's investigations in relation to the Project in 2020 and 2021 (Davis, Burk-Hise, and Henderson 2020; Davis and Ragsdale 2020). Twenty-seven cultural resource studies have been conducted within the Lease Boundary. These surveys were identified through a review of records maintained by DAHP in the Washington Information System for Architectural and Archaeological Records Data (WISAARD); the resources identified by these previous surveys are summarized in **Table 3.9-2**. These include nine previously identified historic sites and one precontact site. Four of these sites are within the Area of Analysis and subject to survey: three historic-period architectural resources (two transmission lines and one roadway) and one precontact archaeological site (**45BN261**). The four resources located within the Area of Analysis (i.e., proposed Project footprint) are discussed in Section 3.9.2.

Table 3.9-2: Previously Identified Resources within the Project Lease Boundary

ID # or Site #	Type	NRHP Eligibility(a,b)
45BN261	Archaeological Precontact	Not evaluated Protected under RCW
12851	Archaeological Historic	Not evaluated
12852	Archaeological/Architectural Historic	Not evaluated
12977 (45BN1497)	Archaeological Historic	Not evaluated
575328	Architectural Historic	Not evaluated
667226	Architectural Historic	Eligible
667765	Architectural Historic	Not eligible
721665	Architectural Historic	Not eligible

Table 3.9-2: Previously Identified Resources within the Project Lease Boundary

ID # or Site #	Type	NRHP Eligibility[a,b]
721666	Architectural Historic	Eligible
45BN205	Archaeological Historic	Not evaluated

Sources: Davis, Jones, et al. 2021; Davis, Tuck, et al. 2021
Notes:
[a] "not evaluated" = not evaluated and potentially eligible for NRHP listing
[b] unevaluated resources would be avoided by the Project, or, if avoidance is not possible they would be evaluated in accordance with guidelines provided by DAHP.
N/A = not applicable; NRHP = National Register of Historic Places; RCW = Revised Code of Washington

3.9.2 Historic and Cultural Resources Identified

The pedestrian survey, limited to the proposed Project design (the Area of Analysis), was undertaken by HRA during 2020 and supplemented in 2021 (to cover additional survey areas not previously accessible) (Davis, Burk-Hise, and Henderson 2020; Davis and Ragsdale 2020, 2021; Davis, Jones, et al. 2021; Davis, Tuck, et al. 2021). Within the Area of Analysis (including both the private land and land owned by DNR), 44 new resources were identified, in addition to the four identified from previous studies (Section 3.9.2.5). Forty of these new sites are archaeological, and three are architectural. One new site is mixed, with both architectural and archaeological components. The resources were found to be concentrated primarily in the western and central-eastern parts of the Lease Boundary and are summarized below according to their type (archaeological or architectural) and period (precontact or historic). All identified sites are summarized below and listed in **Table 3.9-3.**

3.9.2.1 Archaeological Resources

Precontact Period

Five precontact period resources, including two archaeological sites and three isolates, have been identified in the Area of Analysis for the Project (including site **45BN261**, recorded previously). These are discussed according to their survey area below and summarized in **Table 3.9-3**. Precontact sites **45BN261** and **45BN2090** were documented during the pedestrian survey. Precontact isolates **45BN2092** and **45BN2146** were identified through shovel testing. Multi-component site **45BN2153** was identified through pedestrian survey and includes both precontact and historic cultural materials; the site is unevaluated for the NRHP (Davis, Burk-Hise, and Henderson 2020; Davis and Ragsdale 2020, 2021; Davis, Jones, et al. 2021; Davis, Tuck, et al. 2021).

Western Survey Area

The pedestrian survey of the Western survey area, including Webber Canyon, identified four precontact era resources. The westernmost precontact resource is an isolate, **45BN2146**, a single projectile point of white crypto-crystalline silicate (CCS), consistent with a small Columbia Stemmed typology that post-dates 110 B.P. in the region, associated with the Cayuse Phase (Leonhardy and Rice 1970, as cited in Davis, Tuck, et al. 2021, p.107). Radial shovel probes confirmed the isolated nature of the find. Verified as an isolated artifact, the resource is not protected by RCW 27.53 (Davis, Tuck, et al. 2021, p.107).

The second precontact period resource in the survey area is isolate **45BN2092**. The proximal fragment of a CCS broad-necked, corner-notched projectile point was located in a wheat field, on the slope of a ridgeline. The morphology and neck width are consistent with Madras Shouldered lithic assemblages, which do not have a well-defined temporal range but likely predate 2000 B.P. on the Columbia Plateau (Davis, Tuck, et al. 2021, p. 56).

Radial shovel probes, recommended by the Yakama Nation (Horse Heaven Wind Farm, LLC 2021, pp. 4–117), confirmed the isolated nature of the find (Davis, Jones, et al. 2021, p.58).

Precontact site **45BN261** was originally recorded in 1980 and revisited in 2007 and 2013 (Davis, Jones, et al. 2021). The location of **45BN261** was verified during HRA's pedestrian survey in 2021. It is HRA's interpretation that over the last decade, the cultural features at site **45BN261** have been altered in multiple ways, including road construction and maintenance, and disturbance by bikers, hikers, horseback riders, and all-terrain vehicles, involving the displacement of rocks within the features. The Yakama Nation indicated that the precontact site is directly associated with a TCP (Davis, Jones, et al. 2021, p. 4). The site remains unevaluated for NRHP eligibility, but, as a precontact feature, it is currently protected under RCW 27.53 regardless.

A multi-component site, **45BN2153**, was located during the field survey. The site is situated in a planted wheat field and includes an isolated precontact artifact that was recovered near the center of the site. It is unknown if additional subsurface precontact artifacts are present (excavations within the site would require a permit from DAHP).

Eastern Survey Area

One precontact resource, **45BN2090**, was identified during the pedestrian survey of the Eastern survey area. As a precontact site, and prior to further evaluation, it is protected under RCW 27.53, which declares that the public has an interest in conserving, preserving, and protecting archaeological resources (which includes unevaluated precontact sites regardless of their NRHP eligibility).

Historic Period

Thirty-seven historic-period archaeological resources have been identified in the Area of Analysis during the pedestrian survey phase, comprising 27 historic sites and 10 isolates (Davis, Burk-Hise, and Henderson 2020; Davis and Ragsdale 2020, 2021; Davis, Jones, et al. 2021; Davis, Tuck, et al. 2021). These are discussed according to each survey area below and summarized in **Table 3.9-3**.

The majority (n=18) of the historic-period archaeological sites consist of a variety of surface artifacts associated with late 19th- and early 20th-century agricultural activity. Upon locating these sites, HRA mapped their extent and assessed the potential for any subsurface remains while considering the type and density of the surface material and their likely association with any earlier structures (e.g., 19th-century homesteads visible on historic mapping and/or aerial imagery). The historic archaeological sites identified in the Area of Analysis include farmstead remains, field stones, agricultural equipment, historic refuse scatters, and historic infrastructure remains. Where a particularly high density of surface materials was observed by HRA, and where further research or historic mapping identified homesteads or other structures in their vicinity, further archaeological work prior to the evaluation of the site for listing in the NRHP has been recommended (Davis, Burk-Hise, and Henderson 2020; Davis and Ragsdale 2020, 2021; Davis, Jones, et al. 2021; Davis, Tuck, et al. 2021).

Single isolates were generally evaluated to have limited significance or potential for further additional information (e.g., isolated pieces of trash, removed from their wider context). These artifacts were recommended as not eligible for listing in the NRHP due to a failure to convey significance under any of the criteria, and a lack of integrity.

Western Survey Area

HRA documented 23 historic-period archaeological resources in the westernmost survey area (Davis, Burk-Hise, and Henderson 2020; Davis and Ragsdale 2020, 2021; Davis, Jones, et al. 2021; Davis, Tuck, et al. 2021). All

features are listed in **Table 3.9-3**. Site **45BN2147** comprises a stack of cobblestones, likely removed from surrounding agricultural fields. Sites **45BN2159**, **45BN2160**, and **45BN2162** include a variety of 19th- and 20th-century surface artifacts (e.g., ceramics, glass, and metal), and site **45BN2161** comprises two combined harvesters (made between 1940 and 1960) at the edge of a harvested wheat field, alongside a wooden communication pole with a glass insulator. HRA evaluated the archaeological potential of each site location through historic map regression and documentary analysis. No development was observed in the immediate area of either **45BN2147** or **45BN2159**. There is, however, a small historic structure mapped in the vicinity of site **45BN2160** by 1917, subsequently demolished (USGS 1917, as cited in Davis, Tuck, et al. 2021, p. 140) and two buildings just south of location **45BN2161**, according to aerial images from 1955 and 1965 (HistoricAerials.com 1955, 1963; USGS 1965a; as cited in Davis, Tuck, et al. 2021). A structure appears at site **45BN2162** by 1915, demolished by 1955 (HistoricAerials.com 1955; USGS 1915, as cited in Davis and Ragsdale 2021:15). Further archaeological evaluation work is considered necessary to evaluate the eligibility of sites **45BN2147**, **45BN2159**, **45BN2160**, **45BN2161**, and **45BN2162** for listing in the NRHP.

