3.1 EARTH RESOURCES

This section describes existing geologic and soil conditions in the KVWPP area. Potential impacts and mitigation measures designed to limit those impacts also are presented. The analysis in this section is primarily based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Sections 2.15 and 3.1). Where additional information has been used to evaluate the potential impacts associated with the proposal, that information has been referenced.

3.1.1 Affected Environment

Topography

The KVWPP site is north and east of the Yakima River on the ridges that slope south from Table Mountain. Although these ridges slope gently southward along their spines, their transverse slopes are steep. The project site and adjacent lands range in elevation from approximately 2,200 to 3,100 feet above mean sea level. Between the ridges are ephemeral and perennial creeks that flow into the Yakima River. Slopes within the project area generally range from 9 to 36% and can reach 84% or more in some of the canyons. Figure 3.1-1 shows the topography of the project site.

Geology

Regional Geology

The project area is located on the Columbia Plateau, a broad expanse of land at the eastern base of the Cascade Range and at the western edge of the Columbia Intermontane physiographic province (Freeman et al. 1945). This lowland, surrounded by mountain ranges and highlands, covers a vast area of eastern Washington and extends southward into Oregon. It is characterized by moderate topography incised by a network of streams and rivers that empty into the centrally located Columbia River.

The Columbia Plateau is underlain by a series of layered basalt flows extruded from vents between 7 and 26 million years ago. Collectively, these basalt flows are known as the Columbia River Basalt Group. The flows range in thickness from a few millimeters to as much as 300 feet.

Local Geology

The Columbia Plateau is divided into three informal physiographic subprovinces—the Yakima Fold Belt, Blue Mountains, and Palouse subdivisions. The project site is located in the Yakima Fold Belt subprovince, an area that includes most of the western half of the Columbia Plateau north of the crest of the Blue Mountains. The subprovince is characterized by long, narrow anticlines with intervening narrow to broad synclines that extend in an easterly to southeasterly direction from the western margin of the plateau to its center.

Figure 3.1-1:

Most major faults are thrust or reverse faults whose strikes are similar to the anticlinal fold axes; the faults are probably contemporaneous with the folding. Northwest- to north-trending shear zones and minor folds commonly transect the major folds (Sagebrush Power Partners LLC 2003a, Section 3.1.2.2).

The basaltic bedrock underlying the project site consists of lava flows of the Grande Ronde basalt. This basalt is the most abundant and widespread formation of the Columbia River Basalt Group. It consists of about 120 individual flow units and makes up about 90% of the total volume of the Columbia River Basalt Group. The thickness of the basalt below the site is not known, but may be as much as 1,000 feet. Alluvium, glacial, flood, and mass-wastage deposits constitute the surface materials that directly overlie the bedrock.

A single fault in the project area, approximately 2.5 miles long, runs east-west near the intersection of US 97 and Bettas Road as shown in Figure 3.1-1 (Sagebrush Power Partners LLC 2003a, Exhibit 6). The fault crosses US 97 approximately 2,500 feet north of Bettas Road. Running east, the fault intersects the H, I, and J turbine strings and underlies the southernmost turbine in turbine string H (H23). The fault then passes beneath turbine I19 on the I turbine string and between turbines J10 and J11 on the J turbine string. The fault is estimated to have last been active during the Miocene epoch (13 to 25 million years ago). Given the lack of evidence of displacement, this fault is not considered to pose a significant hazard to the proposed project.

While it is possible that there may have been displacement on some faults between 700,000 and 140,000 years ago, the geologic deposits in the Kittitas Valley prevent dating of fault movements. Reidel et al. (1994) indicates that the most recent movement on faults in Kittitas Valley may have been between 11,000 and 1.8 million years ago.

Mineral resources in the immediate project vicinity include active and inactive commercial and private rock quarries. In addition, the area is a known resource for a rare type of agate known as "Ellensburg Blue," which is classified by some gemologists as a precious gem. Ellensburg Blue is found primarily in Kittitas County, northeast to northwest of Ellensburg. Most of the areas where the project would coexist with potential deposits of Ellensburg Blue agate are on privately owned land. It is possible that Ellensburg Blue agate could be found on public lands (DNR parcels) where project facilities would be located. DNR Sections 2 and 22 currently have restricted public access, but the other two sections (Section 16 and Section 10) allow public access. There are other areas within Kittitas County where Ellensburg Blue could potentially be found; therefore, it would not be considered a unique feature specific to the project site.

Surface Soils

Soils in the project area along the ridgetops where wind turbines, access roads, and the electrical collection system are proposed primarily consist of shallow to moderately deep mineral soils that formed in alluvium and glacial drift. Loess mixed with volcanic ash is typically present at the surface. Ridgetop soils in this portion of the project area, which includes the turbine areas, include the following series (USDA 2002a):

- Lablue series consists of shallow, well-drained soils 7 to 10 inches in thickness, with slopes of 3 to 15%.
- Reelow series consists of shallow, well-drained soils 10 to 20 inches in thickness, with slopes ranging from 2 to 25%.
- Sketter series consists of moderately deep, well-drained soils 20 to 40 inches in thickness with slopes of 2 to 15%.
- Reeser series consists of moderately deep, well-drained soils 20 to 40 inches in thickness, with slopes of 2 to 15%.

Surface soil distribution over the project site is depicted in Figure 3.1-2. In general, surface soils have low permeability, are dry to moist, and contain local clay-rich zones that retain moisture. These soils are typically present in the upper 12 inches, although they may extend to 10 feet below ground surface. At most locations on the project site, a cemented layer of alluvium is encountered at various depths below the surface soil. This cemented material has a very low permeability; its presence at the site indicates a relatively high runoff potential.

Geologic Hazards

Geologic hazards that could occur at the project site include earthquakes, volcanic eruptions, and landslides.

Earthquakes

Earthquakes in the region result from three seismic sources: interplate events, interslab events, and crustal events. Interplate and interslab events are related to the subduction of the Juan De Fuca plate beneath the North American plate, referred to as the Cascadia Subduction Zone (CSZ). Earthquakes along crustal faults, generally in the upper 10 to 15 miles, are the third seismic source. In Washington, these movements occur on the crust of the North American tectonic plate when built-up stresses near the surface are released. The largest earthquake in eastern Washington since 1969 was a shallow, magnitude 4.4 event northwest of Othello on December 20, 1973 (WDGER 2002).

According to the Uniform Building Code Seismic Risk Map of the United States, the project site, along with all of eastern Washington and eastern Oregon, is located in Seismic Zone 2B. This corresponds to an intensity VII earthquake (comparable to a magnitude 6.0 event) of the Modified Mercalli (MM) Intensity Scale, which can produce moderate damage should one occur. However, in comparison to Alaska and California, and some parts of Western Washington, Seismic Zone 2B is a relatively low hazard zone.

Seismograph records indicate there has been seismic activity at the project site since 1959. The closest recorded seismic event (1991) with a magnitude of 3.0, or MM intensity of III or greater, had an epicenter about 5.6 miles from the project site. The largest recorded seismic event occurred 56.5 miles from the project site and had a magnitude of 4.9 (1974) (Sagebrush Power Partners LLC 2003a, Section 2.15.2).

Figure 3.1-2:

Volcanic Eruptions

Within the state of Washington, the U.S. Geological Survey (USGS) recognizes five volcanoes as either active or potentially active: Mount St. Helens, Glacier Peak, Mount Rainier, Mount Adams, and Mount Baker. In the last 200 years, only Mount St. Helens has erupted more than once (USGS 1992).

The KVWPP site was in the ash fallout zone from the May 18, 1980, Mount St. Helens eruption. Mount St. Helens remains a potentially active and dangerous volcano, even though it is now quiescent. In the last 515 years, it is known to have produced four major explosive eruptions (each with at least 1 cubic kilometer of eruption deposits) and dozens of lesser eruptions. Two of the major eruptions were separated by only two years. One of those, in 1480 A.D., was about five times larger than the May 18, 1980, eruption, and even larger eruptions are known to have occurred during Mount St. Helens' brief but very active 50,000-year lifetime (Wolfe and Pierson 1995).

Like Mount St. Helens, Glacier Peak has a tendency to produce explosive eruptions that produce large quantities of volcanic ash. Eruptions of Glacier Peak have deposited at least nine layers of pumice ash near the volcano in the last 15,000 years. Eruptions that expel material into the air occur at Glacier Peak about every 2,000 years. By far the thickest deposits were laid down east, southeast, and south of the volcano during a series of powerful eruptions about 13,100 to 12,500 years ago (Waitt et al. 1995).

Mount Rainier is a moderate volcanic ash producer relative to other Cascade volcanoes. Eleven eruptions have deposited layers of pumice near Mount Rainier in the past 10,000 years, most recently in the first half of the nineteenth century. Ash-producing eruptions from Mount Rainier occur about once every 900 years (Hoblitt et al. 1998).

During much of its history, Mount Adams has displayed a relatively limited range of eruptive styles. Highly explosive eruptions have been rare. Compared to the dozens of large explosive eruptions at nearby Mount St. Helens during the past 20,000 years, eruptions of Mount Adams have been meek. Eruptions at Mount St. Helens have blanketed areas more than 120 miles downwind with ash deposits several inches thick, but those at Mount Adams have blanketed only areas a few miles away with a similar thickness of ash (Scott et al. 1995).

Deposits that record the last 14,000 years at Mount Baker indicate that it has not had highly explosive eruptions like those of Mount St. Helens or Glacier Peak, nor has it erupted as frequently. During this time period, only four episodes of magmatic eruptive activity can be definitively recognized. Magmatic eruptions have produced volcanic ash, pyroclastic flows, and lava flows from summit vents and from the Schriebers Meadow cinder cone (Gardner et al. 1995).

Landslides

Areas prone to landslides include steep slopes more than 10 feet tall with thick soils. These conditions are not typical of the KVWPP site. The project is located in areas with a relatively thin veneer of soil covering consolidated alluvium and basaltic rock. Observations of near surface (less than 10 feet below ground) site stratigraphy conducted during geotechnical investigations and visual observations of the landscape and surface geology in the immediate project area indicate that potential landslide-prone terrain is not present on the project site. No landslides were observed during these investigations (Taylor, pers. comm., 2003).

3.1.2 Impacts of Proposed Action

This section describes the potential direct impacts of the KVWPP on project area geology and soils. Direct environmental impacts are associated with construction and operational activities that could increase erosion or affect geologic hazard areas. Direct impacts could be associated with construction, operations, and decommissioning of any of the proposed project elements, including wind turbines and meteorological towers, existing and new gravel access roads, additional power lines, and the proposed O&M facility and substations. Impacts associated with or attributable to specific project elements are discussed where applicable. Indirect impacts are not anticipated because the project is not expected to substantially induce regional growth to an extent that would significantly change offsite geology and soil resources. Table 3.1-1 summarizes potential impacts under the three project scenarios.

Table 3.1-1: Summary of Potential Earth Resource Requirements and Potential Impacts

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Construction Impacts			
Changes to local topography/area of temporary ground disturbance	231 total acres disturbance	311 total acres disturbance	371 total acres disturbance
Cut and fill requirements	328,559 cubic yards	299,470 cubic yards	311,392 cubic yards
Gravel/fill import requirements	259,862 cubic yards	224,923 cubic yards	232,495 cubic yards
Rock export or onsite crushing requirements	76,727 cubic yards	81,567 cubic yards	85,227 cubic yards
Operation and Maintenance Impacts			
Erosion potential/area of permanent ground disturbance	118 acres	93 acres	95 acres
Earthquake hazard	low	low	low
Volcanic hazard	low	low	low
Landslide hazard	low	low	low
Decommissioning Impacts			
	Similar to, but less than, construction impacts. Extent depends on fate of roads.	Similar to, but less than, construction impacts. Extent depends on fate of roads.	Similar to, but less than, construction impacts. Extent depends on fate of roads.

Source: Sagebrush Power Partners LLC 2003a, f.

Construction Impacts

Topographic Modification and Soils

Impacts on soils from project construction would result from clearing, excavation, and filling activities associated with constructing roads, establishing temporary crane pads, and creating the base for each turbine. Each project scenario requires the same length of access road. However, turbines larger than 1.5 MW (i.e., under the lower end scenario) would require wider roads (34 feet versus 24 feet) to safely accommodate the wide-track cranes required for erecting the turbines. This factor accounts for the greater requirements for cut/fill and gravel import for the lower end scenario reflected in Tables 3.1-2 through 3.1-4.

The total amount of ground disturbance during construction would range from 231 acres under the lower end scenario (for 82 turbines) to 371 acres under the upper end scenario (for 150 turbines). (See Table 2-2 in Chapter 2, Temporary Disturbance Footprint for Range of Proposed Turbines, for a detailed summary of footprint requirements for different project facilities.)

Detailed requirements for cut and fill under each project scenario are presented in Table 3.1-2. The largest volume of cut and fill would be required for the lower end scenario because it would require wider roads.

Table 3.1-2: Estimated Cut and Fill Requirements for Proposed Turbines (Cubic Yards)

Facility	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Project Site Roadways (Approx. 1 ft deep by 24 ft wide)			
Electrical Trenching, Poles, and Switch Panel Foundations	153,417[1]	108,294	108,294
Turbine Foundations (Typical is 18 ft dia. by 25 ft deep)	112,794	112,794	112,794
Wind Turbine Generator and Crane Pads (Approx. 30 ft by 100 ft, 1-2 ft. deep)	24,600	36,300	45,000
O&M Facility with Parking (Approx. 2 acres by 1 ft deep)	9,111	13,444	16,667
Substation (Approx. 6 acres by 1 ft deep)	3,227	3,227	3,227
Turnaround Areas (18 at approx. 0.5 acre each, 1 ft deep)	9,680	9,680	9,680
Meteorological Towers (Approx. 0.75 acre by 1 ft deep)	14,520	14,520	14,520
Total Cut/Fill Amount	1,210	1,210	1,210
	328,559	299,470	311,392

Source: Sagebrush Power Partners LLC 2003f.
1 For turbines larger than 1.5 MW, roads are 34 feet wide to accommodate larger cranes.

Estimated quantities of imported gravel and fill and of rock export or onsite rock crushing for the three project scenarios are presented in Tables 3.1-3 and 3.1-4, respectively. The largest volume of imported materials would be required for the lower end scenario, again because it would require wider roadways. The largest amount of exported materials would be generated under the upper end scenario because it involves constructing the largest number of turbines.

A local gravel and concrete company would supply imported fill materials, although the exact source would be selected by the construction contractor. An existing permitted quarry is located just north of turbine F1.

The Applicant plans to use onsite excavated materials for backfill to the extent possible. Excess excavated material not used as backfill for turbine foundations would be used to level out low spots on crane pads and roads consistent with the surrounding grade (Sagebrush Power Partners LLC 2003a, Section 3.1.8). The top soil layer of the excavated materials would be reseeded with a designated mix of grasses and/or seeds around the edges of the disturbed areas. Approximately 50% of excavated spoils is expected to contain material too large for reuse as backfill at foundations and in the electrical trenches. These larger cobbles and boulders would be crushed into smaller rock for use as backfill or road material, or disposed of offsite. The Applicant does not propose to bring a rock crusher onsite. Instead, this material would be transported to the existing permitted quarry just north of turbine F1 for crushing prior to reuse (Taylor, pers. comm., 2003). Those materials that cannot be reused onsite would be disposed of in accordance with Kittitas County and Department of Ecology regulations for clean fill materials (Sagebrush Power Partners LLC 2003f).

Table 3.1-3: Estimated Gravel/Fill Import Quantities for Proposed Turbines (Cubic Yards)

Facility	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Project Site Roadways (Approx. 1 ft deep by 24 ft wide)	153,417[1]	108,294	108,294
Electrical Trenching, Poles, and Switch Panel Foundations	56,397	56,397	56,397
Turbine Foundations (Typical is 18 ft dia. by 25 ft deep)	12,300	18,150	22,500
Wind Turbine Generator and Crane Pads (Approx. 30 ft by 100 ft, 1-2 ft. deep)	9,111	13,444	16,667
O&M Facility with Parking (Approx. 2 acres by 1 ft deep)	3,227	3,227	3,227
Substation (Approx. 6 acres by 1 ft deep)	9,680	9,680	9,680
Turnaround Areas (18 at approx. 0.5 acre each, 1 ft deep)	14,520	14,520	14,520
Meteorological Towers (Approx. 0.75 acre by 1 ft deep)	1,210	1,210	1,210
Total Import Amount	259,862	224,923	232,495

Source: Sagebrush Power Partners LLC 2003f.

1 For turbines larger than 1.5 MW, roads are 34 feet wide to accommodate larger cranes.

Table 3.1-4: Estimated Quantities for Rock Export or Onsite Crushing for Proposed Turbines (Cubic Yards)

Facility	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Electrical Trenching, Poles, and Switch Panel Foundations	56,397	56,397	56,397
Turbine Foundations (Typical is 18 ft dia. by 25 ft deep)	10,250	15,125	18,750
Substation (Approx. 6 acres by 1 ft deep)	9,680	9,680	9,680
Meteorological Towers (Approx. 0.75 acre by 1 ft deep)	400	400	400
Total Amount	76,727	81,567	85,227

Source: Sagebrush Power Partners LLC 2003f.

It is possible that construction activities could encounter some Ellensburg Blue agate. Specimens of the agate are typically small (up to a couple of inches in diameter). Any encountered agate may not be noticed and be placed as backfill or transported with excess excavated material. However, because Ellensburg Blue agate is not unique to the project site and because the majority of the site is currently restricted from legal public access, construction activities are not expected to significantly deplete or preclude the public's ability to collect this resource.

Erosion

Soils on the project site have a high runoff potential, with runoff and erosion potential increasing as the slope increases. In general, slopes range from 9% to 36%. Even though much of the work would occur on the tops of the ridges where slopes tend to be more gradual, there would still be a potential for substantial runoff during significant rain events in all the project scenarios.

Significant erosion would result from a combination of total site disturbance and cut and fill activities. Total site disturbance would range from 231 to 371 acres. Cut and fill requirements are summarized in Table 3.1-2. The largest volume of cuts and fills would be required for the lower end scenario, with an estimated 328,559 cubic yards. Compliance with the requirements of the project's stormwater construction permit and implementation of appropriate BMPs would minimize this impact (see Section 3.1.4, Mitigation Measures, for further discussion).

Landslides

Construction (cut and fill) of access roads in some areas could occur on or under relatively steep slopes (i.e., slopes steeper than 21 to 30 degrees). As a result, some sliding of soil and alluvial materials could be expected during construction, particularly if the cut bank slope were to fail (i.e., during an earthquake). Site-specific BMPs for site slopes would be implemented to control landslides and limit erosion in these areas (see Section 3.1.4, Mitigation Measures, for further discussion).

Operations and Maintenance Impacts

Topographic Modification and Soils

No significant impacts on soils or topography are anticipated during operation and maintenance of the project. Additional fill or aggregate materials may be needed for repairs to roads and underground utilities. However, the amount would be minimal. The surface topography of the site would not be altered after construction of the project is complete. Furthermore, because Ellensburg Blue agate is not unique to the project site and because the majority of the site is currently restricted from legal public access, operations and maintenance activities are not expected to significantly preclude the public's ability to hunt for and collect this resource.

Erosion

No significant soil erosion impact would result from operation and maintenance of the KVWPP. The potential for erosion of site soils is small because exposed soils would either be revegetated or covered with impervious surfaces such as structures, pavement, or compacted crushed rock. Operational BMPs would be implemented to control erosion and sedimentation through site landscaping, grass, and other vegetative cover (see Section 3.1.4 for further discussion).

Earthquakes

A large earthquake could affect wind power operations, disrupt the regional electrical distribution system, or possibly cause turbine towers to collapse. However, the likelihood of catastrophic impacts is remote. KVWPP facilities would be designed to at least the minimum current engineering standards applicable in Kittitas County (i.e., the 1997 Uniform Building Code [UBC]) (Sagebrush Power Partners LLC 2003a, Section 2.15.3). Measures inherent in the project design and implementation of onsite emergency plans to protect the public health, safety, and environment on and off the project site would minimize this potential impact (see Section 3.1.4).

Volcanic Hazards

The main hazard to the project site from volcanic eruptions from any of the five Washington volcanoes would be from volcanic ash. The major hazards of ashfall are derived from the (1) impact of falling fragments, (2) suspension of abrasive fine particles in the air and water, and (3) burial of structures, transportation routes, and vegetation. In particular, ashfall could cause lung damage, respiratory problems, and death by suffocation under extreme conditions. In addition, ash may clog machinery and filters, cause electrical short circuits, and make roads slippery. Ash could also damage computer disk drives and other computer equipment, strip paint, corrode machinery, and dissolve fabric. Communications and transportation also may be disrupted over a large area (Sagebrush Power Partners LLC 2003a, Section 7.2.10). Measures inherent in the project design and implementation of onsite emergency plans to protect the public health, safety, and environment on and off the project site would minimize these potential impacts (see Section 3.1.4). Other types of volcanic hazards (e.g., pyroclastic flow, lava flow, volcanic gas, etc.) would likely not be a concern at the site because of the distances from the active volcanoes.

Landslides

During the EIS scoping process, a commenter expressed concern about the potential for slope instability along the ridgelines where the turbines would be sited. Project facilities would not be located on unstable slopes or landslide-prone terrain. The turbine structures would be built on relatively flat ground (not on edges or slopes). In addition, the project is located in areas with a relatively thin veneer of soil covering consolidated alluvium and basaltic rock. Therefore, risk of a seismic or precipitation-induced landslide in the soils and rock is minimal.

Decommissioning Impacts

Decommissioning would consist of removing aboveground equipment such as turbine and meteorological towers and their associated foundations to a depth of 3 feet below ground. If the overhead power lines could not be used by the applicable utility (PSE or Bonneville), all structures, conductors, and cables would also be removed. The Applicant proposes to leave the underground electrical collection system in place subject to landowner approval. The substations could revert to the ownership of the applicable utility. At the time of decommissioning, the Applicant would consult with the applicable landowner to determine the appropriate disposition of the O&M facility (Taylor, pers. comm., 2003).

The soil surface would be restored as close as reasonably possible to its original condition. Reclamation procedures would be based on site-specific requirements and techniques commonly used at the time the area would be reclaimed, including regrading, adding topsoil, and revegetating all disturbed areas. Decommissioned roads would be reclaimed or left in place based on landowner preferences, and rights-of-way and the leased property would be vacated and surrendered to the landowners (Sagebrush Power Partners LLC 2003a, Section 7.3.12).

3.1.3 Impacts of No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated and the impacts described above would not occur. For example, if the project were not developed, prospector access to Ellensburg Blue agate at the project site would remain unchanged. However, development by others, and of a different nature, including residential development, could occur at the project site in accordance with the County's existing Comprehensive Plan and zoning regulations. Depending on the location, type, and extent of future development at the project site, impacts on earth resources could be similar to or even greater than the proposed action.

If long-term energy needs are to be met, a power-generating facility would need to be built and operated at another location if the KVWPP is not built. This would likely be a gas-fired combustion turbine facility. It is estimated that a combustion turbine facility generating 60 aMW of power could require approximately 14 acres for the plant site (Bonneville and U.S. Department of Energy 1993). (This land use estimate was derived from a study prepared by Pacific Northwest Laboratory that was based on data from literature and existing plants [Pacific Northwest Laboratory 1992]). However, gas-fired combustion turbine projects may result in greater disturbance of earth resources because of the possible need to establish a gas pipeline to the facility and electrical transmission interconnections. Although the specific acreage requirements for these facilities as part of the No Action Alternative are unknown, each facility would result in potential earth resource impacts. The specific type, nature, and extent of earth resource impacts under the No Action Alternative, such as erosion and risk of earthquakes and volcanic eruption, would depend on the site-specific location of the combustion turbine plant and its associated facilities.

3.1.4 Mitigation Measures

Erosion Control during Project Construction

Before construction begins, a detailed SWPPP would be developed and approved by EFSEC for the project to minimize the potential for pollutant discharge from the site during construction and operation activities. The SWPPP would be designed to meet the requirements of the Washington Department of Ecology General Permit to Discharge Storm Water through its stormwater pollution control program (Chapter 173-220 WAC) associated with construction activities.

The SWPPP would include both structural and non-structural BMPs. Examples of structural BMPs include the installation of silt curtains and/or other physical controls to divert flows from exposed soils or otherwise limit runoff and pollutants from exposed areas of the site. Examples of non-structural BMPs include materials handling protocol, disposal requirements, and spill prevention methods.

The SWPPP would be prepared along with a detailed project grading plan by the EPC contractor when design level topographic surveying and mapping are prepared for the project site. The EPC contractor would carry out the construction BMPs, with enforcement by the project's environmental monitor, who would be responsible for implementing the SWPPP.

Site-specific BMPs would be identified on the construction plans for the site slopes, construction activities, weather conditions, and vegetative buffers. The sequence and methods of construction activities would be controlled to limit erosion. Clearing, excavation, and grading would be limited to the minimum areas necessary to construct the project. Surface protection measures, such as erosion control blankets or straw matting, also may be required during construction before site restoration if the potential for erosion is high.

All construction practices would emphasize erosion control over sediment control through such non-quantitative activities as:

- Using straw mulch and vegetating disturbed surfaces;
- Retaining original vegetation wherever possible;
- Directing surface runoff away from denuded areas;
- Keeping runoff velocities low by minimizing slope steepness and length; and
- Providing and maintaining stabilized construction entrances.

Work on the access roads would include grading and regraveling existing roads and constructing new roads. The site would have gravel roadways generally with a low profile design, allowing water to flow over them in most areas. Erosion control measures to be installed during work on the access roads include:

- Maintaining vegetative buffer strips between the affected areas and any nearby receiving waterways;
- Installing sediment fence/straw bale barriers on disturbed slopes and other locations shown in the SWPPP;
- Using straw mulch at locations adjacent to an affected road;
- Providing temporary sediment traps and Sedimat-type mats downstream of seasonal stream crossings;
- Installing silt fences on steep, exposed slopes; and
- Planting affected areas with designated seed mixes.

At each turbine location, a crane pad area of approximately 3,000 square feet would be graded and covered with road rock. During construction, silt fences, hay bales, or matting would be placed on the downslope side of the crane pad. Wind turbine equipment such as blades, tower sections, and nacelles would be transported and off-loaded at each turbine location near the foundation and crane pad. After construction, disturbed areas around all crane pad staging areas would be reseeded as necessary to restore the area as closely as possible to its original condition.

Erosion Control during Project Operations

The project operations group would be responsible for monitoring the SWPPP measures that are implemented during construction to ensure they continue to function properly. Final designs for the permanent BMPs would be incorporated into the final construction plans and specifications prepared by the engineering team's civil design engineer. The EPC contractor's civil design engineer and the project's engineering team would prepare an operations manual for permanent BMPs. The permanent stormwater BMPs would include erosion and sedimentation control through site landscaping, grass, and other vegetative cover. The final designs for these permanent BMPs would conform to the Washington Department of Ecology Western Washington Storm Water Management Manual with adjustment for conditions in Eastern Washington.

Operational BMPs would be adopted, as part of the SWPPP, to implement good housekeeping, preventive and corrective maintenance procedures, steps for spill prevention and emergency cleanup, employee training programs, and inspection and record keeping practices, as necessary, to prevent stormwater pollution. Examples of good operational housekeeping practices, which would be used by the project, include:

- Prompt cleanup and removal of spillage;
- Regular pickup and disposal of garbage;
- Regular sweeping of floors;
- HAZMAT data sheet cataloguing and recording; and
- Proper storage of containers.

The project operations group would periodically review the SWPPP against actual practice. The plant operators would determine if the controls identified in the plan are adequate and if employees are following them.

Earthquakes

Prior to final project design, a detailed geotechnical investigation and field survey would be performed to ensure that no turbine locations or other project components lie immediately above a high-risk fault. Geotechnical investigations would be conducted at each location where a deep foundation is required (i.e., at each turbine and meteorological tower location, at the substation(s), and at the O&M facility).

The wind turbines would be equipped with vibration sensors that would automatically shut down the turbine in the event of a severe earthquake (Sagebrush Power Partners LLC 2003a, Section 7.2.9). In addition, current engineering standards applicable in Kittitas County (that is, the 1997 UBC) would be used in the design of project facilities. These standards require that under the "design" earthquake, the factors of safety or resistance factors used in design exceed certain values. This factor of safety is introduced to account for uncertainties in the design process and to ensure that performance is acceptable. Given the relatively low level of earthquake risk for the site, application of the UBC in project design would provide adequate protection for the project facilities and ensure protection measures for human safety (Sagebrush Power Partners LLC 2003a, Section 2.15.3).

Earthquakes occur without warning, thus damage prevention measures and plans must be made in advance. The Applicant would prepare onsite emergency plans to protect the public health, safety, and environment on and off the project site in case of a major natural disaster such as an earthquake. The Applicant proposes the following measures for its detailed emergency plans that would be developed prior to project construction and operation to mitigate for potential hazards during an earthquake (Sagebrush Power Partners LLC 2003a, Section 7.2.9):

- Personnel would seek safety at the nearest protected location;
- Personnel would take cover to avoid any falling debris;
- All personnel would check the immediate area to identify injuries and equipment failures and report to the Site Construction Manager, O&M Manager, or designee;
- All personnel would be instructed to report to a protected area, as necessary, or would continue monitoring the operating equipment;
- A determination would be made about missing personnel and a search and rescue effort would be taken if safe and appropriate;
- If the conditions warrant, Kittitas County Emergency Communications Center and Bonneville or PSE (the electric transmission line operator) would be notified;
- Turbines would be shut down manually as required depending on the severity of the quake and brought back on-line after they have been cleared for restart;
- Off-duty personnel would report to the site, if they can, as designated in the emergency plan;
- If the structures are intact and other plant safety issues are under control, the O&M Manager would approve re-entry of personnel to any turbines for search and rescue efforts.

Volcanic Hazards

In the event of damage from a volcanic eruption, the project facilities would be shut down until safe operating conditions return. If an eruption occurred during construction, a temporary shutdown would most likely be required to protect equipment and human health (Sagebrush Power Partners LLC 2003a, Section 2.15.4).

The Applicant would prepare onsite emergency plans to protect the public health, safety, and environment on and off the project site in case of a major natural disaster such as a volcanic eruption. The Applicant proposes the following actions be taken to reduce potential impacts from a volcanic eruption (Sagebrush Power Partners LLC 2003a, Section 7.2.10):

- Close all O&M facility vents to prevent ash from entering buildings;
- Cover data processing equipment and computers not required for safe project operation or shutdown, and shut down other electronic equipment sensitive to dust;
- If the dust load is heavy enough, shut down the project facilities;
- If the conditions warrant, notify Kittitas County Emergency Communications Center and Bonneville or PSE (the electric transmission line operator);
- Determine if employees should be sent home immediately before roads become unsafe or if personnel must be sheltered onsite;
- Initiate ash cleaning operations by personnel wearing protective equipment;
- Coordinate all ash disposal activities with local Kittitas County officials.