The historic component of site **45BN2153** comprises a debris scatter, including fragmented and complete vessel glass, ceramic sherds, metal fragments, and ammunition hardware, totaling approximately 40 artifacts. The U.S. Geological Survey (USGS) map from 1917 depicts a structure in the same location as the site, demolished by 1953 (USGS 1917, as cited in Davis, Tuck, et al. 2021, p. 53). Further archaeological evaluation work is necessary to evaluate the eligibility of site **45BN2153** for listing in the NRHP.

Sites **45BN2151** and **45BN2152** are also historic period sites in the Western survey area. The former is the site of a building, visible today as partly buried foundations. No structures are depicted in this location on historic-period maps (GLO 1872; USGS 1917, 1953, 1965b; as cited in David and Ragsdale 2021). An aerial photograph from 1963, however, shows an intact structure, while another from 1996 shows it demolished (HistoricAerials.com 1963, 1996, as cited in Davis, Tuck, et al. 2021, p. 43). Site **45BN2151** could not be evaluated by HRA for listing in the NRHP without further archaeological investigations, though the structural remains appear to meet the 45-year threshold for consideration as an archaeological resource under the Washington State Environmental Policy Act (Davis, Tuck, et al. 2021, p. 43). Site **45BN2152** comprises a historic-period refuse dump, with artifacts that indicate several depositional events within the mid- to late 20th century. Reviews of historic maps and aerial imagery did not suggest the presence of any structures local to the site, and it was determined that the site could not be evaluated for listing in the NRHP without further archaeological investigation.

Site **45BN2084** is a historic-period isolate. As an isolate, site **45BN2084** was recommended by HRA as not eligible for listing in the NRHP due to a failure to convey significance under any of the criteria, and a lack of integrity.

Site **45BN2085** is a large historic debris scatter dating to the early 20th century. Site **45BN2085** cannot be considered for NRHP eligibility without further archaeological evaluation.

Sites **45BN2081** and **45BN2082** are historic isolates. The former is a single piece of farming equipment (possibly a tow-behind disc cultivator) and the latter, a single, fragmented earthenware vessel. Another isolate, **45BN2083**, a pull tab can (dating from the 1950s to 1970s), was found on the ground surface of a plowed field. All three isolates have been recommended not eligible for listing in the NRHP as they are representative of a single episode of discard, with limited potential for any associated subsurface deposits.

Site **45BN2093** consists of historic-period structural remains and artifacts. The remains of two residential structures are present, including the remains of two large outbuildings, numerous other foundations and features

in ruin, and a scatter of historic-period artifacts. HRA determined that the site cannot be evaluated for listing in the NRHP without further archaeological investigation.

A historic-period debris scatter was recorded as site **45BN2086**, in a recently plowed field. The site comprises 119 surface artifacts, including a variety of colored glass over an area of 82 feet (25 meters) by 92 feet (28 meters). HRA determined that the site cannot be evaluated for listing in the NRHP without further archaeological investigation.

Site **45BN2144** is an isolate, a single glass vessel fragment, recommended not eligible for listing in the NRHP. Sites **45BN2143** and **45BN2145** are historic-period artifact scatters. The former includes dumped artifacts over an area of 295 feet (90 meters) by 148 feet (45 meters), including large items (farming equipment and vehicles), as well as smaller pieces (ceramic and glass). Historic maps show multiple structures within 1 mile (1.6 kilometers [km]) of Site **45BN2143** in 1915, but nothing in its immediate vicinity (USGS 1915, as cited in Davis, Tuck, et al. 2021, p. 96). The latter site, **45BN2145**, comprises surface artifacts in a recently plowed field, over a 394- by 262-foot (120- by 80-meter) area, and potentially associated with a homestead dating to 1907. HRA determined that neither site can be evaluated for listing in the NRHP without further archaeological investigation (Davis, Tuck, et al. 2021).

Site **45BN2149** includes a historic-period surface scatter over 131 by 164 feet (40 by 50 meters) totaling approximately 80 items (ceramic sherds, shotgun casing) indicative of a mid- to late-20th-century deposition. A USGS map from 1915 shows a structure in the same location as the site, demolished by 1955. HRA determined that the site cannot be evaluated for listing in the NRHP without further archaeological investigation. Sites **45BN2150** and **45BN2163** are historic-period isolates, a single ceramic sherd (**45BN2150**) and a colorless glass bottle found in seven pieces (**45BN2163**). Isolated finds of discarded trash, such as a broken bottle, are common in rural settings such as the Lease Boundary, and HRA determined that neither site is eligible for listing in the NRHP due to their failure to convey significance under any of the required criteria, and a lack of integrity (Davis, Tuck, et al. 2021).

Site **45BN2157** includes three historic-period artifacts (milk glass and ceramic) found in a harvested wheat field, potentially associated with site **45BN2158**, immediately to the east where over 200 items were recorded. Historic mapping does not show any buildings around site **45BN2157**, although a structure is depicted in nearly the same location as site **45BN2158** by 1915. HRA determined that neither site can be evaluated for listing in the NRHP without further archaeological investigation.

East-Central Survey Area

There are 12 historic-period archaeological sites in the East-Central survey area. All features are listed in **Table 3.9-3**. Sites **45BN205**, **45BN2139**, and **45BN2140** are surface scatter. Site **45BN205** was previously identified during the desk-based study, which recorded some structural remains (Randolph and Boreson 1975a, as cited in Davis, Jones, et al. 2021). Although large pieces of wagon debris were identified during the field survey, no structures were seen. Background research indicates that there was limited development in the vicinity of sites **45BN2139** and **45BN2140** in the late 19th and early 20th centuries. Site **45BN2139** was evaluated as not eligible for listing in the NRHP due to its low artifact density, while site **45BN2140** requires further evaluation in this regard.

A single amber glass fragment (**45BN2138**) appears to represent a single episode of discarded trash associated with agricultural or residential use, possibly in the late 19th or early 20th century. It may have been thrown out of a

vehicle, as it was found adjacent to a roadway. The isolate is not eligible for listing in the NRHP due to a failure to convey significance under any of the criteria, and a lack of integrity.

Site **45BN2141** consists of a historic-period refuse scatter over a 213-foot (65-meter) by 82-foot (25-meter) area with an array of fragmented glass vessels (amber, aqua, colorless, green, milk (opaque white), and pink-colored fragments. Site **45BN2142** consists of two historic-period structural remains on a southeast-facing slope adjacent to an artificially flattened area, potentially a grain elevator and ramp/scale house. Historic maps show two structures approximately 0.3 miles (0.5 km) west of both sites (USGS 1917, as cited in Davis, Tuck, et al. 2021, p. 169). HRA determined that neither site can be evaluated for listing in the NRHP without further archaeological investigation (Davis, Tuck, et al. 2021).

Site **45BN2154** is a historic debris scatter located within an unnamed drainage. The site includes structural remains that likely represent a former grain elevator. Artifacts observed include automotive parts and metal containers for oil, weed killer, and paint. Historic mapping and aerial images show a structure in the vicinity of the site location by the mid-twentieth century (Davis, Tuck, et al. 2021, p. 176). HRA concluded that Site **45BN2154** cannot be evaluated for listing in the NRHP without further archaeological investigation (Davis, Tuck, et al. 2021).

Isolate **45BN2155** consists of an amethyst-colored glass fragment. Site **45BN2156** comprises two metal oil drums, one manufactured in 1945 and the other in 1951. Background research indicates little development in this area in the early to mid-20th century, with no mapped homesteads, plots of cultivated land, or structures in the site vicinity on maps from 1865 to 1964 (Davis, Tuck, et al. 2021). HRA recommended that neither the isolate (**45BN2155**) nor the site of the two oil drums (**45BN2156**) is eligible for listing in the NRHP due to their failure to convey significance under any of the required criteria, and a lack of integrity (Davis, Tuck, et al. 2021).