Decommissioning Plans

During the EIS scoping process, a commenter requested that the costs of preparing and implementing a restoration plan for the reclamation (i.e., decommissioning) phase of development be bonded to or deposited with the state prior to project approval. The Applicant would provide adequate financial assurances to cover all anticipated costs associated with decommissioning the project, including the costs of preparing and implementing a restoration plan, in the form of a rolling reserve account using funds from the operation of the project, or a decommissioning surety bond. In all cases, final financial responsibility for decommissioning would rest with the Applicant (Sagebrush Power Partners LLC 2003a, Section 1.3.3). The specific process for funding the restoration plan has yet to be determined. However, this plan, and the process for its funding, would be developed and submitted to EFSEC for review and approval prior to project construction.

3.1.5 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts on earth resources are identified. Project design and implementation of the SWPPP, BMPs, onsite emergency plans, and other measures outlined above would minimize risks from erosion or natural hazards such as earthquakes and volcanic eruption.

3.2 VEGETATION, WETLANDS, WILDLIFE AND HABITAT, FISHERIES, AND THREATENED AND ENDANGERED SPECIES

This section discusses five elements: vegetation, wetlands, wildlife and habitat, fisheries, and threatened and endangered species. It discusses the affected environment, addresses potential impacts on these elements associated with the proposed project, and identifies mitigation measures designed to limit those impacts.

The vegetation and wetland sections discuss upland vegetation and wetland communities within the KVWPP area. Wildlife and habitat of the project site are discussed together because of the close interaction between these two resources. The fisheries section discusses freshwater habitat and potential fish use. The threatened and endangered species section addresses threatened and endangered plant, wildlife, and fish species that are regulated under the Endangered Species Act (ESA).

Within this section the term project area is used in reference to the approximately 5- by 3.5-mile area that includes all project-related activities. The term project site is used in reference to the actual locations within the project area where construction and operation activities would occur. A project vicinity map is shown on Figure 1-1. The project site is shown on Figure 2-1.

The analysis of existing conditions and potential effects resulting from the construction and operation of the proposed project is based on literature review, agency information, and onsite surveys conducted in 2002 and 2003 by the Applicant’s consultants. Information for this section is summarized primarily from the ASC (Sagebrush Power Partners LLC 2003a, Section 3.4 [Plants and Animals], Exhibit 8 [Rare Plant Report], Exhibit 9 [Project Habitat Map], Exhibit 11 [Wildlife Baseline Study], and Exhibit 12 [Biological Assessment]). Subsequent correspondence from the Applicant includes the April 13, 2003 Technical Memorandum, *Potential Stream Crossing for the Kittitas Valley Wind Power Project* (Sagebrush Power Partners LLC 2003c), the May 23, 2003 Technical Memorandum, *Kittitas Valley Wind Power Project Rare Plant Report Addendum #1* (Sagebrush Power Partners LLC 2003f), and the August 2003 *Joint Aquatic Resources Permit Application* (Sagebrush Power Partners LLC 2003i). Where additional sources of information have been used to evaluate the potential impacts associated with the proposed project, those sources have been cited.

3.2.1 Background

Methods

Extensive wildlife surveys were performed as part of the project analysis. Wildlife surveys performed for the project emphasized birds and big game. Point count and in-transit surveys were performed. Additionally, aerial surveys within approximately two miles of the KVWPP project area identified visible raptor nests. To estimate the number of wintering bald eagles in the project vicinity, transect surveys were performed by driving through the survey area. As part of the analysis for these surveys, results were compared to seven other wind development projects in the western United States. These projects include Buffalo Ridge (Minnesota), Foote Creek Rim (Wyoming), Klondike (Oregon), Nine Canyon (Washington), Zintel Canyon (Washington), Stateline (Oregon/Washington), and Vansycle (Oregon).

To identify and evaluate protected vegetation, wildlife species, and habitats, existing documentation and information were gathered from a variety of sources. The Applicant's consultants contacted the U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA) Fisheries (previously known as National Marine Fisheries Service), and the Washington Department of Fish and Wildlife (WDFW) to provide information on federal and state protected species that may occur in or near the project area. Information from the WDFW Priority Habitats and Species database and the Washington Department of Natural Resources (Washington DNR) Natural Heritage Program was reviewed regarding priority habitats and sensitive plant and wildlife species that may occur in or near the project area. A Biological Assessment (BA) prepared by the Applicant for the project was reviewed to provide information on threatened and endangered species identified by the USFWS and NOAA Fisheries as potentially occurring within the proposed project area. Shapiro and Associates, Inc. also consulted with WDFW to obtain their input and guidance on issues and concerns regarding plants, animals, and fisheries, and with Ecology to ensure concerns regarding wetland impacts are adequately addressed.

Federal Laws and Regulations

Section 7 of the federal ESA of 1973 (as amended) requires an analysis of the effects of major construction projects on any federally listed or proposed threatened or endangered species that may use the project area if there is a federal nexus. Consultation with the USFWS and NOAA Fisheries is necessary if any threatened or endangered species would be affected by a project. Applicable regulations are found in the Code of Federal Regulations (50 CFR 17).

The Migratory Bird Treaty Act (16 USC 703-711) prohibits the taking, killing, or possession of migratory birds except as allowed by the Secretary of the Interior. The list of migratory birds is found in 50 CFR 10, and permit regulations are found in 50 CFR 21.

The federal Bald Eagle Protection Act (16 CFR 668-668c) prohibits the taking, possession, purchase, sale, barter, transport, export, or import of any bald or golden eagle or any part, nest, or egg of a bald or golden eagle, except for certain scientific, exhibition, and religious purposes. Eagle permit regulations are found in 50 CFR 22.

State Laws and Regulations

Washington State fish and wildlife laws are contained in RCW 75 and 77, respectively. These titles contain several sections generally applicable to the environmental review process.

Fish and aquatic habitats are protected under RCW 75.20, commonly referred to as the Hydraulic Code. Any environmental impacts that could occur in waters of the state below the ordinary high water mark would need to be addressed in a Hydraulic Project Approval process.

Bald eagles and protection of their habitat are addressed in RCW 77.12.650 and 77.12.655. Any taking of protected wildlife, which includes destroying eggs and removing raptor nest trees, is prohibited under RCW 77.16.120.

3.2.2 Affected Environment

Vegetation

Vegetation communities within the KVWPP site consist primarily of sagebrush and grasslands. There are riparian zones along ravines and lithosols (shallow soils) communities along ridgetops. The higher portions of the project area border the ponderosa pine zone (Franklin and Dyrness 1988).

The KVWPP is located at the eastern base of the Cascade Mountain range, at the western edge of the Columbia Basin physiographic province (Franklin and Dyrness 1988). This lowland province, surrounded on all sides by mountain ranges and highlands, covers a vast area of eastern Washington, and extends south into Oregon. The province is characterized by moderate topography incised by a network of streams and rivers that empty into the centrally located Columbia River.

The project is at the western edge of the Central Arid Steppe zone defined by the Washington State Gap Analysis (Cassidy et al. 1997). Their classifications for Eastern Washington steppe vegetation closely follow Daubenmire (1970). The Central Arid Steppe zone typically contains plant communities dominated by big sagebrush (*Artemisia tridentata*), bluebunch wheatgrass (*Pseudoroegnaria spicata* previously *Agropyron spicatum*), and Sandberg's bluegrass (*Poa secunda*). In many areas of the zone, the introduced species cheatgrass (*Bromus tectorum*) is common due to past and present disturbance factors (Cassidy et al. 1997).

Franklin and Dyrness (1988) also describe a number of plant associations that occur on lithosols within the shrub-steppe region. These specialized habitats within the Columbia Basin province are particularly important for the purposes of this investigation because lithosolic habitats occur commonly on the ridgetops within the project area. They are habitats with shallow stony soils over bedrock. Daubenmire (1970) recognizes a variety of lithosolic plant associations. All are typically composed of a uniform layer of Sandberg's bluegrass, over a crust of mosses and lichens, with a low shrub layer above. The primary difference in these communities is in the composition of the shrub layer. Within the project area, the shrub layer on these lithosols is principally composed of several different buckwheat (*Eriogonum*) species.

Specialized habitats such as lithosols occur throughout the region, although the extent of this habitat has not been quantified at a regional scale. Lithosols are of concern at the project site because they are a specialized subdominant habitat with unique characteristics and are both sensitive to disturbance and difficult to replace. The project site's lithosol areas are typically in "good" condition. Lithosols present in the surrounding region are likely to be of comparative quality because of similar land uses such as development and cattle use. The above descriptions of generalized vegetation zones and associations are based on climax communities, which typically develop over time in the absence of disturbance. Within the project area (as in most of the shrub-steppe region) many of the plant communities have been significantly modified due to numerous disturbance factors. Disturbance is especially pronounced in the valley bottoms and side slopes. Cattle grazing, wildfire frequency changes, introduction of exotic plant species, ground disturbance from development activities, and a host of other factors have resulted in plant communities that are kept at an early- to mid-seral stage of development. In addition, natural disturbance factors, such as lightning, have also affected the communities. Non-native aggressive invader species are common, and often dominate the community. Within the project area, the effects of these disturbances are common, although most of the communities are still dominated by native species. In many places, however, cheatgrass and bulbous bluegrass (*Poa bulbosa*) dominate the grass layer, and noxious weeds, such as diffuse knapweed (*Centaurea diffusa*), are common.

Several riparian areas associated with springs, seeps, and creeks also are present in the project area. These habitats are typically degraded from heavy cattle use, and much of the riparian vegetation has been removed. Common native riparian associates include chokecherry (*Prunus virginiana*), golden currant (*Ribes aureum*), various rush species (*Juncus* spp.), various speedwell species (*Veronica* spp.), and yellow monkeyflower (*Mimulus guttatus*).

Table 3.2-1 describes the general cover types and habitat conditions found along the proposed turbine string ridgetops. In addition, a habitat map for the entire project area is shown on Figure 3.2-1.

In the habitat descriptions that follow, ratings of habitat quality are based on general observed patterns of plant community composition, amount of non-native species, and overall vegetative structure. The habitat ratings are qualitative based on direct visual observations.

Expected community composition was based on past experience with similar habitats, and on tables and descriptive information presented in Daubenmire (1970) and Franklin and Dyrness (1973). When all or most of the characteristic plant species that would be expected in a particular association were present (at close to expected densities), the area was considered to have "good" community composition. The species to be expected in a particular area vary based on the plant association present. For example, good condition lithosol ridgetops would be expected to contain a very different species assemblage than a good condition riparian streambank. Conversely, where few or none of the expected characteristic species were present, the area was considered to have "poor" community composition. Poor community composition was most often observed in areas

Figure 3.2-1

where one or more weedy invaders had overtaken some (or all) of the native species. The amount of non-native species in an area was based on informal visual estimates of non-native cover. It was necessary to take into account the overall area being evaluated because small, dense patches of non-native species were present in some areas. For example, in some larger areas that were relatively weed-free overall, heavy weed densities were present along the road shoulders (Sagebrush Power Partners LLC 2003c).

Table 3.2-1: Summary of Habitats Associated with the Proposed Turbine Strings of the Project

Facility	Habitat Description
Turbine String A	Shallow-soiled lithosol alternates with deeper-soiled shrub-steppe habitat. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils.
Turbine String B	The north half of this string is located on a mosaic of shallow-soiled rocky areas and deeper-soiled shrub-steppe habitat. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. Various limited ground and vegetation disturbance has occurred here from recreational activities (gun club). One noxious weed population was observed along a jeep trail that runs along this section of the proposed string. The south half of this string contains the same mosaic of shallow and deeper soils, however, a fire within the last 10 years has removed most of the shrubs, and the habitat now consists of a mix of native and non-native grasses and forbs, with widely scattered small shrubs. Habitat quality is generally fair. Weedy species are more common in the deeper-soiled areas, and several populations of noxious weeds are present.
Turbine String C	Shallow-soiled grassland and lithosol alternates with deeper-soiled shrub-steppe habitat. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils.
Turbine String D	The north half of this string is similar to String C with alternating lithosols and deeper-soiled habitats in generally good condition. The south half of this string is a continuation of the same deeper-soiled shrub-steppe habitat.
Turbine String E	This string consists mainly of deeper-soiled shrub-steppe habitat, with inclusions of shallow-soiled lithosol in the north half, and small patches of non-native species throughout. Much of the habitat in the string is in fair to good condition (i.e., dominated by native shrubs and forbs, and a mix of native and non-native grasses), although some areas have been burned recently, and one noxious weed population is present along the jeep trail, which runs the length of the ridgetop.
Turbine String F	This string contains mainly shallow-soiled lithosols, with some areas of deeper-soiled shrub-steppe in the south half. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. However, a large gravel pit operation at the north end of this string has completely displaced the lithosol habitat in that area. A rough jeep trail runs the length of this proposed string.

Table 3.2-1: Continued

Facility	Habitat Description
Turbine String G	This string consists almost entirely of shallow-soiled lithosol habitat, with small areas of deeper-soiled shrub-steppe and deciduous thicket habitats in the north half and at the south end. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. Two noxious weed populations were observed, one along a road at the north end of the string, and another in a small draw near the south end of the string. A well-developed jeep trail is present along the north half of the corridor.
Turbine String H	This string also consists almost entirely of shallow-soiled lithosol habitat, with areas of deeper-soiled shrub-steppe habitat at the north end, midpoint, and the south end. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. However, there are two areas of major soil disturbance (blading) near the midpoint of the string, where the lithosol species have been largely replaced by non-native forbs and grasses. In addition, three populations of noxious weeds were observed along this string, near roads. Finally, one portion of the lithosol in the south end shows signs of heavy livestock use, although native plants continue to dominate. A well-developed two-lane gravel access road runs the length of this ridgetop, providing access for local landowners.
Turbine String I	This string consists primarily of shallow-soiled lithosol habitat, although portions of the middle section, and the entire southern tip, contain deeper-soiled shrub-steppe habitat, as well as small inclusions of grassland. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. However, the areas of grassland are only of fair quality; they are dominated by non-native grasses and forbs, and one noxious weed population was observed at the south end of the string.
Turbine String J	The south half of the string is located mainly on deeper-soiled shrub-steppe habitat, with one area of shallow-soiled lithosol. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. However, the south tip of the string consists of fair quality, shallow-soiled grassland dominated by non-native grasses and forbs. Two populations of noxious weeds were observed in this half of the string. The north half of this string contains the same general pattern of shallow and deeper soils; however, a fire within the last 5-10 years removed most of the shrubs, and the deeper-soiled habitat now consists of a mix of native and non-native grasses and forbs, with widely scattered small shrubs. Although overall habitat quality is fair, several small inclusions of generally good quality lithosol are present in this half of the string.
Intervening Facilities (access roads, electric lines, O&M facility, etc., located between turbine strings)	More than 40% of the potential project impact corridors are located off of the ridgetops, between the turbine strings. Primarily, these are connecting facilities such as access roads and electrical lines, but this percentage includes O&M areas also. These non-ridgetop habitats are typically deeper-soiled, and are generally more degraded from past disturbance than the ridgetop habitats. This is especially true in the valley bottoms, where cattle grazing and road impacts have created large areas dominated by non-native invader species. Overall, the non-ridgetop habitats within the impact corridors are in fair condition. However, habitat quality ranges from poor in many of the valley bottoms, to good on some of the canyon slopes.

Source: Sagebrush Power Partners LLC 2003a.

The following categories were used to describe habitat condition: "Excellent" (good community composition with negligible amounts of non-native weedy species, along with good vegetative structure); "Good" (fair to good community composition, dominated by native plants, although with significant inclusions of non-native species in certain areas, and fair to good vegetative structure); "Fair" (fair community composition, with non-native species dominance or co-dominance in some or all layers, and fair vegetative structure); and "Poor" (poor community composition, dominated by non-native, weedy invaders in some or all layers, and poor vegetative structure) (Sagebrush Power Partners LLC 2003c).

Habitat quality within the project area ranges from poor in many of the valley bottoms, to good along some of the ridgetops and flats. Generally, the ridgetop habitats are in fair to good condition. More specifically, the ridgetop lithosols are typically in good condition, containing a relatively intact vegetative structure and few non-native species. The deeper-soiled ridgetop habitats are generally in fair condition, with certain areas dominated or co-dominated by non-native species in the grass layer.

The Applicant proposes to purchase and protect an approximately 550-acre area as a habitat mitigation site. The site is located between proposed turbine strings B and C (Sections 22 and 27, Township 19 North, Range 17 East, WM) and is adjacent to land owned by the Washington DNR. The mitigation parcel consists of two north-south trending ridges, with an unnamed creek and associated canyon running between them. Within the parcel, five different cover types have been mapped: moderately dense shrub-steppe (278 acres), sparse shrub-steppe (74 acres), grassland (189 acres), riparian tree (8 acres), and deciduous scrub thicket (2.8 acres). There are also several small inclusions of lithosol habitat on the eastern ridge. These are in good condition, dominated by native bunchgrasses (primarily Sandberg's bluegrass), as well as native forbs and low shrubs. Although high concentrations of noxious weeds were not found within the parcel, scattered patches and individuals (primarily diffuse knapweed [*Centaurea diffusa*]) are present throughout. Overall, the habitat quality in this parcel is in fair to good condition.

Wetlands

Wetlands within the KVWPP project area are rare and consist primarily of ephemeral areas within the riparian zone of ravines. Within or near the project site two potential wetlands were identified using the methods provided in the *U.S. Army Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Washington State Wetland Identification and Delineation Manual* (WIDM) (Ecology 1997).

Wetlands within or near the project site were delineated in April 2003. Using these methods, vegetation, soil, and hydrologic parameters were examined for wetland characteristics.

A technical memorandum identifying potential stream channels within the project site was prepared as part of the project analysis (Sagebrush Power Partners LLC 2003c). This memorandum included wetlands in its analysis. The final determination of jurisdictional status is at the discretion of the regulatory agencies. For consistency, the numbering system used in the technical memorandum is also used in this discussion. Potential wetlands locations (as well as stream crossings, discussed below under "Fisheries") are shown on Figure 3.2-2.

Potential wetland area A-1 is a nearly flat drainage basin located downslope of a man-made pond. An earthen berm had evidence of water seeping through a low swale and across Hayward Road to the southeast. A dirt road already crosses the area near the proposed access road. There was little water flow, but there were wet holes up to 3 feet wide and 6 inches deep in places. The weather ten days prior to the survey was seasonally cool and damp. The ground was damp in the lowest areas of the ravine and there was some wetland vegetation. Some characteristics of wetland hydrology and vegetation were present. Although this site marginally meets the definition of wetland, and might be determined by the agencies to be non-jurisdictional, for the purposes of evaluating all potential wetland areas, this area is now assumed to be jurisdictional waters.

Wetland S-1 is near the location of the proposed PSE substation and in the vicinity of an NWI-mapped wetland. The wetland is a large stock pond with earthen impoundments. A culvert takes high water from Dry Creek to flood the pond. Stock use, and perhaps rapid seasonal drainage, restrict vegetation at the pond.

Wildlife and Habitat

The project area consists primarily of long north-south trending ridges. Between the ridges are ephemeral and perennial creeks that flow into the Yakima River, which is located south of the project area. Slopes within the project area are generally less than 20 degrees but can reach 40 degrees or more in some of the valley bottoms. Elevations in the project area ranges from about 2,200 feet along US 97, to about 3,150 feet at the top of String G (Figure 2-1). Most of the project site would be located on areas of exposed ridgetops.

Vegetation communities associated with the project area are described in the Vegetation section above and are shown on the project habitat map (Figure 3.2-1). Table 3.2-1 describes the cover types and habitat conditions found within the project area. Vegetation communities are described in this section in the context of wildlife habitat.

Habitats within the proposed project area include a variety of vegetation communities, including: grassland, shrub-steppe, sagebrush, coniferous forest, deciduous tree and shrub, riparian, and developed areas. Lithosol habitat within the project area is included as a sub-category of the grassland, sagebrush, and shrub-steppe vegetation communities. As described in Table 3.2-1 and shown on the project habitat map (Figure 3.2-1), some of these vegetation communities have been characterized in even further detail. For example, conifer forests are identified as two vegetation cover types, dense and sparse. Shrub-steppe habitat is defined as three cover types, sparse, moderate, and dense. Overall, grassland, shrub-steppe, and sagebrush vegetation communities comprise a significant majority of habitat types within the project area and within the project site. Coniferous forest within the project area includes a relatively small area to the northwest where the perimeter of a ponderosa pine forest is located (Figure 3.2-1).

Habitat types within the proposed project area are not regionally unique (Daubenmire 1970; Franklin and Dyrness 1988; Cassidy et al. 1997; Johnson and O'Neil 2001). Coniferous forest within and near the project area does not include stands of old-growth forest habitat. East of the Cascade mountain range, shrub-steppe communities extend from the northern border of Washington to the southern border of Oregon (Johnson and O'Neil 2001). Within about 50 miles east and south of the proposed project area there are several large areas of protected grassland, shrub-steppe, and sagebrush vegetation communities (the Colockum, Quilomene, and L.T. Murray wildlife areas and the Yakima Training Center) (WDFW 2003g).

WDFW maintains a database of species and habitats identified as priorities for management and preservation. A priority habitat is defined as a habitat type with unique or significant value to many species (WDFW 1996a). Priority habitat within the WDFW south-central region, which includes Kittitas County, includes stream, riparian, freshwater wetlands, and shrub-steppe habitats. These areas may or may not be regulated depending on the presence or absence of certain wildlife or plant species (e.g., threatened or endangered) or the significance of these areas in providing habitat requirements. Stream, riparian, freshwater wetlands, and shrub-steppe habitats occur within the project area. WDFW has only developed management recommendations for riparian habitats (WDFW 2003h).

Much of the shrub-steppe and grassland habitat in Eastern Washington has been converted to agricultural and grazing uses. According to WDFW (1996b), 323,946 acres of shrub-steppe habitat exist in Kittitas County compared to the historical total of 581,164 acres. Fragmentation of shrub-steppe habitat has likely lowered the suitability of Washington's shrub-steppe habitat for many native species (WDFW 1996b). Generally, as described below, wildlife species documented within the project area are relatively common and widespread in similar habitats in Washington (Ingles 1965; Nussbaum et al. 1982; Leonard et al. 1993; Brown et al. 1995; and Washington Ornithological Society 2003).

Riparian habitat associated with streams and seeps in the project area occur in low topographic areas between ridges. Riparian habitat in the project area is typically degraded from heavy cattle use. Much of the riparian vegetation has been removed and nonnative invasive species are growing in many of these disturbed areas. Stream channels in the project area, as described below in the Fisheries section, have intermittent flow during the year. Riparian systems associated with streams with year-round flows are generally considered to provide higher quality habitat for wildlife species that rely on aquatic habitat for breeding and foraging.

Developed areas within the project area include numerous unpaved roads and trails that range from all-weather gravel roads to bare-ground trails. Communication antenna clusters and transmission line corridors are located at several points within the project area. US 97 parallels the proposed turbine strings in the eastern portion of the project area and SR 10 runs along the Yakima River, south of the project area.

Following is a general description of wildlife species observed during field surveys. A comprehensive list of avian species observed during field surveys is provided in Appendix A, Table A-1.

Figure 3.2-2

A variety of native birds, mammals, and reptiles are expected to inhabit habitats in the project area and surrounding vicinity. Amphibians and other bird, mammal, and reptile species that rely on aquatic habitat for breeding and foraging are less likely to occupy the project area due to the lack of wetland habitat and relatively low quality riparian habitat. Wildlife diversity is generally related to the structure and plant species composition within vegetative communities. Wetlands and forested areas with well-developed vegetation layers are likely to support the greatest number of species and populations of wildlife (Brown 1985; Johnson and O'Neil 2001). Even-aged forest stands generally provide less diversity than mature mixed-aged forested areas.

As described above in the vegetation section, shrub-steppe, grassland, and sagebrush habitats in the project area are generally considered "fair" to "good" based on the plant community composition, the amount of non-native species, and overall vegetative structure. Grassland, shrub-steppe, and sagebrush habitats within the project area do not provide conditions typically associated with high-quality habitat for wildlife because of degraded conditions associated with current and historical grazing practices and the presence of non-native invasive species.

Compared to forested habitat, the low vertical structure diversity in grassland, shrub-steppe, and sagebrush habitats provides fewer habitat layers for wildlife, resulting in lower species diversity. Habitats with a shrub component generally have more diverse wildlife communities than grass-dominated habitats due to increased potential nesting and foraging areas. For example, there are 49 wildlife species closely associated with quality shrub-steppe habitat whereas there are only 34 species associated with quality grassland habitat. Habitats dominated by native plants have more species diversity than habitats dominated by non-native invasive plant species (Johnson and O'Neil 2001).

Shrub-steppe communities are characterized by a relatively small number of breeding bird species. Many species observed in shrub-steppe habitat breed in other habitats and are identified as they forage or migrate through the shrub-steppe habitat (Johnson and O'Neil 2001).

Mammal species diversity in shrub-steppe habitats is lower than in more structurally complex habitats such as forested areas. For example, 40 small mammal species are closely associated with forested habitats of Washington and Oregon, whereas 20 small mammal species are closely associated with shrub-steppe habitat (Johnson and O'Neil 2001).

Of the 32 amphibian species documented in Washington and Oregon, 10 are closely associated with shrub-steppe habitat. Compared to bird, mammal, and amphibian species, reptile diversity in shrub-steppe habitats is relatively high. Twenty-one of 28 reptile species in Washington and Oregon are closely associated with shrub-steppe habitats.

Birds

A total of 97 avian species were identified during the surveys and other site visits (Sagebrush Power Partners LLC 2003a, Section 3.4 and Exhibit 11). Passerines were the most abundant avian group observed. Passerines species documented during surveys include aerial feeders such as swifts and swallows and gleaners including warblers, vireos, chickadees, kinglets, and sparrows. Passerine species use diverse habitats and occupy a variety of foraging and nesting niches. Passerine species typically nest and forage in wetlands, forest stands, riparian habitats, and within snags or duff created by decaying logs. Species of sparrows, finches, and grosbeaks observed during the surveys typically are associated with forest-edge habitat. Cumulatively, four passerines, American pipit (*Anthus rubescens*), American robin (*Turdus migratorius*), horned lark (*Eremophila alpestris*), and western meadowlark (*Sturnella neglecta*), composed 47% of the observations. No other species individually accounted for more than 5% of the observations.

Several species of woodpeckers, including northern flicker (*Colaptes auratus*), Lewis' woodpecker (*Melanerpes lewis*), and downy woodpecker (*Picoides pubescens*) were observed. These species rely on conifer forest stands with snags in varying stages of decay that provide habitat for nesting, foraging, and food caching.

The next most abundant avian group varied by season, with corvids (crows, ravens, and jays) higher in spring and fall, and raptors more prevalent in summer. Raptor species observed during the surveys include American kestrel (*Falco sparverius*); bald eagle (*Haliaeetus leucocephalus*); golden eagle (*Aquila chrysaetos*); turkey vulture (*Cathartes aura*); northern goshawk (*Accipiter gentilis*) red-tailed (*Buteo jamaicensis*), rough-legged (*Buteo lagopus*), sharp-shinned (*Accipter striatus*), and Cooper's hawks (*Accipiter cooperii*); and great horned owl (*Bubo virginianus*). These species inhabit dense coniferous and deciduous forests, foraging in open areas associated with wetlands, meadows, grasslands, riparian, and open water habitats. Most of the raptor species forage on small mammals. The most common raptor species observed were red-tailed hawks and American kestrels. Approximate bald eagle perches and raptor nest locations are shown on Figures 3.2-3 and 3.2-4, respectively.

Observed upland game birds include blue grouse (*Dendragapus obscurus*), ruffed grouse (*Bonasa umbellus*), California quail (*Callipepla californica*), and gray partridge (*Perdix perdix*).

Bird species unique to shrub-steppe habitats, such as sage thrasher (*Oreoscoptes montanus*) and sage grouse (*Centrocercus urophasianus*), were once common but are now in decline (Ritter and Paige 2000; Christensen 2000; Washington Department of Wildlife 1993). Sage thrasher was observed during project surveys. Sage grouse was not observed (Sagebrush Power Partners LLC 2003a, Section 3.4 and Exhibit 11).

Avian species observed during the surveys are known to occupy and/or breed in similar habitats in Washington and are generally common and widespread in Kittitas County and Eastern Washington (Washington Ornithological Society 2003).

Figure 3.2-3

Figure 3.2-4

Amphibians and Reptiles

Reptiles observed during the field studies included rubber boa (*Charina bottae*), Great Basin gopher snake (*Pituophis catenifer deserticola*), Northern Pacific rattlesnake (*Crotalus viridis oreganus*), and short-horned lizard (*Phrynosoma douglassii*). An amphibian chorus heard during spring surveys was identified as likely to be one of the true frog species (e.g., Cascade frog, *Rana cascadae*). Reptile and amphibian species observed during the surveys are known to occupy and/or breed in similar habitats in Washington and are generally common and widespread in Kittitas County and Eastern Washington (Nussbaum et al. 1982; Leonard et al. 1993; Brown et al. 1995).

Mammals

Field surveys confirmed the presence of mule deer (*Odocoileus hemionus*), elk (*Cervis elaphus*), and American pika (*Ochotona princeps*). Mule deer were frequently observed throughout the project area. Large groups and individuals of elk were observed near the northern points of the project area. American pika was heard regularly on the talus slopes in the western portion of the project area.

Based on the WDFW Priority Habitat and Species database, the project area is located adjacent to elk winter range, more than 3 miles southeast of elk calving areas, and more than 2 miles from the Quilomene elk migration corridor (Sagebrush Power Partners LLC 2003a, Exhibit 11). The project area is located within mule deer winter range. The boundaries of these features are shown on Figure 3.2-5.

Cover is an important component of elk wintering and calving habitat. Elk are grazers and concentrate browsing activity on shrubs and small-stature trees when grasses are not available. Elk rely on river bottom, floodplain, riparian, and forested upland habitats for wintering, calving, and migration (WDFW 2003c).

Elk and mule deer in the project area primarily occupy the grassland, shrub-steppe, and riparian corridor habitats. Fragmentation associated with existing human activity within the project area has likely reduced the quality of potential winter range. US 97, which accommodates an average of 2,200 vehicles a day, runs through the project area. Bettas and Hayward roads each serve approximately 20 vehicles per day.

The potential for bats to occur is based on key habitat elements such as food sources, water, and roost sites. Potential roost structures such as trees occur along drainages and riparian areas within the project area. Water resources associated with drainages in the project area may be used as foraging and watering areas, although flows in these drainages are intermittent. Little is known about bat species distribution, but several species of bats could occur in the project area according to the Washington Gap Analysis (WDFW n.d.).