Site **45BN2148** is a multi-component site featuring archaeological surface scatter and historic-period architectural remains (discussed in Section 3.9.3). The archaeological component includes seven features in various states of ruin and some assorted debris. Three water cisterns set in concrete were noted, along with a root cellar, reinforced with automotive parts. Other elements include calf pens, other unidentifiable wooden structures in a collapsed state, and an intact pickup truck. Hundreds of modern shotgun casings, as well as modern trash (beer bottles, plastic bottles, and food containers), were also noted within the site vicinity. Reviews of aerial imagery and historic mapping suggest the farmstead was built in approximately 1920, and HRA determined that the archaeological component of the site cannot be evaluated for listing in the NRHP without further investigation.

Site **45BN2087** comprises a historic-period debris scatter located in a fallow wheat field east. A variety of surface artifacts were recorded, including glass, ceramic, brick, and metal, amounting to 63 pieces in total. Historic maps show a building located 0.1 miles (0.16 km) southwest of the site and a more clearly marked building 0.6 miles (1 km) to the southwest (Davis, Jones, et al. 2021, p. 142). It was determined that neither site can be evaluated for listing in the NRHP without further archaeological investigation.

Isolate **45BN2091** is a single, fragmented stoneware vessel (consisting of 10 sherds). Considering the nature of the isolated find, its location in a disturbed agricultural field, and the absence of significant historical development in the vicinity, it is not likely that significant deposits are present at the isolate location. Therefore, the isolate was recommended ineligible for listing in the NRHP.

Eastern Survey Area

There are two historic-period archaeological sites identified within the Eastern survey area, in the easternmost part of the Area of Analysis. The sites are similar, both comprising surface debris across a dispersed area. They

remain unevaluated for the eligibility for listing in the NRHP without further archaeological investigation. Both features are listed in **Table 3.9-3**.

Site **45BN2088** consists of a surface scatter covering an approximate area of 98 by 98 feet (30 by 30 meters). Nineteen artifacts were recorded in total, including glass, some decorated ceramics, and metal pieces. The finds date to the mid-19th to early 20th century. Site **45BN2089** covers a slightly smaller footprint, with similar artifacts recovered, including some farming equipment and a metal tricycle, dated to the early 20th century. Reviews of historic mapping and aerial imagery did not directly associate either site with an earlier farmstead, though a building is mapped 0.5 miles (0.8 km) northwest of site **45BN2088** and 0.2 miles (0.3 km) south of site **45BN2089**, at the edge of a canyon in 1917 (Davis, Jones, et al. 2021).

3.9.3 Architectural Resources Identified During the Pedestrian Survey

A total of seven architectural resources were recorded during the pedestrian surveys across the Area of Analysis (Davis, Burk-Hise, and Henderson 2020; Davis and Ragsdale 2020, 2021; Davis, Jones, et al. 2021; Davis, Tuck, et al. 2021). These include three resources identified during previous studies of the area (as listed in Section 3.9.2.5). All features are listed in **Table 3.9-3**.

Historic architectural remains documented at Site **45BN2148** (Nicoson Road Farmstead) include a farmstead, built in approximately 1920. Many of the original buildings and structures on the farmstead, as pictured in historic mapping, are no longer extant, including a farmhouse, barn, and assorted outbuildings (USGS 1952a, 1963a, as cited in Davis, Tuck, et al. 2021, p. 75). The surviving cribbed grain elevator is an example of an early 20th-century type ubiquitous in the region; it has also lost some of its important components and is in a generally dilapidated condition. Davis, Jones, et al. (2021, p. 80) recommend that Site **45BN2148** is not significant under NRHP criteria A, B, or C. As such, the historic architectural features of Site **45BN2148** are recommended not eligible for the NRHP (Davis, Jones, et al. 2021, p. 80). As stated in Section 3.9.3.2, the archaeological potential of Site 45BN2148 under NRHP Criterion D remains unevaluated.

3.9.3.1 Western Survey Area

A single architectural resource, 17302 County Well Road, Prosser (DAHP Property ID: **724939**), was identified during the pedestrian survey of the Western survey area. A farmstead cluster comprising a residence (constructed in 1934), a detached garage, a shop, a machine shed, a grain elevator, and five grain storage silos/bins, surrounded by agricultural fields. Most of the buildings are noted to have sustained significant alterations, primarily in the 1980s and 2000s. HRA evaluated the resources both individually and as a collective farmstead, and, although no alterations were visible for either the grain elevator or storage silos (constructed between 1955 and 1963), they are considered to be a type ubiquitous across the region and lacking in distinctive characteristics. Consequently, the site was recommended not eligible for listing in the NRHP (Davis, Tuck, et al. 2021).

3.9.3.2 West-Central Survey Area

A multistorey grain elevator (DAHP Property ID **722995**) was recorded within the West-Central survey area. The elevator is clad in corrugated metal and was constructed around 1940. Analysis of historic maps has not associated the elevator with any nearby homestead, and, as it is built of common materials and of typical type and style, it was recommended not eligible for individual listing in the NRHP as it does not meet any NRHP criteria (Davis, Jones, et al. 2021, p. 130). WISAARD, Washington State's online database of architectural resources, lists the grain elevator (DAHP Property ID **722995**) as determined eligible as of November 19, 2021 (WISAARD 2022a).

3.9.3.3 East-Central Survey Area

The McNary–Pasco line is a 115-kilovolt (kV) transmission line that was originally constructed in approximately 1948 (Brannan and Clark 2007, as cited in Davis, Burk-Hise, and Henderson 2020). The line was rerouted in 1975 and passes through the East-Central survey area, in the central-eastern part of the Lease Boundary. Two portions of the line, McNary–Badger Canyon No. 1 Transmission Line (DAHP Property ID **721665**) and McNary–Franklin No. 2 Transmission Line (DAHP Property ID **721666**), were recorded in 2020 as within the Lease Boundary. McNary–Badger Canyon No. 1 Transmission Line (DAHP Property ID **721665**) was recommended not eligible for listing in the NRHP per the guidelines in the context of the Multiple Property Documentation (MPD) for the BPA Transmission System. DAHP concurred the eligibility recommendation in a letter dated May 26, 2020 (Horse Heaven Wind Farm, LLC 2021, pp. 4–110; see also WISAARD 2022b).

McNary–Franklin No. 2 Transmission Line, DAHP Property ID **721666**, runs parallel to the McNary–Badger Canyon No. 1 Transmission Line (DAHP Property ID **721665**), through the East-Central survey area. It is a 230-kV line, originally constructed in 1955 and energized in 1956. The transmission line was recommended eligible for listing in the NRHP under Criterion A because of its association with themes of commerce, engineering, industry, and government, and within the context of the MPD for the BPA Transmission System. DAHP concurred with the eligibility recommendation in a letter dated May 26, 2020 (Horse Heaven Wind Farm, LLC 2021, pp. 4–110; see also WISAARD 2022c).

A manufactured house, 147407 E. Beck Road (DAHP Property ID: **722996**), was identified in the East-Central survey area and comprised a modern Quonset hut and a residence (south of the roadway). Analysis of aerial imagery suggests that the residence was constructed between 1963 and 1996 (Davis, Jones, et al. 2021). As a manufactured (kit set) house, it does not display any significant characteristics or association, and it is recommended not eligible for individual listing in the NRHP because it does not meet any NRHP criteria (Davis, Jones, et al. 2021, p. 155).

3.9.3.4 Eastern Survey Area

The northeastern alignments of two transmission lines extend through the northern part of the Eastern survey area. McNary–Franklin No. 2 Transmission Line (DAHP Property ID **721666**) has been determined eligible for listing in the NRHP under Criterion A for its association with themes of commerce, engineering, industry, and government.

A roadway, Nine Canyon Road (DAHP Property ID **667765**), was previously recorded in 2012. The road extends through the rolling hills south of a canyon, crossing the Eastern survey area in three places. The road was built in approximately 1950 and has been improved multiple times. The Federal Highway Administration and DAHP determined in 2014 that the resource is not eligible for listing in the NRHP. HRA recommends that Nine Canyon Road remain not eligible for listing in the NRHP (Davis, Jones, et al. 2021, p. 176).

3.9.4 Traditional Cultural Properties

TCPs may exist within the Area of Analysis for the Yakama Nation, CTUIR, Nez Perce, and/or Wanapum Tribe. Specific cultural sites and geographic locations of cultural interest are considered confidential by the Tribes. They may include places associated with place names, spiritual sites, viewsheds, places of particular historic significance (i.e., a specific event), traditional use sites, and the specific availability of traditional food sources and medicines. The locations of TCPs within the Area of Analysis would likely remain confidential and privileged information solely for the Tribes, and the potential for significant impacts to these cultural resources is unknown.