Figure 3.2-5

Other mammals that likely exist within the project area include badger (*Taxidea taxus*), coyote (*Canis latrans*), pocket gopher (*Thomomys mazama*), bobcat (*Lynx rufus*), and other small mammals such as rabbits, voles and mice. Mammal species identified above are known to occupy and/or breed in similar habitats in Washington and are generally common and widespread in Kittitas County and Eastern Washington (Ingles 1965). Mammal species unique to shrub-steppe habitats, such as pygmy rabbit, which were once common, are now in decline (Ritter and Paige 2000; Christensen 2000; Washington Department of Wildlife 1993).

Wildlife Migration

The proposed project area does not currently support large congregations of mule deer or elk but is within an area considered winter range for these species (WDFW 2002). The project area is located within portions of the Lauderdale, Ellensburg, and SR 10 Mule Deer Wintering Areas and the Lookout Mountain Elk Winter Area. During the winter months, an influx of mule deer and elk move from the surrounding mountains to the west and north into these winter areas. Based on the information in the WDFW Priority Habitats and Species database, it is estimated that between 200 and 400 mule deer and 50 elk winter in these areas. No distinct migration routes have been identified within the project area. The Quilomene Elk Migration Corridor is located north and east of the project area (WDFW 2002). It is likely that wintering mule deer and elk move in from surrounding areas through undeveloped tracts of land.

Reptiles and amphibians are present in the project area and may be concentrated in areas of suitable habitat (e.g., wetlands). No migration corridors for reptiles or amphibians are known to be present in the project area. Many amphibians migrate short distances during spring or fall breeding periods to and from suitable wetlands and during fall dispersal of juveniles.

The project area is located within the Pacific Flyway, one of four principal north-south bird migration routes in North America. Bounded roughly by the Pacific Ocean and the Rocky Mountains, the Pacific Flyway extends from the Arctic regions of Alaska and Canada to Central and South America. Within the flyway, certain groups of birds may travel along narrower migration corridors, with more well-defined paths.

The project area location along the east flank of the Cascades places it within possible migration corridors of several bird species, and the Yakima River riparian corridor south of the project area may also be used by migrating songbirds. The river provides a distinct geographic visual cue to migrating birds and provides resting habitat for waterfowl. Riparian habitat along the river provides resting and foraging habitat for songbirds and raptors.

Passerine use of the project area documented during the project surveys was highest in the spring and fall compared to summer, suggesting some migrant use during the migration seasons. Overall, raptor use was relatively similar in the spring and summer periods, and slightly lower in the fall. Accipiter use, Cooper’s hawk, northern goshawk, and sharp-shinned hawk, was highest in the spring, likely due to migrant hawks returning or passing through from wintering grounds.

Waterfowl occasionally were observed during the surveys within the project area (Table A-1, Appendix A). Waterfowl use is expected to be higher south of the project area near the Yakima River. Some waterfowl use can be expected associated with drainages within the project area and along Swauk Creek to the west of the project area (WDFW 2002).

Some species of bats may also migrate through the project area. At least two species of bats, hoary bat (*Lasiurus cinereus*) and silver-haired bat (*Lasonycteris noctivagans*), are known to migrate through Washington. Other species such as little brown bat (*Myotis lucifugus*) and big brown bat (*Eptesicus fuscus*) may make localized short-distance migrations to suitable hibernacula sites (e.g., caves, mines). Bats typically migrate at night, and are most frequently observed migrating during August and mid-September.

Fisheries

Based on the literature review, there are no fish-bearing aquatic resources located within the project area. Potential fish habitat within the project area is limited to low topographic areas between ridges. The WDFW Priority Habitat and Species database does not identify any fish-bearing streams within the project area. The nearest fish-bearing aquatic resources include the Yakima River, located more than 0.5 mile south of the project area, and Swauk Creek located more than 0.5 mile west of the project area. Within the project area, low topographic areas between ridges contain stream channels and seeps that flow into the Yakima River (Figure 3.2-1). These streams are small, narrow channels with intermittent flows that do not provide habitat for resident or anadromous fish.

A technical memorandum identifying potential stream channels within the project site was prepared as part of the project analysis (Sagebrush Power Partners LLC 2003c). The investigation was performed in April 2003. This report identified areas within the project site with characteristics that would possibly be classified as jurisdictional waters of the United States (well-defined banks, streambed, and evidence of hydrology). This report identified six areas with these characteristics that occur within or adjacent to elements of the proposed project. The final determination of jurisdictional status is at the discretion of the regulatory agencies.

Characteristics of potential stream channels are summarized in Table 3.2-2. Potential stream channel crossings were numbered in the technical memorandum based on the letter of the nearest turbine string. For consistency, the numbering system used in the technical memorandum is also used in this discussion. Potential stream channel crossing locations, as identified in the technical memorandum, are shown on Figure 3.2-2.

Table 3.2-2: Characteristics of Potential Stream Channel Crossings within the Project Area

Stream Channel	Flow	Characteristics	Location
Stream I-1	Intermittent	6 inches deep and 6 feet wide, evidence of periodic flooding at higher levels was observed, no flow during investigation, substrate coarse gravels and cobbles	Located on an existing road in the southern portion of the project area.
Stream G-1	Intermittent	1 inch deep and 12 inches wide, no flow during investigation, a culvert that drains the ravine below US 97 had a high-water stain of 6 inches	A ravine ascending northwest from US 97 near a proposed access road to the G turbine string.
Stream H-1	Intermittent	6 feet wide and 18 inches deep, flow in the channel was 6 inches deep, well-defined stream bed and stream banks	Near a proposed access road in the northern segment of the project area.
Stream I-2	Intermittent	2 feet wide and 6 inches deep, flow in the channel was 3 inches deep	In the valley to the east of Stream H-1.
Stream J-1	Intermittent	4 feet wide and 6 inches deep, flow in the channel was 2 inches deep, degraded due to livestock activity and the presence of a variety of noxious weeds adjacent to the stream	East of Stream I-2 in the northeast portion of the project area.
Stream J-2	Intermittent	6 feet wide and 12 inches deep, no flow during investigation	Approximately 0.5 mile downslope of Stream J-1.

Source: Sagebrush Power Partners LLC 2003c.

Rivers and streams in Kittitas County are classified according to the Washington State stream typing system, as defined in Chapter 222-16-030 WAC. Ecology and the Washington DNR recognize the WAC stream typing system.

The following paragraph is taken from the WAC (222-16-030):

> (5) "Type 5 Waters" means all segments of natural waters within the bankfull width of the defined channels that are not Type 1, 2, 3, or 4 Waters. These are seasonal, nonfish habitat streams in which surface flow is not present for at least some portion of the year and are not located downstream from any stream reach that is a Type 4 Water. Type 5 Waters must be physically connected by an above-ground channel system to Type 1, 2, 3, or 4 Waters.

Based on existing fish utilization and habitat characteristic information, streams within the project area would be classified as Type 5 Waters according to guidelines established in Chapter 222-16-030 of the WAC. The streams do not support fish populations, do not have surface flow during portions of the year, and are not located downstream of a Type 4 Water (WAC 222-16-030). A Type 5 Water is the smallest stream classification according to the Washington State stream typing system. The Kittitas County Critical Areas Ordinance (Chapter 17A) does not have protective buffer requirements for Type 5 systems. Buffer requirements for Type 4 systems are 10 to 20 feet.

Threatened and Endangered Species

Section 7(c) of the ESA of 1973 requires an analysis of the effects of construction projects with a federal nexus (permits, funds, land) on any federally listed or proposed threatened or endangered species that may use the project site. Consultation with USFWS and NOAA Fisheries is necessary if any threatened or endangered species would be adversely affected by the project. Applicable regulations are found in 50 CFR 17. The ESA does not protect candidate species and species of concern, but if a species were to be elevated to the proposed, endangered, or threatened category once the project had begun, additional analysis would be required to determine the project's potential effects on that species.

A BA prepared for the project in 2002 was reviewed to provide information on threatened and endangered species documented as potentially occurring near the proposed project site (Sagebrush Power Partners LLC 2003a, Exhibit 12). Plant, wildlife, and fish species identified by USFWS, NOAA Fisheries, and/or WDFW as likely to occur in the project vicinity are discussed below.

Plant Species

Two rare plant investigations were conducted in the project area in 2002 and in 2003. The survey corridors and findings of these two investigations are described below.

The first investigation was conducted in the spring-summer of 2002. This investigation began with a pre-field review of existing data to determine the rare plant species with potential for occurrence in the project area. Target species included all USFWS endangered, threatened, proposed, or candidate plant species, as well as all Washington State endangered, threatened, sensitive, and review plant species. The pre-field review identified 38 rare plant species that had the potential to occur in the project area, as shown in Table A-2 in Appendix A.

Three field surveys of the project area were performed (April, June, and July 2002) to determine the presence of target species. The survey corridors included all land within 50 meters of proposed project facilities (e.g., turbine strings, access roads, staging areas, etc.) as defined through July 2002. The 2002 rare plant field surveys did not locate any federal endangered, threatened, proposed, or candidate plant species.

Marginal potential habitat was found for one federally listed species, Ute ladies'-tresses (*Spiranthes diluvialis*), in several of the project area riparian zones. However, the project area is west of the species' known range, and the habitat at these sites was degraded due to past disturbance. Both these factors greatly reduced the potential for occurrence of Ute ladies'-tresses.

Marginal potential habitat was found for one federal candidate species, basalt daisy (*Erigeron piperianus*). Although basalt daisy is typically restricted to the extensive cliffs along the Yakima River and Selah Creek, all cliffs within the project area were searched intensively for the presence of the species with negative results. Marginal potential habitat was also found within the study area for a number of federal species of concern. These include Columbia milkvetch (*Astragalus columbianus*), Hoover's desert-parsley (*Lomatium tuberosum*), least phacelia (*Phacelia minutissima*), Seely's silene (*Silene seelyi*), and Hoover's tauschia. In all cases, where potential habitat was found for these species, the area was searched carefully, with negative results.

Likewise, the field surveys did not locate any plants listed as endangered, threatened, or sensitive by Washington State. Potential habitat, however, was found for several of these species throughout the project area. These habitats were searched thoroughly for the presence of the target species, but none was found.

One species that was recently removed from the Washington State review list was found within, or immediately adjacent to, the project area. The species, white-margined knotweed (*Polygonum polygaloides* ssp. *kelloggii*), was found in the project area in vernally moist draws and swales. However, since the original 2002 rare plant survey was conducted, white-margined knotweed has been dropped from the Washington Natural Heritage Program (WNHP) list.

Subsequent changes to the project layout resulted in siting proposed facilities in areas that were not covered during the original 2002 rare plant surveys. To adequately evaluate project-related rare plant impacts, additional field surveys were conducted in May 2003. Overall, 331 acres of ground were surveyed in May 2003 along a 50-meter buffer corridor (Sagebrush Power Partners LLC 2003f).

The 2003 field surveys did not locate any USFWS endangered, threatened, proposed, or candidate plant species. Marginal potential habitat was found, however, for a number of Federal 'Species of Concern'. These include Columbia milkvetch, Hoover's desert-parsley, least phacelia, and Seely's silene. In all cases, where potential habitat was found for these species, the area was searched carefully, with negative results.

The field surveys did not locate any plants listed as endangered, threatened, sensitive, extirpated, or review by the WNHP. However, potential habitat was found for a number of these species throughout the project area. These habitats were also searched thoroughly for the presence of the target species, but none was found.

<u>Wildlife and Fish Species</u>

Table 3.2-3 presents a list of 55 wildlife and fish species (26 bird, 14 mammal, 2 reptile, 6 amphibian, and 7 fish) with federal and/or state status identified by USFWS, NOAA Fisheries, and/or WDFW as potentially occurring near or within the project area. Of these 55 species, seven species are federally listed threatened or endangered species, and as such are currently protected under the ESA. Five species on Table 3.2-3 with state monitor status were not identified during the agency review as potentially occurring near or within the project area. However, these species are included in the table because they were documented during avian surveys. Table 3.2-4

identifies any documented use in the project area and/or surrounding area, and the potential for use of the project area of all wildlife and fish species with federal and/or state status.

Species are identified as likely, possibly, or unlikely to occur in or near the project area. All seven fish species are identified as not occurring in the project area due to the lack of potentially suitable fish habitat. Species are identified as unlikely to occur due to limited potential habitat or because the project area is located outside the periphery of the known species distributions. Species are identified as possibly occurring if potential habitat is available but individuals have not been documented in or near the project area. Species that have been documented in or near the project area are identified as likely to occur.

Twenty-two species (10 bird, 8 mammal, and 4 amphibian) are identified as unlikely to occur due to limited potential habitat or because the project area is located outside the periphery of the known species distributions. Thirteen species (3 bird, 6 mammal, 2 reptile, and 2 amphibian) are identified as possibly occurring because potential habitat is available but individuals have not been documented within the project area vicinity. Thirteen bird species documented in the project area vicinity during surveys are identified as likely to occur.

USFWS indicates that there are five federally listed species under USFWS jurisdiction that are likely to occur in the project vicinity: bald eagle (*Haliaeetus leucocephalus*), northern spotted owl (*Strix occidentalis caurina*), grizzly bear (*Ursus arctos*), gray wolf (*Canis lupus*), and bull trout (*Salvelinus confluentus*). Gray wolf is a federally listed endangered species. Bald eagle, northern spotted owl, grizzly bear, and bull trout, are federally listed threatened species (Table 3.2-3).

Federally listed threatened species under the jurisdiction of the NOAA Fisheries include chinook salmon (*Oncorhynchus tshawytscha*) and middle Columbia River steelhead (*Oncorhynchus mykiss*) (Table 3.2-3).

Based on an analysis and review of natural resource documents and information from natural resource agencies, one federally listed species, bald eagle, regularly occurs within the project area. No other federally listed species regularly forages, breeds, or occurs in or near the project area.

Table 3.2-3: Federal and State Protected Wildlife Species Identified by Federal and State Agencies as Potentially Occurring near or within the Project Area

Common Name	Scientific Name	Federal Status	Washington State Status
Birds			
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Threatened
Northern spotted owl	*Strix occidentalis caurina*	Threatened	Endangered
Black tern	*Chlidonias niger*	Species of concern	Monitor
Burrowing owl	*Athene cunicularia*	Species of concern	None
Ferruginous hawk	*Buteo regalis*	Species of concern	Threatened
Harlequin duck	*Histrionicus histrionicus*	Species of concern	None
Loggerhead shrike	*Lanius ludovicianus*	Species of concern	Candidate
Northern goshawk	*Accipiter gentilis*	Species of concern	Candidate
Olive-sided flycatcher	*Contopus cooperii*	Species of concern	None
Peregrine falcon	*Falco peregrinus*	Species of concern	Sensitive
Willow flycatcher	*Empidonax traillii*	Species of concern	None
Black-backed woodpecker	*Picoides arcticus*	None	Candidate
Golden eagle	*Aquila chrysaetos*	None	Candidate
Lewis' woodpecker	*Melanerpes lewis*	None	Candidate
Long-billed curlew[1]	*Numenius americanus*	None	Monitor
Merlin	*Falco columbarius*	None	Candidate
Flammulated owl	*Otus flammeolus*	None	Candidate
Gyrfalcon[1]	*Falco rusticolus*	None	Monitor
Osprey[1]	*Pandion haliaetus*	None	Monitor
Pileated woodpecker	*Dryocopus pileatus*	None	Candidate
Prairie falcon[1]	*Falco mexicanus*	None	Monitor
Sage sparrow	*Amphispiza belli*	None	Candidate
Sage thrasher	*Oreoscoptes montanus*	None	Candidate
Turkey vulture[1]	*Cathartes aura*	None	Monitor
Vaux's swift	*Chaetura vauxi*	None	Candidate
White-headed woodpecker	*Picoides albolarvatus*	None	Candidate
Mammals			
Gray wolf	*Canis lupus*	Endangered	Endangered
Grizzly bear	*Ursus arctos*	Threatened	Endangered
Fisher	*Martes pennanti*	Species of concern	Endangered
Fringed myotis	*Myotis thysanodes*	Species of concern	None
Long-eared myotis	*Myotis volans*	Species of concern	None
Long-legged myotis	*Myotis evotis*	Species of concern	None
Small-footed myotis	*Myotis ciliolabrum*	Species of concern	None
Townsend's big-eared bat	*Corynorhinus townsendii*	Species of concern	Candidate
Yuma myotis	*Myotis yumanensis*	Species of concern	None
Western gray squirrel	*Sciurus griseus*	Species of concern	Threatened
Wolverine	*Gulo gulo*	Species of concern	Candidate
Black-tailed jackrabbit	*Lepus californicus*	None	Candidate
Merriam's shrew	*Sorex merriami*	None	Candidate
White-tailed jackrabbit	*Lepus townsendii*	None	Candidate
Amphibians and Reptiles			
Cascades frog	*Rana cascadae*	Species of concern	None
Columbia spotted frog	*Rana luteiventris*	Species of concern	Candidate
Larch Mountain salamander	*Plethodon larselli*	Species of concern	Sensitive
Red-legged frog	*Rana aurora*	Species of concern	None
Tailed frog	*Ascaphus truei*	Species of concern	Monitor

Table 3.2-3: Continued

Common Name	Scientific Name	Federal Status	Washington State Status
Western toad	*Bufo boreas*	Species of concern	Candidate
Sharptail snake	*Contia tenuis*	None	Candidate
Striped whipsnake	*Masticophis taeniatus*	None	Candidate
Fish			
Bull trout	*Salvelinus confluentus*	Threatened	Candidate
Chinook salmon	*Oncorhynchus tshawytscha*	Threatened	Candidate
Steelhead	*Oncorhynchus mykiss*	Threatened	Candidate
Interior Redband trout	*Oncorhynchus mykiss gairdneri*	Species of concern	None
Pacific lamprey	*Lampetra tridentate*	Species of concern	None
Westslope cutthroat	*Oncorhynchus clarki lewisi*	Species of concern	None
Mountain sucker	*Catostomus platyrhynchus*	None	Candidate

Source: Sagebrush Power Partners LLC 2003a.

1 Not identified by state agencies as potentially occurring in project area, but documented during surveys.

Table 3.2-4: Potential Occurrence of Federal and State Protected Wildlife and Fish Species within the Project Area

Common Name	Potential Occurrence within Project Area
Birds	
Bald eagle	Likely, WDFW documented winter resident, average of 5.6 bald eagles documented per winter driving survey with a maximum survey day count of 12, winter use relatively high compared to other wind projects, but mostly along Yakima River
Black tern	Unlikely due to species distribution in Washington, no records within Kittitas County
Black-backed woodpecker	Unlikely, breeding habitat possible in forests/burns near project area, recorded in Kittitas County
Burrowing owl	Unlikely due to species distribution in Washington, possible in extreme eastern Kittitas County
Ferruginous hawk	Unlikely, most records in Eastern Washington in steppe zones, possible rare transient or migrant
Flammulated owl	Unlikely within project area, possible in forests near project area, recorded in Kittitas County
Golden eagle	Likely, six observations during fixed-point surveys, six during in-transit surveys, no nest found, lower use (0.02-0.05 per 20-minute survey) compared to Foote Creek Rim (Wyoming) (0.2 – 0.3 per 20-minute survey) and Altamont Pass (California) (0.2-0.3 per 20-minute survey)
Gyrfalcon	Likely, one observation during winter bald eagle surveys
Harlequin duck	Unlikely, occurs in fast-flowing mountain streams and marine shorelines, recorded in Kittitas County west of project area
Lewis' woodpecker	Likely, breeding possible in forests near project area, recorded in Kittitas County, one observation documented during surveys
Loggerhead shrike	Likely, possible breeding habitat includes shrub-steppe, shrubland, and agricultural, recorded in Kittitas County, one observation during winter bald eagle surveys as well as two unidentified shrike observations, not observed during spring and summer avian surveys
Long-billed curlew	Likely, one observation documented during surveys
Merlin	Likely, breeding possible within project area, two observations during spring and summer surveys, documented by WDFW
Northern goshawk	Likely, documented breeding north and west of project area, numerous WDFW records from mountains north and west of project area in coniferous and aspen forests, two observations outside of project area during fixed-point surveys

Table 3.2-4: Continued

Common Name	Potential Occurrence within Project Area
Northern spotted owl	Unlikely, appropriate habitat not present within project area, documented site centers north and west of project area
Olive-sided flycatcher	Possible, breeding in forested habitats, recorded in Kittitas County
Osprey	Likely, one observation during fixed-point surveys, one during in-transit surveys
Peregrine falcon	Unlikely, most records in Western Washington, possible transient or migrant
Pileated woodpecker	Unlikely within project area, possible in forests near project area, recorded in Kittitas County
Prairie falcon	Likely, five observations during spring surveys
Sage sparrow	Possible, breeding habitat includes sagebrush and shrubland, documented in southern and eastern Kittitas County
Sage thrasher	Likely, possible breeding habitat includes sagebrush and shrubland, documented in southern and eastern Kittitas County, one observation during fixed-point surveys
Turkey vulture	Likely, 25 observations during fixed-point surveys, 31 during in-transit surveys
Vaux's swift	Likely, possible breeding habitat includes varied habitats below alpine habitats, recorded in Kittitas County, two observations during fixed-point surveys
White-headed woodpecker	Unlikely within project area, breeding habitat possible in forests near project area, recorded in Kittitas County
Willow flycatcher	Possible, breeding habitat moist forested areas and riparian habitats, recorded in Kittitas County
Mammals	
Black-tailed jackrabbit	Possible, grassland and shrub habitats, records from southeast Kittitas County
Fisher	Unlikely, associated with mature coniferous forests, suitable habitat in western Kittitas County
Fringed myotis	Possible, varied habitats include forested or riparian habitats and shrubland, roosts in buildings and trees, hibernates in mines and caves, potential habitat throughout eastern two-thirds of Kittitas County
Gray wolf	Unlikely, unknown status in Washington but suitable habitat in North Kittitas County, WDFW records from 1992 and 1993 from L.T. Murray State Wildlife Recreation Area southwest of I-90
Grizzly bear	Unlikely, unknown status in Washington but suitable habitat in North Kittitas County, one WDFW record north of project area
Long-eared myotis	Unlikely, habitat primarily forested habitats and edges, juniper woodland, mixed conifers, and riparian areas, roosts in snags, crevices, bridges, buildings, and mines, potential habitat in western and northern Kittitas County
Long-legged myotis	Unlikely, habitat primarily coniferous and mixed forests and riparian areas, roosts in caves, crevices, buildings, and mines, potential habitat in western and northern Kittitas County
Merriam's shrew	Possible, sagebrush shrub and mesic grass/shrub habitats, records from southeast Kittitas County
Small-footed myotis	Possible, habitat varied arid grasslands and shrubland, and mixed forests, roosts in crevices and cliffs, hibernates in caves and mines, records from eastern Kittitas County
Townsend's big-eared bat	Unlikely, varied habitats but tends to prefer forested and riparian areas, hibernates in caves, no records from Kittitas County
Western gray squirrel	Unlikely, suitable habitat in northeast Kittitas County; WDFW records from south of I-90 in L.T. Murray State Wildlife Recreation Area
White-tailed jackrabbit	Possible, grassland and shrub habitats, recorded in northeast Kittitas County
Wolverine	Unlikely, generally associated with northern coniferous forest; suitable habitat in western Kittitas County, WDFW record from northeast of project area
Yuma myotis	Possible, closely associated with water in varied habitats, no records from Kittitas County

Table 3.2-4: Continued

Common Name	Potential Occurrence within Project Area
Amphibians and Reptiles	
Cascades frog	Unlikely, occurs in wet mountain meadows with ponds and potholes, records in western and northern Kittitas County
Columbia spotted frog	Possible, occurs in wetlands, marshy edges of ponds/lakes, documented throughout Kittitas County, two WDFW records north of project area
Larch Mountain salamander	Unlikely, found in lava talus slopes, recorded in western Kittitas County
Red-legged frog	Unlikely, species range moist forests, streams, and ponds, recorded in western Kittitas County
Sharptail Snake	Possible, found in stable talus slopes, damp/moist habitats, and forest edges, records from Kittitas County
Striped whipsnake	Possible, occurs in grasslands, sagebrush, and dry rocky canyons, records from eastern Kittitas County
Tailed frog	Unlikely, habitat fast-flowing permanent streams in forested areas, records in western and northern Kittitas County
Western toad	Possible, occurs in spring pools, ponds, lake shallows, slow moving streams and nearby uplands, documented in Kittitas County
Fish	
Bull trout	No, suitable stream habitat not present in project area, occurs in Yakima River and major tributaries
Chinook salmon	No, suitable stream habitat not present in project area, occurs in Yakima River and major tributaries
Interior redband trout	No, suitable stream habitat not present in project area, occurs in Yakima River and major tributaries
Mountain sucker	No, suitable stream habitat not present in project area, occurs in Yakima River and major tributaries
Pacific lamprey	No, suitable stream habitat not present in project area, occurs in Yakima River and major tributaries
Steelhead	No, suitable stream habitat not present in project area, occurs in Yakima River and major tributaries
Westslope cutthroat	No, suitable stream habitat not present in project area, occurs in Yakima River and major tributaries

Source: Sagebrush Power Partners LLC 2003a

3.2.3 Impacts of Proposed Action

This section describes the potential direct impacts on vegetation; wetlands; wildlife and habitat; fisheries; and threatened and endangered plant, wildlife, and fish species from development of the KVWPP. Direct impacts are associated with construction, operations, and decommissioning activities that affect these resources. Direct impacts include directly filling or grading areas of the listed resource types (e.g., wildlife habitat or wetlands) on the site. Direct impacts could be associated with any of the proposed project elements, including the wind turbines and meteorological towers, existing and new gravel access roads, additional power lines, and the proposed O&M facility and substations. Impacts associated with or attributable to specific project elements are discussed where applicable. For example, the potential for bird mortality at the project site is associated with turbine and meteorological tower collections. Potential impacts associated with the proposed project would be minimized or avoided through implementation of the BMPs and mitigation measures as described in Section 3.2.5. Indirect impacts are not anticipated because the project is not expected to substantially induce regional growth to the extent that it would result in significant effects to offsite resources.

Construction Impacts

Table 3.2-5 summarizes potential construction impacts on vegetation, wetlands, wildlife, fisheries, and threatened and endangered species under the three project scenarios.

Table 3.2-5: Summary of Potential Construction Impacts: Vegetation, Wetlands, and Wildlife

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Vegetation			
Temporary vegetation removal and habitat loss	231 acres disturbed area	311 acres disturbed area	371 acres disturbed area
Permanent vegetation removal and habitat loss[1]	118 acres disturbed area	93 acres disturbed area	95 acres disturbed area
Wetlands			
Impacts on wetlands	185 square feet disturbed	135 square feet disturbed	Same as middle scenario
Wildlife and Fisheries			
Impacts on wildlife species	Possible avoidance behavior, potential mortality less than the middle scenario	Possible avoidance behavior, potential mortality negligible or unlikely	Possible avoidance behavior, potential mortality greater than the middle scenario
Impacts on elk or mule deer	Same as middle scenario	Possible avoidance behavior	Same as middle scenario
Impacts on fish or fish habitat	Same as middle scenario	None	Same as middle scenario
Impacts on stream crossings[1]	1,245 square feet disturbed, negligible effects	1,041 square feet disturbed, negligible effects	Same as middle scenario
Threatened and Endangered Species			
Impacts on plant, fish, or wildlife species protected under ESA	Same as middle scenario	Unlikely	Same as middle scenario
Impacts on federal or state protected plant, fish, or wildlife species	Same as middle scenario	Negligible	Same as middle scenario

Source: Sagebrush Power Partners LLC 2003a, c, f.

1 The amount of permanent disturbed area of habitat and jurisdictional waters and wetlands is greatest for the lower end scenario because wider roads would be required to accommodate safe travel of larger cranes.

<u>Vegetation</u>

Impacts during construction at any of the proposed KVWPP facilities would involve direct disturbance to vegetation through heavy equipment, vehicle, and construction crew activities. The disturbances would include vegetation clearing, and digging, filling, grading, trenching, and compaction of soils. The extent of impact would depend on the type and quantity of affected vegetation for each project scenario. Construction-related impacts on vegetation would be greatest under the upper end scenario, because this scenario would result in the largest amount of ground disturbance in the project area.

The predicted area of disturbance associated with project construction by vegetation community is based on preliminary design plans and project vegetation and habitat maps. Table 3.2-6 summarizes the temporary vegetation community impacts and Table 3.2-7 summarizes the permanent vegetation community impacts associated with the project. Data presented in the tables represent the maximum extent of clearing that would occur under each of the proposed project scenarios.

Total temporary habitat disturbance would range from 231 acres under the lower end scenario to 370 acres under the upper end scenario. Total permanent habitat disturbance would range from 93 acres under the middle scenario to 118 acres under the lower end scenario. Under the upper end scenario, 95 acres would be permanently disturbed.

Grassland, shrub-steppe, and sagebrush vegetation communities account for more than 98% of temporary impacts and more than 96% of permanent impacts associated with the clearing of vegetation. The remaining vegetation communities that would be disturbed, coniferous forest, deciduous shrub, and riparian habitat account for 0.2% of temporary impacts and less than 0.1% of permanent impacts on vegetation. Riparian impacts are discussed in further detail in the Fisheries section below. Developed areas account for 1.7% of temporary impacts and 1.6% of permanent impacts. Talus slopes located in the western portion of the project area are located outside the footprint of the project site and would not be disturbed during project construction. The ratio of habitat acreage affected would be the same under all three project scenarios.

It is estimated that 75% of the total area affected by project construction would only be temporarily disturbed (i.e., for less than one year), and would be replanted and restored after construction is finished. The remainder would continue to be occupied by project facilities (see Direct Operations and Maintenance Impacts below).

The lithosol sub-type shown on the habitat map (Figure 3.2-1) is a sub-category of the grassland, low sagebrush, and shrub-steppe cover types identified in Tables 3.2-6 and 3.2-7. Therefore, the impacts on the grassland, low sagebrush, and shrub-steppe cover types identified in Tables 3.2-6 and 3.2-7 include the lithosol sub-type. The estimated impact area of lithosol habitat is identified at the bottom of Tables 3.2-6 and 3.2-7. WDFW is concerned about project disturbance to lithosol soils because they are difficult to restore, sensitive, and may prove to be important in the life cycles in many animal species, including sage grouse (WDFW 2003b). Loss of this habitat type would be considered an adverse effect of the project but would be adequately mitigated with proposed and recommended mitigation measures identified in Section 3.2.5.

While the extent of lithosol habitat at the project site is defined and quantified, the regional extent of this habitat type is not quantitatively known. Therefore, it is difficult to assess the magnitude of lithosol impacts at the project site within the context of the surrounding region. Specialized habitats such as lithosols occur throughout the region but it is unknown if project impacts would disproportionally affect this specific habitat type relative to its occurrence throughout the region.