Culturally valued and sensitive information has been passed down for generations through oral tradition, and there is potential for related landmarks to occur throughout the Area of Analysis. The Confederated Tribes and Band of the Yakama Nation's Cultural Resources Program has notified both the Applicant and EFSEC that the Project would be located in a highly sensitive and complex traditional property. They have indicated that, while the entire Project would harm this property, there are specific turbine strings that would be most impactful to cultural resources. The following sensitive areas have been highlighted during engagement with the Tribes to date: Chandler Butte, the Webber Canyon area, and the Columbia River.

The CTUIR traditional use study (TUS) executive summary identifies traditional food sources observed or expected within the Project Lease Boundary (CTUIR 2021). In summary, 21 native place names are associated with ancient use and knowledge of the land and beliefs about culture and the nature of the world (Quaempts 2021). Oral history investigations conducted for the TUS highlighted, in addition, the presence of 21 traditional food sources ("First Foods") that were either observed or expected within the Area of Analysis. The loss of access to First Foods was raised as a particular concern by elder informants. The TUS executive summary has also highlighted possible burial site locations within the Lease Boundary (CTUIR 2021). Resources of religious and cultural significance are potentially within the viewshed of the Project. The ability to pinpoint specific landmarks was also highlighted as being integral to Tribes' oral tradition, legend, and storytelling (Quaempts 2021). All TCPs within the Area of Analysis remain unevaluated for listing in the NRHP.

3.9.5 Conclusion

In summary, 48 historic and cultural resources have been identified within the Area of Analysis, including four precontact period resources, 37 historic-period resources, and seven architectural resources (see **Table 3.9-3,** below). These include two sites with mixed components (e.g., both precontact and historic cultural materials). The presence of culturally valued and sensitive spaces has been confirmed through discussions with the affected Tribes.

The baseline data collation phase for historic and cultural resources within the Area of Analysis has established a potential for precontact and historic-period sites. Precontact resources present within the Area of Analysis are indicative of ephemeral activities associated with hunting and gathering and cultural or spiritual viewpoints and/or routeways.

Historic-period archaeological resources present throughout the Area of Analysis include artifacts and features associated with agriculture and ranching, including debris scatters and farm equipment. There are 10 historic-period isolated finds. Twenty-five historic sites require further archaeological evaluation before a decision can be made. Identified architectural resources include the transmission lines that extend through the East-Central and Eastern survey areas. McNary–Franklin No. 2 Transmission Line (DAHP Property ID **721666**) has been determined eligible for listing in the NRHP under the BPA MPD.

TCPs include, but are not limited to, resources of religious and cultural significance potentially within the viewshed of the Project, as well as possible burial sites and the locations of First Foods. The specific locations of cultural and historic landmarks and other places of spiritual significance for the Tribes have not been disclosed, and coordination in this regard is ongoing.

Table 3.9-3: Historic and Cultural Resources in the Area of Analysis

ID # or Site #	Resource Type	NRHP Eligibility/Status
45BN261	Precontact (Archaeological Site)	As a precontact site, it cannot be disturbed without a permit issued under RCW 27.53.060.
45BN2146	Precontact (Isolate)	Not protected by RCW 27.53 (confirmed isolate). Consultation with Tribes is advised.
45BN2092	Precontact (Isolate)	Not protected by RCW 27.53 (confirmed isolate). Consultation with Tribes is advised.
45BN2153	Multi-component Archaeological Site: Precontact and Historic	Cannot be evaluated for listing in the NRHP without further archaeological investigation (historic component). Protected by RCW 27.53 (precontact component).
45BN2090	Precontact (Archaeological Site)	As a precontact site, it cannot be disturbed without a permit issued under RCW 27.53.060.
45BN2147	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN2159	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN2160	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN2161	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN2162	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN2151	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN2152	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN2084	Historic (Isolate)	Recommended not eligible for listing in the NRHP.
45BN2085	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN2081	Historic (Isolate)	Recommended not eligible for listing in the NRHP.
45BN2082	Historic (Isolate)	Recommended not eligible for listing in the NRHP.
45BN2083	Historic (Isolate)	Recommended not eligible for listing in the NRHP.
45BN2093	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN2086	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN2144	Historic (Isolate)	Recommended not eligible for listing in the NRHP.
45BN2143	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.

Table 3.9-3: Historic and Cultural Resources in the Area of Analysis

ID # or Site #	Resource Type	NRHP Eligibility/Status
45BN2145	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN2149	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN2150	Historic (Isolate)	Recommended not eligible for listing in the NRHP.
45BN2154	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN2163	Historic (Isolate)	Recommended not eligible for listing in the NRHP.
45BN2157	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN2158	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigation.
45BN205	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigations.
45BN2139	Historic (Site)	Recommended not eligible for listing in the NRHP. Low artifact density, limited subsurface potential.
45BN2140	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigations.
45BN2138	Historic (Isolate)	Recommended not eligible for listing in the NRHP.
45BN2141	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigations.
45BN2142	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigations.
45BN2155	Historic (Isolate)	Recommended not eligible for listing in the NRHP.
45BN2156	Historic (Site)	Recommended not eligible for listing in the NRHP.
45BN2148	Historic (Site) Architectural	Recommended not eligible (architectural). Unevaluated[(a)] under Criterion D (archaeological). Cannot be evaluated for listing in the NRHP without further archaeological investigations.
45BN2087	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigations.
45BN2091	Historic (Isolate)	Recommended not eligible for listing in the NRHP.
45BN2088	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigations.
45BN2089	Historic (Site)	Cannot be evaluated for listing in the NRHP without further archaeological investigations.
17302 County Well Road, Prosser (DAHP Property ID: 724939)	Historic (Site) Architectural	Recommended not eligible for individual listing in the NRHP as it does not meet any NRHP criteria.

Table 3.9-3: Historic and Cultural Resources in the Area of Analysis

ID # or Site #	Resource Type	NRHP Eligibility/Status
Grain elevator (DAHP Property ID: 722995)	Historic (Site) Architectural	Determined eligible for individual listing in the NRHP.
McNary–Badger Canyon No. 1 Transmission Line (DAHP Property ID 721665)	Historic (Site) Architectural	Recommended not eligible for individual listing in the NRHP as it does not meet any NRHP criteria.
McNary–Badger Canyon No. 1 Transmission Line (DAHP Property ID 721665)	Historic (Site) Architectural	Eligible for listing in the NRHP under the MPD for the BPA Transmission System (Criterion A).
147407 E. Beck Road (DAHP Property ID: 722996)	Historic (Site) Architectural	Recommended not eligible for individual listing in the NRHP as it does not meet any NRHP criteria.
Nine Canyon Road (DAHP Property ID 667765)	Historic Architectural	Recommended not eligible for individual listing in the NRHP as it does not meet any NRHP criteria.

Notes:
[a] "Unevaluated" = not evaluated and potentially eligible for NRHP listing
BPA = Bonneville Power Administration; DAHP = Washington State Department of Archaeology and Historic Preservation; MPD = Multiple Property Documentation; NRHP = National Register of Historic Places; RCW = Revised Code of Washington; Tribes = Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and Wanapum Tribe

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3.10 Visual Aspects, Light and Glare

This section describes metrics and terminology, the applicable regulatory framework (including industry standards), and affected environment for the proposed Horse Heaven Wind Farm (Project, or Proposed Action) vicinity in relation to visual resources. The Project vicinity includes the areas south/southwest of Kennewick, Washington, in Benton County, and the larger Tri-Cities urban area along the Columbia River. The Project's consistency with relevant environmental standards, regulations, goals, and policies, and impacts from the Project and from the No Action Alternative, are evaluated in Section 4.10.

This section focuses on three aspects of visual resources in the Project vicinity—visual aspects, shadow flicker, and light and glare—and describes the metrics and terminology, and the regulatory setting—for each.

3.10.1 Visual Aspects

Metrics and Terminology

The visual resources inventory focused on three elements:

- Landscape character
- Viewing locations
- Viewer sensitivity

The term "landscape character" is used to describe the overall visual appearance of a given landscape, based on its vegetation, landforms/water, and human-made modifications. Landscape character is often described in terms of landscape character areas, which are portions of a larger landscape that share harmonizing features that result in and exhibit a particular visual character.

The visibility of the Project structures from typical or sensitive viewing locations considers the most critical places from which the public would view the Project. These are commonly referred to as key observation points (KOP) and are used to assess the Project's anticipated visual impacts. KOP locations can be static, such as residential areas, where views would occur from a consistent location, as well as linear, such as travel ways, where views change as viewers move along a road or trail.

Reactions to changes in the landscape by a viewer (also termed "receptor") is called viewer sensitivity and can vary depending on the characteristics and preferences of the viewer group. For example, residential viewers are typically expected to have a high concern regarding changes in views from their residences. These preferences may also vary depending on whether the residential viewer is a Project participant (i.e., a resident with whom the Applicant has a lease agreement) or if views are from a non-participating property. Motorists' concerns generally depend on when and where travel occurs and the type of travel involved (e.g., commuting vs. recreational travel). Recreational users' concerns vary based on the activities occurring and the length of time that receptors experience the landscape (view duration). For example, viewers at a scenic overlook would have a higher concern regarding changes in view because in this case the landscape would be viewed for a long duration and the view is integral to its use, compared to other recreational uses (e.g., birding), in which landscape is viewed for a shorter duration and is not the focus of the recreation activity.

Regulatory Setting

Benton County has adopted planning goals and policies in its Comprehensive Plan to conserve areas of potential value to the county and its residents (Benton County 2022). The following planning goals and policies are most applicable to this visual analysis:

- Public Lands designation Goal 3: 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.
- Policy 3: Pursue a variety of means and mechanisms such as the preparation of specific and area plans, conservation easements, clustered developments, land acquisitions and trades, statutory requirements 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.
- Policy 4: Consider the preservation of the ridges and hillside areas through various development regulations.

These county goals and policies provide the intentions and interests of Benton County, rather than specific compliance requirements for this Project.

As part of the Washington Energy Facility Site Evaluation Council site certification process, Washington Administrative Code 463-60-362(3) identifies the following standard for analysis of visual resources (aesthetics):

> "The application shall describe the aesthetic impact of the proposed energy facility and associated facilities and any alteration of the surrounding terrain. The presentation will show the location and design of the facilities relative to the physical features of the site in a way that will show how the installation will appear relative to its surroundings. The applicant shall describe the procedures to be utilized to restore or enhance the landscape disturbed during construction (to include temporary roads)."

The Washington site certification process does not require use of a particular visual resource analysis method. This section summarizes the location and design elements of the Project that may influence existing aesthetic conditions and the analysis methods used to characterize visual resources. Section 4.10 describes how the Project would appear relative to the surrounding landscape and analysis of visual impacts of the Project.

The Visual Resource Management (VRM) system developed by the Bureau of Land Management (BLM) has become an industry standard to analyze potential visual impacts, particularly in the western United States, and is often applied to projects on non-BLM lands (BLM 1986). The BLM VRM system and other federal agency visual resource methodologies (e.g., U.S. Forest Service scenery management system and U.S. Federal Highway Administration Guidelines for the Visual Impact Assessment of Highway Projects) have three common elements:

- Scenery: continuous units of land with harmonized features that result in and exhibit a particular character
- Views (sensitivity to visual change and visibility): public viewing locations, including recreation areas, travel routes, residences, and lands with special management, where viewers have sensitivity to landscape changes
- Agency visual management requirements: identify allowable levels of change to landscape character and the allowable degree of attention that a project could attract from viewing locations

To build on the BLM VRM methods, this section also considers elements from the Visual Impact Assessment Process for Wind Energy Projects from the Clean Energy States Alliance (CESA), which were developed to address the unique visual characteristics of wind energy projects (CESA 2011).

3.10.2 Shadow Flicker

Metrics and Terminology

A turbine's rotating blades can cast a moving shadow on locations within a certain distance of the turbine. This can create a temporary phenomenon experienced by nearby viewers called "shadow flicker." This phenomenon has the potential to be a nuisance to humans in both outdoor and indoor settings (McGlinchey and Caporossi 2013). The influence area associated with shadow flicker depends on the time of year and day (which determine the angle of the sun in relation to the turbine and the receptor) and the turbine's physical characteristics (e.g., height, rotor diameter, blade width, and orientation of the rotor blades). The effect of shadow flicker on surrounding properties generally occurs during low-angle sunlight conditions, typically during sunrise and sunset. However, when the sun angle is very low (i.e., less than 3 degrees), sunlight passes through more atmosphere and becomes too diffuse to form a coherent shadow.

Shadow flicker does not occur when the sun is obscured by clouds or fog, at night, or when the source turbine(s) are not operating. In addition, shadow flicker occurs only when at least 20 percent of the sun's disc is covered by the turbine blades.

Shadow flicker intensity is calculated as the difference in brightness at a given location in the presence and absence of a shadow. Shadow flicker occurrence and intensity diminishes with greater receptor-to-turbine separation distance. In general, shadow flicker may become more noticeable the closer a viewer is to the turbine.

Regulatory Setting

Shadow flicker is not regulated in state or federal law applicable to the Project, nor is it addressed by the local county ordinances; therefore, potential shadow flicker impacts were assessed against the industry standard threshold of 30 hours per year (Lampeter 2011).

3.10.3 Light and Glare

Metrics and Terminology

Light

Light sources would be introduced as part of the Project operations as security lighting for the substations, battery energy storage systems (BESSs), and solar arrays and as aviation lighting for turbine towers and other elevated structures, per Federal Aviation Administration (FAA) requirements. Additionally, it is possible that the Project would involve nighttime construction and decommissioning activities that require lighting, though these activities would be concentrated during the daylight hours.

Light is part of the electromagnetic spectrum, which ranges from radio waves to gamma rays. Electromagnetic radiation waves are fluctuations of electric and magnetic fields, which can transport energy from one location to another. Visible light is not inherently different from other parts of the electromagnetic spectrum, with the exception that the human eye has evolved to detect visible waves. The human eye responds to light based on its frequency. The frequency of light that is within the visible range establishes the observed color. While response to light varies from person to person, the Commission Internationale de l'Eclairage (CIE) defined standard luminosity coefficients for the human eye in 1931 (CIE 1997).

Light Trespass

Light trespass refers to light or illuminance that strays from its intended purpose and potentially becomes an annoyance to nearby receptors. Some regulators have established programs to reduce light trespass caused by outdoor lighting (NCSL 2022). These programs are based on limiting the amount of light from a light source that is transmitted onto adjoining properties. Similar to noise, light trespass standards vary according to the land uses where the trespass occurs.

Sky Glow

Sky glow is stray light scattering in the atmosphere, brightening the natural sky background level, and reducing star visibility at night. Sky glow impacts are often associated with light pollution, which can have a regional effect on perceived lighting conditions. Sky glow information and comparisons are presented in **Appendix 3.10-1**.

Glare

Solar panels may be a source of reflected light during operation of the Project, and there may be temporary light reflection during construction and decommissioning from equipment windshields and glass enclosures, causing glint and glare for some viewers. ForgeSolar (2020) defines glint and glare as follows:

> "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's solar arrays, the potential reflectance from the Project is referred to as glare.

Regulatory Setting

Light

As part of the site certification process, Washington Administrative Code 463-60-362(2) identifies the following requirement for analysis for light and glare analysis in an Application for Site Certification (ASC):

> "The application shall describe the impact of light and glare from construction and operation and shall describe the measures to be taken in order to eliminate or lessen this impact."

Lighting conditions are assessed in terms of percentage of brightness above natural dark sky background and classified based on definitions and descriptions from CIE guidelines, which consist of a set of established Environmental Lighting Zones (ELZ) for classifying exterior light levels (CIE 1997, 2003). These zones and related quantitative thresholds are shown in **Table 3.10-1**.