Table 3.2-6: Temporary Vegetation Community Impacts

Vegetation Community	Lower End Scenario (acres)	Middle Scenario (acres)	Upper End Scenario (acres)
Dense Conifer	0.1	0.1	0.1
Deciduous Shrub Thicket	<0.1	<0.1	<0.1
Dense Shrub-Steppe	4.5	6.0	7.1
Moderate Shrub-Steppe	42.5	57.2	68.3
Sparse Shrub-Steppe	40.2	54	64.5
Low Sagebrush	21.1	28.4	33.9
Grassland	118.4	159.2	190.2
Riparian Tree	0.3	0.4	0.4
Riparian	<0.1	<0.1	<0.1
Developed	3.9	5.3	6.3
Totals	231.0	310.5	370.8
Lithosol impacts[1]	93.4	125.6	149.9

Source: Sagebrush Power Partners LLC 2003c.
Note: Totals may not sum due to rounding.
1 The lithosol sub-type shown on Figure 3.2-1 is a sub-category of the grassland, low sagebrush, and shrub-steppe cover types. The three cover types in the table do not separate the lithosol sub-category. Lithosol impacts were estimated as shown at the bottom of the table. The Applicant's consultants provided an estimate of lithosol impacts for the middle scenario. Potential lithosol impacts under the lower and upper end scenarios were estimated based on the ratio of lithosol impacts on cover type identified under the middle scenario. Lithosol impacts were estimated within the original 50-meter survey corridor, which does not cover the entire proposed impact footprint. The lithosol acreage given above likely understates the actual amount by approximately 10%. (Taylor, pers. comm., 2003).

Table 3.2-7: Permanent Vegetation Community Impacts

Vegetation Type	Lower End Scenario (acres)	Middle Scenario (acres)	Upper End Scenario (acres)
Dense Conifers	<0.1	<0.1	<0.1
Deciduous Shrub Thicket	<0.1	<0.1	<0.1
Dense Shrub-Steppe	3.1	2.4	2.5
Moderate Shrub-Steppe[1]	29.0	22.6	23.2
Sparse Shrub-Steppe	20.5	15.9	16.4
Low Sagebrush[2]	11.8	9.8	10.0
Grassland	51.7	40.3	41.4
Riparian Tree	<0.1	<0.1	<0.1
Riparian	0.0	0.0	0.0
Developed	1.8	1.5	1.5
Totals	118.0	92.5	95.0
Lithosol impacts[3]	36.4	28.5	29.3

Source: Sagebrush Power Partners LLC 2003c.
Note: Totals may not sum due to rounding.
1 Includes 1.8 acres of area where proposed facilities lie outside of the area delineated on the habitat cover type map. This only occurs along three small segments of an existing dirt road added to the project layout after the vegetation typing was complete. However, based on photos of the area and notes from the rare plant survey, it appears that most of these "Not Typed" acres would likely be typed as "Moderate Shrub-Steppe."
2 Permanent disturbance to low sagebrush habitat assumes disturbance of both the proposed Bonneville and PSE substation sites (3 acres each), therefore total acreage numbers have been adjusted accordingly.
3 The lithosol sub-type shown on Figure 3.2-1 is a sub-category of the grassland, low sagebrush, and shrub-steppe cover types. The three cover types in the table do not separate the lithosol sub-category. Lithosol impacts were estimated as shown at the bottom of the table. The Applicant's consultants provided an estimate of lithosol impacts for the middle scenario. Potential lithosol impacts under the lower and upper end scenarios were estimated based on the ratio of lithosol impacts on cover type identified under the middle scenario. Lithosol impacts were estimated within the original 50-meter survey corridor, which does not cover the entire proposed impact footprint. The lithosol acreage given above likely understates the actual amount by approximately 10%. (Taylor, pers. comm., 2003).

The use of heavy equipment on areas of temporary disturbance could cause soil compaction that may affect plant survival and growth after construction completion. Soil compaction might directly affect the soil characteristics suitable for native plant growth and might reduce the infiltration of water and nutrients into the soil.

Exposed, unvegetated, and/or compacted soils that result from land conversion may also be susceptible to colonization by invasive species if measures are not taken to reduce the establishment of these species. Clearing associated with new roads often provides routes for migration of weeds into previously weed-free areas. The severity of weed advancement would depend on a variety of factors, including the health and vigor of the existing vegetation; the timing and duration of clearing, reseeding, and replanting of cleared areas; and the weed species present in the vicinity. Implementation of proposed measures to control the introduction and spread of undesirable plants during construction would minimize potential adverse effects associated with invasive species (see Section 3.2.5, Mitigation Measures).

Potential impacts on vegetation and plant species of concern could occur as a result of increased dust associated with construction activities. For example, dust could have a seasonal effect on vegetation by coating plant leaves with particulate material. This potential impact would be greatest under the upper end scenario because it would result in the largest amount of ground disturbance. Implementation of appropriate dust control measures (see Section 3.11, Air Quality, Mitigation Measures section) would minimize potential adverse effects to project area vegetation. The short-term nature of project construction and implementation of the proposed invasive weed control program (see Section 3.2.5) would additionally mitigate for potential adverse indirect effects watering for dust control could have on native vegetation.

Project construction activities could also have the potential to ignite wildfires if precautions are not taken. Because it is not clear if wildfires would have a positive or negative effect on project area vegetation, the most prudent course of action would be to implement measures to maintain current fire frequency patterns.

<u>Wetlands</u>

Potential impacts on wetlands associated with construction of the proposed project include filling or grading of wetland systems. Only one of the identified potential wetland systems would be affected by proposed construction activity. Impacts on potential Wetland Area A-1 may involve up to 135 square feet due to proposed road and electrical collection system improvements under the middle and upper scenarios, and 185 square feet under the lower end scenario. The proposed PSE substation would be located upslope and to the west of Wetland S-1, approximately 700 feet distant; therefore, Wetland S-1 would not be affected by the project. Impacts on potential wetlands assume a road width corridor of 24 feet and a combined utility and road corridor width of 30 feet. For turbines larger than 1.5 MW (i.e., under the lower end scenario), roads would need to be 34 feet wide to safely accommodate larger cranes. Correspondingly, the area of affected wetland resources may be higher.

Wildlife and Habitat

Potential impacts on wildlife and wildlife habitat associated with construction of the proposed project includes removal and loss of habitat associated with clearing vegetation communities and noise associated with construction. The primary effect from project construction would be the fragmentation, alteration, and removal of wildlife habitat. Diversity and abundance of wildlife relate directly to the amount, type, and quality of habitat and its supply of forage, protective cover, and secure nesting/rearing areas. Removing forested habitat would create a corresponding adverse effect on the wildlife that inhabits the project area. Loss of snags and coarse woody debris negatively affects primary and secondary cavity nesters such as woodpeckers and chickadees. Removing the overstory adversely affects canopy-using mammals and birds and decreases thermal cover. Decreases in understory adversely affect ground-dwelling species. Loss of plant communities that generally offer less diverse wildlife habitat, such as dry grassland and shrub-steppe, would result in a lower adverse effect than loss of the more complex vegetation associations such as wetlands and forested areas.

Clearing vegetation for the proposed construction would eliminate and modify existing wildlife habitat. Such impacts on habitats would displace and/or eliminate wildlife that currently depend on this vegetation. Most wildlife species (such as birds, deer, or coyotes) would be able to move away from areas of disturbance. Wildlife populations are generally considered to be at or near carrying capacity in all habitat types (Krebs 1994; Morrison et al. 1992; Miller 1990; Robinson and Bolen 1989; Wallace 1987). Once vegetation has been removed, wildlife displaced into adjacent habitats may be unsuccessful in colonizing nearby suitable habitats because these areas are usually already occupied. The increased stress of competition for limited resources and susceptibility to predation may cause displaced animals to perish or to displace other individuals that in turn may perish. Upland game birds, passerines, hawks, small mammals, deer, elk, and reptiles currently using the project area would be adversely affected by this loss of habitat. Vegetation communities associated with construction areas of the project are unlikely to support populations of amphibian species.

Excavation could result in mortality of individuals in underground burrows. Ground-dwelling mammals would lose the use of permanently disturbed areas; however, they are expected to repopulate the temporarily disturbed areas. Because the turbine pad and road construction would occur in relatively narrow areas, most wildlife species would be able to move away from areas of disturbance during construction. Overall, loss of habitat would result in a decrease in wildlife diversity and abundance over existing conditions.

During construction, increased noise levels created by heavy machinery and blasting activity may affect wildlife in adjacent habitats by disrupting feeding and nesting activities. Increased noise levels created by heavy machinery and blasting could cause birds to abandon their nests and may displace wildlife. Construction activities could result in avoidance behavior by some wildlife species. Generally, wildlife species are more sensitive to noise disturbances during spring breeding activity and noise impacts could result in disrupted breeding activity or cause breeding adults to abandon their young. As described above in the Affected Environment section, most of the avian species observed in the project area are foraging and/or migrating species and do not breed in the project area. Blasting would occur where required to loosen subsurface rock and facilitate excavation for the foundations of the wind turbines, meteorological towers, and substation equipment. Due to the rocky conditions at the site, most wind tower foundations are anticipated to require one to two blasts each. Blasting would occur during the excavation phase of construction, which would last for approximately two months for the lower end scenario and three months for the upper end scenario. All blasting activity would occur during the daytime. Many wildlife species, particularly mammals, are nocturnal and are relatively inactive during daylight hours. They typically retreat to burrows and other resting areas, and generally would not be affected by construction noise that occurs during the day. Once construction and blasting activities are complete, wildlife would likely inhabit available habitat, but likely to a lesser extent because of increased human disturbance associated with the turbines.

In the absence of systematic quantitative surveys, precise population densities of native wildlife are difficult to predict. Overall, loss of habitat would result in a decrease in wildlife diversity and abundance over existing conditions. Impacts on wildlife and habitat associated with proposed project construction, with implementation of the proposed mitigation measures, are not expected to result in a significant impact on native wildlife based on the following factors:

- Habitat types within the proposed project area are not regionally unique. Quantitative impacts on wildlife habitat, as shown on Tables 3.2-6 and 3.2-7, would not result in a significant loss of habitat relative to the amount of similar or higher quality habitat in Kittitas County and Eastern Washington.
- Wildlife species documented within the project area are generally relatively common and widespread in Kittitas County and Eastern Washington.

Elk and Mule Deer

During construction, elk and mule deer would likely avoid the site due to disturbance associated with construction equipment and other human activity. Most construction would take place during the summer months, minimizing construction disturbance to wintering big game. Construction-related disturbance is expected to be limited to the construction period time frame.

During project construction, quality wintering, calving, and migration corridor habitat typically associated with elk (river bottom, floodplain, riparian, and forested upland habitat) would not be disturbed.

The proposed project area occurs approximately 3 miles southeast of mapped elk calving areas. The proposed project would not impact the mapped calving area.

Fisheries

Potential impacts on fish or fish habitat associated with construction of the proposed project include impacts on water quality and changes in water quantity. Natural resource information does not identify any fish-bearing aquatic habitat within 0.5 mile of proposed construction activity. The nearest documented fish-bearing aquatic resources are the Yakima River, located more than 0.5 mile south of the project area and Swauk Creek located more than 0.5 mile west of the project area. Potential fish habitat within the project area is limited to stream channels in low topographic areas between ridges. These channels are narrow, shallow systems with intermittent flows and do not provide habitat for resident or anadromous fish. The characteristics of these channels would likely classify them as Type 5 Waters according to guidelines established in Chapter 222-16-030 of the WAC. Although fish habitat is not documented within 0.5 mile of the project area, general mitigation measures have been proactively developed associated with stream channel crossings and potential water quality and quantity impacts on minimize potential impacts on fish and fish habitat. In addition, mitigation measures and impacts would be further detailed and refined as the design phase proceeds prior to construction.

Water quality can be degraded by accidental spills of petroleum hydrocarbons from construction activities and exposure to construction waste, such as concrete wash water. Potential significant impacts due to erosion and sedimentation are not likely. Potential water quality impacts related to construction are expected to be short term and negligible with proper management. Section 3.3 Water Resources, contains more detailed information on water quality impacts.

Six potential stream channel crossings associated with the proposed project were identified (Table 3.2-2 and Figure 3.2-2). Construction activities associated with the project that would occur in low topographic areas between ridges include an aboveground collector cable and access roads. The aboveground access cable would not result in any disturbance to the stream channels or associated riparian habitat. As identified on Table 3.2-8, access roads associated with the project would cross three stream channels. Estimated permanently disturbed areas of impact associated with the proposed access roads are identified in Table 3.2-9. The estimated area of fill within the channels associated with project access roads was based on visual observations in the field (Sagebrush Power Partners LLC 2003c). The proposed project would not realign or substantially alter any stream channels. Because the proposed access roads associated with stream crossings do not vary between the different scenarios, potential impacts on stream channels would be the same under each of the upper end, middle, and lower end scenarios.

There would be no impacts associated with Streams I-1, G-1, and H-1. Proposed access roads would impact Streams I-2, J-1, and J-2 and their associated riparian habitat. Moving the potential crossings up or down the stream channels would not provide the opportunity to reduce impacts. A proposed access road would cross at Stream Crossing I-2. Impacts associated with Stream Crossing I-2 would not exceed 245 square feet of disturbance under the middle and upper end scenarios and 295 square feet under the lower end scenario. The proposed access road crossing associated with Stream J-1 would be in the same locations as an existing jeep trail that crosses the stream channel. Total square footage impacts at this location would not be more than 196 square feet under the middle and upper end scenarios and 236 square feet under the lower end scenario. The proposed access road at the location of Stream Crossing J-2 would pass between the intermittent stream and a nearby property corner. Impacts associated with the two crossings at Stream J-2 would not exceed 600 square feet of disturbance under the middle and upper end scenarios and 714 square feet under the lower end scenario.

Table 3.2-8: Potential Stream Channel Crossings within the Project Area

Stream Channel	Comments
Stream I-1	Activities associated with the proposed project would not cross Stream I-1. The closest point from a proposed access road to Stream I-1 is 60 feet where the access road turns sharply to the right and goes up an existing road leading away from the stream to the southeast.
Stream G-1	Activities associated with the proposed project would not cross Stream G-1. A proposed access road would be approximately 260 feet upslope and to the south.
Stream H-1	Activities associated with the proposed project would not cross Stream H-1. A proposed access road would be located approximately 580 feet upslope from Stream H-1.
Stream I-2	Activities associated with the proposed project include an access road that would cross Stream I-2.
Stream J-1	Activities associated with the proposed project include an access road that would cross Stream J-1 in the same location as an existing jeep trail.
Stream J-2	Activities associated with the proposed project include an access road that would not cross Stream J-2 but would pass between Stream J-2 and the project area boundary.

Source: Sagebrush Power Partners LLC 2003c.

Table 3.2-9: Impacts at Potential Stream Crossings (square feet)

Stream	Lower End Scenario	Middle Scenario	Upper End Scenario
I-1	none	none	none
G-1	none	none	none
H-1	none	none	none
I-2	295	245	Same as middle scenario
J-1	236	196	Same as middle scenario
J-2	714	600	Same as middle scenario

Source: Sagebrush Power Partners LLC 2003i.

Impacts on potential streams assume a road width corridor of 24 feet under the middle and upper end scenarios. For turbines larger than 1.5 MW (i.e., under the lower end scenario), roads would need to be 34 feet wide to safely accommodate larger cranes. Correspondingly, the area of affected water resources may be higher.