Table 3.10-1: Environmental Lighting Zone Classifications for Sky Glow

ELZ	Description of the ELZ	Sky Glow (% brightness above natural dark sky)	Sky Glow (mag/arcsec^2)
E1	Intrinsically dark natural areas (e.g., national parks or protected sites, roads usually unlit)	0 % < x ≤ 20 %	21.3–23.0
E2	Areas of low district brightness (e.g., agricultural, industrial, or outer urban/rural residential areas)	20 % < x ≤ 100 %	20.4–21.3
E3	Areas of medium district brightness (e.g., industrial, or small-town centers / residential suburbs)	100 % < x ≤ 200 %	18.0–20.4
E4	Areas of high district brightness (e.g., town/city centers and commercial areas urban areas, residential and commercial with high levels of nighttime activity)	x > 200 %	<18.0

Source: CIE 1997
ELZ = Environmental Lighting Zone; mag/arcsec^2 = magnitudes per square arcsecond

The FAA outlines wind turbine lighting standards to increase the visibility of lighting systems for pilots in its Advisory Circular No. 70/7460-1L, issued on August 17, 2018. Lighting systems must consist of aviation red obstruction lights that are either flashing, strobe, or pulsed, as outlined in the Advisory Circular as FAA L-864 lighting. This lighting must be synchronized to flash with nearby systems. For wind farms, turbines with a rotor tip height above 499 feet must be lit regardless of the configuration of the larger wind farm or nearby turbines. Wind energy systems above 699 feet must feature lighting on the nacelle—the housing for the generator at the top of a turbine that is connected to the rotor—as well as at a midpoint on the turbine's mast, placed between the nacelle at the top of the turbine and the ground (FAA 2018).

Glare

The 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 (FAA 2010). The FAA guidance recommends that glare analyses should be performed on a site-specific basis using the Sandia Laboratories Solar Glare Hazard Analysis Tool (FAA 2010). This tool is the standard for measuring potential visual impact as a result of solar facilities. The FAA guidance applies to solar facilities located on federally obligated airport property. It is not mandatory for solar facilities not located on an airport property (for these, 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.

According to 78 FR 63276, the FAA has determined that "glint and glare from solar energy systems could result in an ocular impact on 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:

1) No potential for glint or glare in the existing or planned air traffic control tower cab.

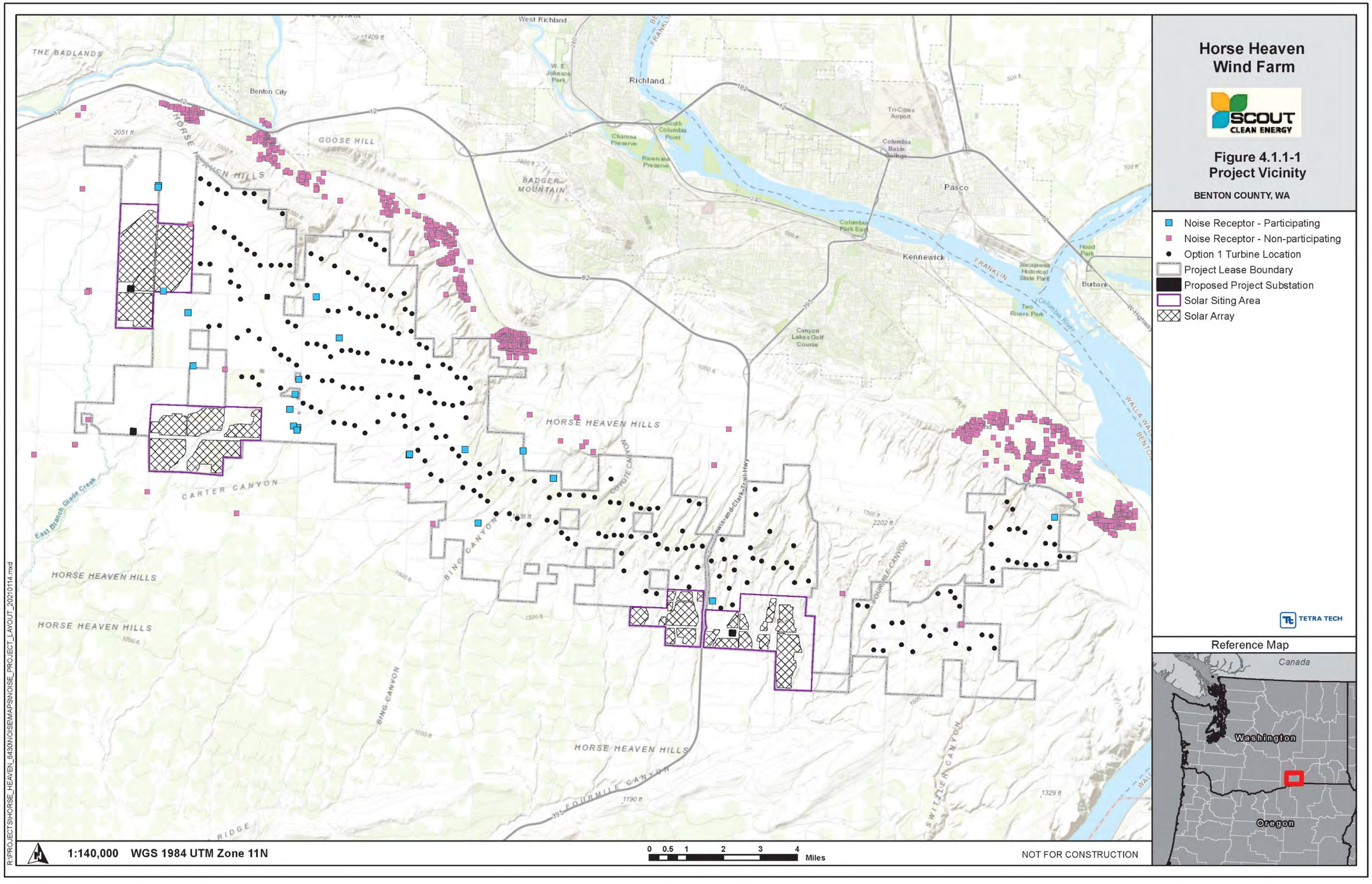
2) No potential for glare, or "low potential for after-image," along the final approach path for any existing or future landing threshold (including any planned interim phases of the landing thresholds), as shown on the

current FAA-approved Airport Layout Plan. 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 near 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, so a formal filing is not necessary.

3.10.4 Affected Environment

The Project Lease Boundary is dominated by rolling hills bisected by meandering canyons, some of which constitute ephemeral or intermittent drainages. The Horse Heaven Hills ridgeline lies along the northern border of the Lease Boundary. On the southern side of this ridge, the landscape transitions to rolling topography with shallow, meandering canyons that drain southwest into the Columbia River. **Figure 3.10-1** provides an overview of the Project vicinity and shows the locations of nearby residences that are considered KOPs and receptors for light and glare analysis, as well as their visual aspect. These receptors will be used to assess the Project's compliance with identified standards and guidelines as viewers potentially impacted by changes in visual aspect, light and glare in Section 4.10. The residential receptors are a subset of the noise sensitive receptors analyzed for the Project as part of the acoustic assessment (Section 3.11) and retain the associated identification numbers for cross-reference.



Source: Horse Heaven Wind Farm, LLC 2021a

Figure 3.10-1: Noise Sensitive Receptors in Project Vicinity

3.10.4.1 Visual Aspects

Inventory Methods

The visual resource area of analysis identified in the ASC was the area within 10 miles of the proposed wind turbines and transmission line and within 5 miles of the proposed solar arrays, substations, and BESSs. Based on guidance from both the BLM (Sullivan et al. 2012) and CESA (2011), the area of analysis for the wind turbines in this Draft EIS was extended to 25 miles.

Existing Landscape Character

The Project would be located within the Columbia Plateau U.S. Environmental Protection Agency Level III ecoregion, which is typically characterized by a broad expanse of sagebrush-covered volcanic plains and valleys adjacent to the Columbia River and dotted with isolated mountains (EPA 2010). There are landscape features in the area of analysis associated with a series of cataclysmic floods that occurred at the end of the most recent ice age, when glacially dammed lakes ruptured, and large volumes of water rushed through the northwestern United States (NPS 2014).

The Lease Boundary is primarily characterized by the following features:

- Panoramic landscapes are flat to rolling, comprising arid sagebrush steppe and grasslands that have been partially converted to agricultural lands.
- Topography gently slopes from north to south, with a distinctive ridge located north of the Lease Boundary that connects the elevated sagebrush steppe to the Columbia River Valley.
- There are a series of minor drainageways that dissect the landscape, with some forming small canyon settings.
- Due to the arid climate, there are limited trees within the Lease Boundary. Most trees visible in the Lease Boundary are associated with ornamental landscaping and windbreaks adjacent to residences, with the primary vegetation communities being agricultural lands with areas of remnant sagebrush steppe and grassland.
- Vegetation color in agricultural areas ranges from green to tan and brown, depending on the season and the crop being grown. More vivid colors occur along the Columbia River Valley associated with residential, commercial, and agricultural development that contrasts with the arid, muted colors found within the Lease Boundary.

The inventory of existing landscape character, based on CESA guidance, also considered the intactness of the landscape. This relates to the extent of modifications present in the existing landscape and their overall effect on natural patterns, which define the landscape. These modifications have the potential to create unintended focal points contrasting with the natural landscape character. There are three main landscape character areas that define the Lease Boundary's landscape character:

- Plateau lands west of Interstate 82 (I-82): The arid, rolling plateau lands west of the interstate are mostly intact with limited existing utility or other industrial uses. An existing transmission line traverses the western edge of the Lease Boundary, influencing the adjacent setting. There are also residences dispersed across this rural agricultural landscape, introducing geometric structures and additional vegetation in the setting associated with wind breaks and ornamental landscaping. The juxtaposition of residences and agricultural lands, including barns and other structures, creates an agrarian landscape character common to the region.

- Plateau lands east of I-82: The landscape east of the interstate is similar to the western area but includes a series of wind turbine strings associated with the existing Nine Canyon Wind Project. There is also an existing transmission line that crosses the Lease Boundary near the west side of the existing Nine Canyon Wind Project and along the southern edge of the Lease Boundary adjacent to I-82. The influence of the existing landscape modifications extends throughout this landscape, reducing its level of intactness. The tall vertical form of the existing wind turbines and their movement attract attention within the setting, generally dominating the local landscape character.
- Ridgeline: This landscape is most prominent east of I-82 but continues to the west as a connection between the flat lands adjacent to the Columbia River and the elevated steppe lands. Due to the steep terrain, this area is visually prominent as viewed from the communities located north of the Lease Boundary. There are multiple paragliding launch sites along the ridge, including Jump Off Joe butte, M&M Ridge, and Kiona Ridge (see Figure 3.12-5). Additionally, there are two strings of the existing Nine Canyon Wind Project sited along the ridge, as well as a communication tower, which reduce the intactness of the setting east of I-82.

Viewing Locations

To identify the KOP locations used in this analysis, a series of bare earth viewshed analyses were run to depict the visibility of the Project from the surrounding area. The bare earth modeling approach used in the viewshed analysis does not account for screening effects from vegetation or buildings that could block or partially block some views. In this manner, the bare earth viewshed approach results in a conservative assessment of potential Project visibility. The analysis in the ASC submitted for the Project included six viewsheds to compare visibility of the two turbine layout options, identify visibility of the three solar array siting areas, and assess the visibility of the proposed transmission lines (Horse Heaven Wind Farm, LLC 2021b). Based on the expansion of the area of analysis for the wind turbines from 10 miles to 25 miles, the viewsheds associated with the two turbine layout options were updated in the Horse Heaven Wind Farm Project Visual Impact Assessment Report (**Appendix 3.10-2**) to include this larger, regional setting (SWCA 2022).

Within Horse Heaven Wind Farm, LLC's (Applicant) visual resources area of analysis, results of the viewshed analyses and aerial photography were used to identify potential KOPs, including:

- Residential structures
- Travel ways
- Cultural resources with visual aspects
- Recreation areas
- Other areas of interest, including open space areas

These KOPs represent critical viewpoints, typical views in representative landscapes, and views of any special Project features. Additionally, the Applicant sought input from Benton County to identify potential areas of interest to local community members. Benton County noted interest on the part of residents located north of the Project. This area of interest contains a large number of residences, as well as a series of parks and other recreation areas. The resulting list of potential KOPs was visited and photographed, and a series of KOPs were identified for analysis to represent the range of viewers and locations that would have views of the proposed Project infrastructure. In addition to these Applicant-selected KOP locations, supplementary viewing locations were

considered to represent views from dispersed residences located directly adjacent to the proposed wind turbines and views from Horse Heaven Hills, a BLM-managed dispersed recreation area (BLM 2022).

The types of users in the visual study areas include residents of the adjacent Tri-Cities communities, including Benton City, Burbank, Kennewick, Pasco, Richland, West Richland, Finley, and Prosser; travelers on the various interstates and highways; and recreationists visiting the Rattlesnake, Red, Candy, and Badger Mountains, McNary National Wildlife Refuge, and other recreational facilities in the area. Lands within the Lease Boundary are also of interest to the Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, and Nez Perce Tribe, who may attach cultural significance to natural landscape components.

Distance from the Project is a key factor in determining potential visual impacts, with the amount of perceived contrast generally diminishing as distance between the viewer and the affected area increases (BLM 1986). Contrast is defined as the level of visible change to the existing features of the landscape (including landform/ water, vegetation, and human-made structures) resulting from the introduction of a project or management activity. The BLM VRM system and other visual resource systems establish a series of distance zones to identify visibility thresholds and inventory the existing landscape. For the purposes of this study, the distance to the Project (in miles) was used to identify viewing distance, with a particular focus on the foreground distance zone. This area corresponds to the area within 0.5 miles of the Project, where views of modifications to the landscape would be most prominent, leading to views potentially dominated by Project infrastructure.

The list of viewing locations and KOPs used in this analysis, as well as the associated viewer type, viewer sensitivity, and distance to the Project, are presented in **Table 3.10-2** and depicted in **Figure 3.10-2**. Some of the KOPs have multiple views looking in different directions such as KOP 2 (KOP 2a, 2b, and 2c), which includes potential views of the Project to the southeast, south, and southwest (Horse Heaven Wind Farm, LLC 2021b).

Table 3.10-2: Key Observation Point Locations

KOP Number	Viewer Name	Viewer Type	Viewer Sensitivity	Distance to Project	Description
1	McNary National Wildlife Refuge (NWR)	Recreation	Moderate	5.2 miles (wind turbines) Solar arrays, transmission lines, and substations/ BESSs would not be visible from this location.	Viewpoint is located along an unpaved road within the McNary NWR, looking southwest across the Columbia River toward the Project Lease Boundary.
2 (2a, 2b, and 2c)	S Clodfelter Road – East, Central, and West	Residential	High	3.0 miles (wind turbines) 3.4 miles (transmission line) Solar arrays and substations/BESSs would not be visible from this location.	Viewpoint is located along the south side of Manuel Drive, toward S. Clodfelter Road, looking southeast to southwest.
3	Chandler Butte	Recreation	High	2.5 miles (wind turbines) 2.1 miles (solar array) 4.2 miles (transmission line) The substations/BESSs would be visible from this location but would be outside of the photo frame.	Viewpoint is located along the unpaved road east of the communication towers, looking southeast.

Table 3.10-2: Key Observation Point Locations

KOP Number	Viewer Name	Viewer Type	Viewer Sensitivity	Distance to Project	Description
4 (4a and 4b)	I-82 South	Travel route	Moderate	7.0 miles (wind turbines) 6.0 miles (solar array) 6.5 miles (transmission line) The HH-East Substation/ BESSs would be visible from this location.	Viewpoint is located along the right shoulder of the highway, looking northwest to northeast.
5	Badger Mountain	Recreation	High	4.7 miles (wind turbines) Solar arrays, transmission lines, and substations/ BESSs would not be visible from this location.	Viewpoint is located along the southern side of the top of Badger Mountain looking southwest.
6	Bofer Canyon Road/I-82	Travel route	Moderate	1.7 miles (wind turbines) 0.6 mile (solar array) 1.2 miles (transmission line) The HH-East Substation/ BESSs would be visible from this location but would be outside of the photo frame.	Viewpoint is located along the right shoulder of the road, looking north.
7	Highway 221	Travel route, residential	High	5.8 miles (wind turbines) 3.1 miles (solar array) 2.2 miles (transmission line) The HH-West Substation/ BESSs would be visible from this location.	Viewpoint is located along the right shoulder of the highway, looking northeast.
8 (8a and 8b)	Kennewick (Canyon Lakes Area) – South and West	Residential	High	3.6 miles (wind turbines) 5.9 miles (solar array) 7.4 miles (transmission line) The substations/BESSs would not be visible from this location.	Viewpoint is located on the southwest end of S. Olson Street, looking west to south.
9	Benton City	Residential, travel route, commercial	High	2.7 miles (wind turbines) 3.9 miles (solar array) 5.5 miles (transmission line) The substations/BESSs would not be visible from this location.	Viewpoint is located on the east side of Division Street/State Route 225, looking south.
10	Badger Road	Residential, travel route	High	1.5 miles (wind turbines) 6.4 miles (solar array) 4.3 miles (transmission line) The substations/BESSs would not be visible from this location.	Viewpoint is located on the north side of Badger Road, looking southwest.

Table 3.10-2: Key Observation Point Locations

KOP Number	Viewer Name	Viewer Type	Viewer Sensitivity	Distance to Project	Description
11	Highland/ Finley Area	Residential	High	2.0 miles (wind turbines) 8.5 miles (solar array) 8.7 miles (transmission line) The substations/BESSs would not be visible from this location.	Viewpoint is located on the north side of E. Cougar Road near an entrance driveway to Finley Elementary School, looking southeast.
12	County Well Road	Residential, travel route	High	2.5 miles (wind turbines) 0.2 miles (solar array) 0.2 miles (transmission line) The HH-West (Alternative) Substation/BESSs would be visible from this location and located 0.5 mile away.	Viewpoint is located on the left shoulder of County Well Road, looking northeast.
13	Travis Road South of Sellards Road	Residential, travel route	High	1.1 miles (wind turbines) 1.0 mile (solar array located outside of photo frame) 0.1 mile (transmission line) The substations/BESSs would not be visible from this location.	Viewpoint is located on the right shoulder of Travis Road, looking north.
N/A	Dispersed residences located 0.5 mile from proposed turbines (foreground views)	Residential	High	Less than 0.5 mile (wind turbines) The other Project component distances would vary but are more specifically described from other KOP locations.	There are approximately 14 residences located within the foreground distance zone of the proposed wind turbines, less than 0.5 mile, with three of those identified as non-Project participating properties. Additionally, there are numerous residences located within 0.5 to1 mile of the proposed wind turbines.
N/A	Horse Heaven Hills Recreation Area	Recreation	Moderate	0.8 mile (wind turbines) Solar arrays, transmission lines, and substations/ BESSs would not be visible from this location.	Dispersed recreation including opportunities for hiking, nature viewing, and mountain biking with potential views of the Project to the south.

Source: SWCA 2022
BESS = battery energy storage system; KOP = Key Observation Point; N/A = not applicable

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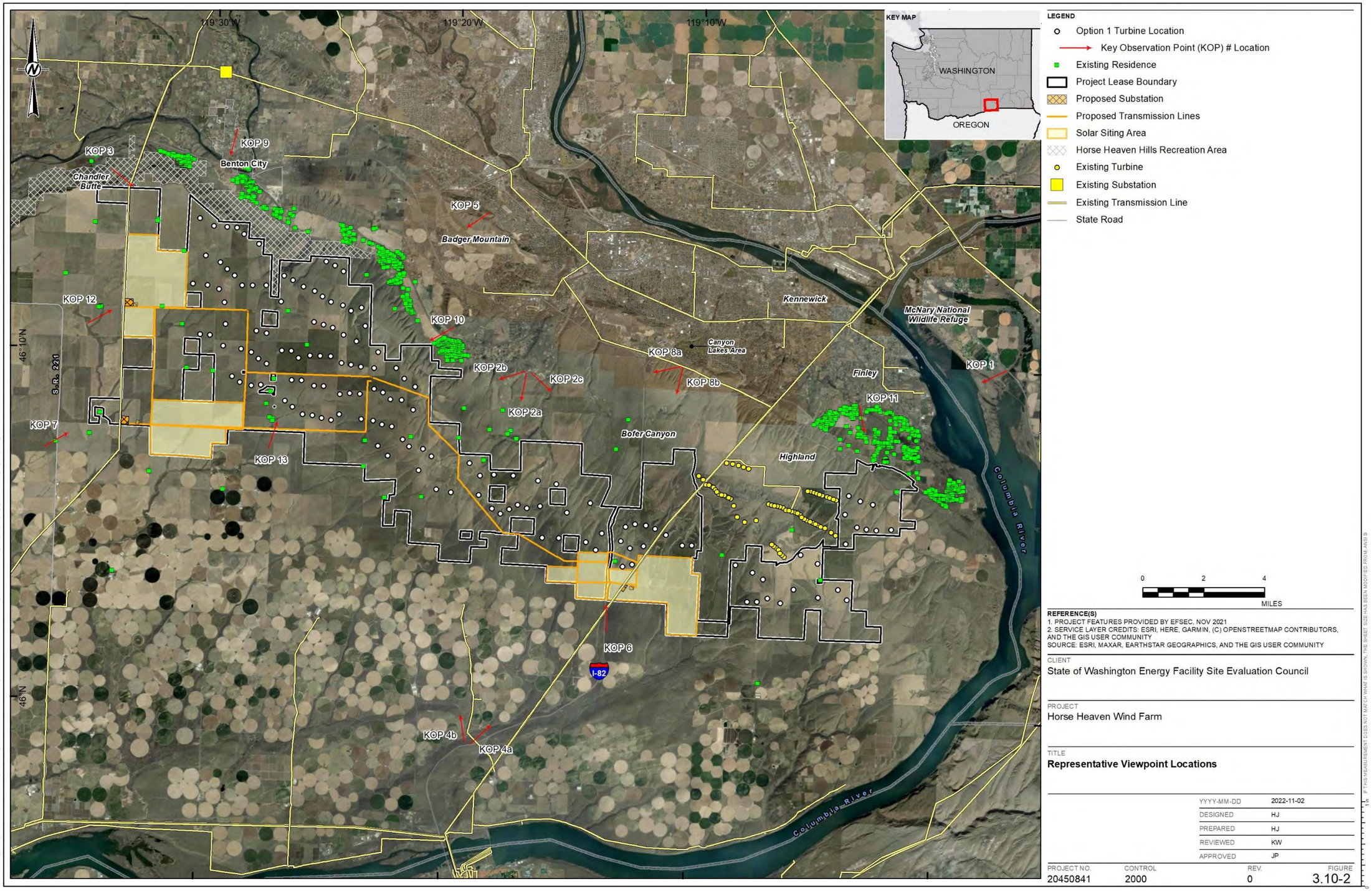

REFERENCE(S)
1. PROJECT FEATURES PROVIDED BY EFSEC, NOV 2021
2. SERVICE LAYER CREDITS: ESRI, HERE, GARMIN, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

CLIENT
State of Washington Energy Facility Site Evaluation Council

PROJECT
Horse Heaven Wind Farm

TITLE
Representative Viewpoint Locations

YYYY-MM-DD	2022-11-02
DESIGNED	HJ
PREPARED	HJ
REVIEWED	KW
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
20450841	2000	0	3.10-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

Figure 3.10-2: Representative Viewpoint Locations

A series of visual simulations were prepared from KOPs 1 through 13, with both wind turbine options depicted, and are included in **Appendix 3.10-2**. No simulations were developed from either of the unnumbered KOP viewing locations (e.g., Horse Heaven Hills Recreation Area or dispersed residences within foreground distance zone) as these locations represent distributed views from within the BLM recreation area or from multiple, dispersed residences near proposed turbine locations. Existing condition photographs were taken using standard focal lengths to most closely represent the human field of view. To create photographic simulations, a three-dimensional model of the turbine, solar array, and transmission line layouts were placed in the photographic view, taking into consideration Lease Boundary topography (elevation) and distance from the observation point. Simulated turbines, solar arrays, and transmission lines were aligned to the photographs, and the model was rendered and composited to create the visualizations. Some of the KOP locations have multiple simulations looking in different directions, such as KOP 2, which includes potential views of the Project to both the southeast, south, and southwest (Horse Heaven Wind Farm, LLC 2021b).

3.10.4.2 Light and Glare

The landscape surrounding the Project is primarily natural, residential, or agricultural land use and therefore has limited sources of artificial light at night. Existing light or glare could occur from vehicles traveling on local roadways and I-82, nearby rural residential development, the adjacent Nine Canyon Wind Project, and any nearby Bonneville Power Administration substations. No street lighting exists along local roadways. The level of light and glare from these sources is low, and typical for the rural, largely agricultural setting.

The assessment of the existing nighttime lighting is based on the current perceived lighting conditions experienced by viewers at night. To establish a baseline of pre-project lighting conditions, the existing sky glow light levels can be assumed based on receptor locations and their surrounding land uses. The receptor locations are shown in **Figure 3.10-1**.

Based on the ELZ classifications outlined in **Table 3.10-1**, identified receptors inside the Lease Boundary and in the Project vicinity fall into one of the middle two ELZ classifications:

- E2 – Participating residences and receptors adjacent to the Lease Boundary located in rural low density agricultural areas. Light trespass assumed to be indistinguishable from property to property at this ELZ.
- E3 – Receptors adjacent to the Lease Boundary and receptors located in the Project vicinity that are in less rural and more densely populated residential areas, mainly to the north of the Project. Light trespass assumed to be indistinguishable to small from property to property at this ELZ.

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