No direct impacts on fish associated with construction of the proposed project would occur. With the mitigation and protection measures in place, no significant impact on surface water is anticipated under the proposed project. Potential impacts on the stream channels related to construction are expected to be short term and negligible with proper management. The project site grading plan and roadway design would incorporate measures in line with the SWPPP and BMPs as described in Section 3.2.6, Mitigation Measures and in Section 3.3, Water Resources. The SWPPP and BMPs including silt fences, straw bales, and mulch would be used as necessary for clearing and construction to control erosion until the area can be stabilized with gravel or vegetation. Culverts would be designed and installed according to WDFW guidelines and according to Washington State Hydraulic Code guidelines. Where extensions or replacements of culverts occur, EFSEC would require a Hydraulic Project Approval (HPA) with WDFW review, for work that diverts, obstructs, or changes the natural flow or bed of any salt or fresh waters of the state (see Section 3.2.5, Mitigation Measures). The HPA would stipulate conditions for erosion and sedimentation control and for an allowable time period to complete any in-water work. The project would not adversely affect habitat associated with the Yakima River downstream of the project site.

Threatened and Endangered Species

Plant Species

Because no rare plant species were identified in the KVWPP project area, there would be no direct construction impacts on endangered plant species.

Wildlife and Fish Species

Birds

Bald eagle and northern spotted owl are the only bird species protected under the ESA identified as potentially occurring within the project area.

Northern spotted owl site centers and associated territory buffers are mapped by the WDFW approximately 0.5 mile north of the project area. Spotted owls occur almost exclusively within forested environments. Potential nesting habitat is not located within the project area. Although possible, it is unlikely that spotted owls would hunt within or disperse through the project area. Construction activity associated with the project would not impact northern spotted owl.

Bald eagle is documented as wintering, but not breeding, within the project area. Few bald eagles were observed within the project area during surveys. Most bald eagles observations were along the Yakima River and in areas where cattle are pastured. While use of the project area by bald eagles does occur, it is relatively low compared to adjacent areas along the Yakima River and appears to be related to the presence of livestock or wildlife carcasses, which they utilize for forage.

During project construction, the possibility of mortality effects to bald eagles is considered negligible and very unlikely to occur. Bald eagles in the area during the construction period are unlikely to occur within the construction zones due to disturbances and therefore are unlikely to be at risk of construction-related mortality. In addition, the majority of construction is likely to take place during late spring, summer, and fall months when bald eagles occur very rarely or not at all in the area.

Ten bird species are identified as unlikely to occur due to limited potential habitat or because the project area is located outside the periphery of the known species distributions (Table 3.2-4). No breeding or foraging habitats associated with these ten species would be affected by construction of the proposed project under the upper end, middle, or lower end scenarios.

As shown on Tables 3.2-3 and 3.2-4 a variety of other bird species with federal or state protected status may occur in the project area based on the availability of suitable habitat (3 species) or their observed presence during surveys (13 species). Construction-related impacts on potential habitat for these 16 species would be greatest under the upper end scenario, because this scenario would result in the largest amount of ground disturbance in the project area. Many of these species may occasionally occur in the project area while hunting or migrating, but are unlikely to breed within the project area. During construction activities, the possibility of mortality effects to bird species is considered negligible and very unlikely to occur under the upper end, middle, or lower end scenarios.

Mammals

Several of the mammal species with federal or state protected status, such as, grizzly bear, gray wolf, wolverine, fisher, western gray squirrel, Townsend's big-eared bat, long-legged myotis, and long-eared myotis, are unlikely to occur within the project area due to habitat constraints and/or uncertain population status in Washington. No impacts on these species associated with construction of the project are likely to occur. Of these species, grizzly bear and gray wolf are federally listed species protected under the ESA.

White-tailed and black-tailed jackrabbits and Merriam's shrew have been documented within Kittitas County, and suitable habitat for these species is present in the project area. Some suitable habitat for these species would be lost to turbine pads and road construction. Overall, total impacts on habitat are relatively small and no significant impacts on these species are expected to occur associated with project construction.

Suitable foraging habitat for three bat species, fringed myotis, small-footed myotis and Yuma myotis, is present within the project area. Typical roosting habitat for these bat species (caves, cliffs, and crevices), is not located within the project area. Only general descriptions of potential distributions are available for these three species. Very little is known concerning the ecology of these three species, making it more difficult to accurately predict potential impacts on these species. These species would likely avoid construction activity associated with the project and no disturbance to roosting habitat would occur.

Amphibians and Reptiles

Field surveys conducted for the project did not specifically target reptiles or amphibians. All six amphibian species and both reptile species with federal or state protected status have been documented within Kittitas County. Suitable habitat for amphibians is very limited in the project area due to the lack of wetland habitat and streams with perennial flows. No significant impacts on protected amphibian species are expected to occur associated with project construction.

Construction activity associated with the project may affect protected reptiles (striped whipsnake and sharptail snake) through loss of habitat and direct mortality of individuals occurring in construction zones. The level of mortality associated with construction would be based on the abundance of these species on site. Some mortality may occur as reptiles retreat to burrows underground for cover or during periods of winter dormancy. Excavation for turbine pads, roads, or other wind project facilities could kill individuals in underground burrows. Above-ground snakes are generally mobile enough to escape construction activity.

Fish

Potential fish habitat for fish species with federal or state protected status is not located within the project area. No impacts on fish species associated with construction of the project would occur under the upper end, middle, or lower end scenarios.

Operations and Maintenance Impacts

Table 3.2-10 summarizes potential operations and maintenance impacts on vegetation, wetlands, wildlife and fisheries, and threatened and endangered species under the three project scenarios. No indirect impacts on vegetation, wetlands, wildlife and fisheries, or threatened and endangered species associated with operations and maintenance of the project would occur. Induced growth or increased regional development would not occur as a result of the proposed project. Public concern was raised during the EIS scoping process regarding the potential for indirect impacts on wildlife species resulting from the spread of noxious weeds and wildfires. As described below in Section 3.2.5, Mitigation Measures, protective measures would be implemented to reduce these potential indirect impacts.

Table 3.2-10: Summary of Potential Operations and Maintenance and Decommissioning Impacts: Vegetation, Wetlands, and Wildlife

Operations and Maintenance Impacts	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Vegetation			
Vegetation shading by wind turbines	Same as middle scenario	Negligible	Same as middle scenario
Dust generation	Same as middle scenario	Negligible	Same as middle scenario
Potential project area colonization by invasive species	118 acres disturbed area	93 acres disturbed area	95 acres disturbed area
Change in fire frequency patterns in project area	118 acres disturbed area	93 acres disturbed area	95 acres disturbed area
Wetlands			
Impacts on wetlands	Same as middle scenario	None	Same as middle scenario
Wildlife and Fisheries			
Impacts on wildlife associated with vehicle traffic	Potential mortality less than the middle scenario	Potential mortality negligible or unlikely	Potential mortality greater than the middle scenario
Impacts on wildlife associated with wind turbines	Potential mortality less than the middle scenario	Possible avoidance behavior, potential mortality	Potential mortality greater than the middle scenario
Impacts on elk or mule deer	Same as middle scenario	Possible temporary avoidance behavior	Same as middle scenario
Impacts associated with wildlife migration	Same as middle scenario	None	Same as middle scenario
Impacts on fish or fish habitat	Same as middle scenario	None	Same as middle scenario
Threatened and Endangered Species			
Impacts on plant, fish, or wildlife species protected under ESA	No impacts on plant or fish species, potential mortality to bald eagle less than the middle scenario	No impacts on plant or fish species, potential mortality to bald eagle	No impacts on plant or fish species, potential mortality to bald eagle greater than the middle scenario
Impacts on federal or state protected plant, fish, or wildlife species	No impacts on plant or fish species, potential mortality to wildlife species less than the middle scenario	No impacts on plant or fish species, potential mortality to wildlife species	No impacts on plant or fish species, potential mortality to wildlife species greater than the middle scenario
Decommissioning Impacts			
Vegetation impacts	Similar to but lower than those described for construction in Table 3.2-5	Similar to but lower than those described for construction in Table 3.2-5	Similar to but lower than those described for construction in Table 3.2-5
Wetland and impacts	Same as middle scenario	Unlikely	Same as middle scenario
Wildlife and habitat, fisheries, and threatened and endangered species habitat	Similar to but lower than those described for construction in Table 3.2-5	Similar to but lower than those described for construction in Table 3.2-5	Similar to but lower than those described for construction in Table 3.2-5

Source: Sagebrush Power Partners LLC 2003a, c, f.

Vegetation

Project operations and maintenance would result in permanent vegetation removal. The extent of impact would depend on the type and quantity of affected vegetation for each project scenario. Tables 3.2-6 and 3.2-7 identify the predicted areas of temporary and permanent disturbances during project construction by habitat type. Total permanent habitat disturbance would range from 93 acres under the middle scenario to 118 acres under the lower end scenario. Vegetation communities associated with the proposed project that would be cleared include grassland, shrub-steppe, sagebrush, deciduous shrub, riparian vegetation, and conifer forest (see Tables 3.2-6 and 3.2-7). Lithosol habitat is a sub-category of the grassland, low sagebrush, and shrub-steppe cover types. Loss of this habitat type would be considered a permanent adverse effect of project operations but would be adequately mitigated with proposed and recommended mitigation measures identified in Section 3.2.5.

Operation impacts on vegetation communities would include shading associated with the turbine towers, as well as impacts caused by increased dust generated by travel on graveled roadways, potential changes in fire frequency patterns, and potential introduction of invasive species. Although as many as 150 turbines would be constructed under the upper end scenario, there should be no noticeable effect from shading on the underlying vegetation under any of the three project scenarios. Similar to construction period effects, there would be dust associated with travel across gravel access roads that could have a seasonal effect on vegetation. This potential impact would be greatest under the lower end scenario, where the permanent roadway footprint would be 95 acres (as opposed to 67 acres under the middle and upper end scenarios). Predicted vehicle travel between the O&M facility and the individual turbines during project operations would be minimal because scheduled maintenance is typically performed only every six months on each turbine. Therefore, potential impacts on onsite vegetation would be expected to be negligible.

Project operation and maintenance activities have the potential to ignite wildfires in the project area if precautions are not taken. However, the Applicant proposes to implement measures to minimize the risk of wildfire during the operation phases of the project (see Section 3.2.5, Mitigation Measures). Implementation of these measures would protect project area vegetation during project operations and maintenance.

Project operations could also introduce invasive species to the site that in turn could alter the vigor of existing vegetation communities in the project area. New access roads could provide a route for migration of weeds into previously weed-free areas. As stated above, this potential impact would be greatest under the lower end scenario, where the permanent roadway footprint would be 95 acres. However, predicted vehicle travel between the O&M facility and the individual turbines during project operations would be minimal. With implementation of proposed measures to control the introduction and spread of undesirable plants during and after construction (see Section 3.2.5, Mitigation Measures), potential impacts on onsite vegetation would be expected to be negligible.

Wetlands

Potential impacts on wetlands resulting from operation of the proposed project are unlikely under the upper end, middle, and lower end scenarios. Project operations are not expected to have impacts on wetland resources if proper drainage, erosion-control plans, and stormwater management practices are implemented. The proposed design approach, operational procedures, mitigation measures, BMPs, and other pollution prevention measures described in detail in Section 3.3, Water Resources, would protect wetlands associated with the proposed project.

Wildlife and Habitat

Other than wildlife habitat affected by construction, operation of the proposed project is not expected to affect existing wildlife habitats. Potential impacts on wildlife species associated with operation of the proposed project include disturbance associated with vehicle traffic, avoidance of turbines, and collisions with turbines and meteorological towers. Noise levels associated with operation of the proposed project are anticipated to be within or equal to about 5 to 10 decibels of current ambient noise levels, which would not significantly disturb wildlife species in the project area.

Some mammal and reptile fatalities can be expected from vehicle traffic in the project area. Given the amount of residential development and the existing roads and disturbance within the project area (including US 97, which runs through the middle of the project area), disturbance levels after operation begins would not be greatly increased. Daily vehicle traffic is expected to increase from 28 to 40 daily trips (Section 3.10, Transportation). During project operations, travel on the new and upgraded private gravel access roads within the project site is expected to consist largely of weekly or less frequent trips to turbines in service vehicles for maintenance and repair activities (Sagebrush Power Partners LLC 2003a, Section 3.2.4). This impact would be expected to be greatest under the upper end scenario because it would consist of the largest number of turbines (150) that would require maintenance. The number of vehicle trips associated with ongoing operations and maintenance workers commuting to and from the O&M facility and substations on paved state and county roads would range from 28 daily trips under the lower end and middle scenarios to 40 daily trips under the upper end scenario. Impacts are expected to be low and not significant due to the relatively low increase in traffic volumes. Birds also would be affected, but to a lesser degree because of their aerial agility.

Turbine Avoidance

Avian avoidance behavior associated with wind power development has not been extensively studied in the United States. Most studies of turbine avoidance effects have been conducted in Europe, and most of the impacts have involved wetland habitats and groups of birds not common in this project area, such as waterfowl, shorebirds and waders. European studies of disturbance to breeding birds suggest negligible impacts. Disturbance effects were documented during only one study (Pedersen and Poulsen 1991). For most avian groups or species at other European wind power projects, no turbine avoidance effects on breeding birds were observed (Karlsson 1983; Phillips 1994; Winkelman 1989; Winkelman 1990).

At a large wind power project on Buffalo Ridge, Minnesota, abundance of shorebirds, waterfowl, upland game birds, woodpeckers, and several groups of passerines was found to be significantly lower at survey plots with turbines than at plots without turbines. Turbine avoidance effects are likely due to the direct loss of habitat near the turbine for the turbine pad and associated roads. These results are similar to those of Osborn et al. (1998) who reported that birds at Buffalo Ridge avoided flying in areas with turbines. Also at Buffalo Ridge, Leddy et al. (1999) found that densities of male songbirds were significantly lower in grasslands containing turbines than in grasslands without turbines. Reduced avian use near turbines was attributed to avoidance of turbine noise and maintenance activities, and reduced habitat effectiveness due to the presence of access roads and large gravel pads surrounding turbines (Leddy 1996; Johnson et al. 2000a). Construction and operation of the Foote Creek Rim Wyoming wind power project did not appear to cause reduced use of the wind power project and adjacent areas by most avian groups.

Avoidance of wind power projects by raptors has not been documented at any U.S. wind power projects. Anecdotal evidence indicates that raptor use of the Altamont Pass, California wind resource area may have increased since installation of wind turbines (American Wind Energy Association 1995). Although avoidance by birds of wind power projects is not desirable, especially where important habitats may be limited, if other suitable habitats are available, one potential benefit of avian avoidance of turbines is the reduced potential for collision mortality to occur (Crockford 1992).

Based on the available information, it is probable that some turbine avoidance effects may occur to the grassland/shrub-steppe avian species occupying the project area. The extent of these effects and their significance is unknown and hard to predict. Avoidance by avian species is expected to range from several hundred feet to no avoidance behavior. Impacts on avian species would be considered low.

Operation of the proposed project would not affect raptor nests unless there were avoidance effects that caused raptors to not return to the nests close to the project site. Impacts would be considered low given the low density observed in close proximity to the turbines, and the species involved (red-tailed hawk).

Potential avoidance impacts are expected to be similar under each of the proposed project scenarios because within the project site the access roads, turbine strings, and associated facilities would occur within the same general footprint.

<u>Turbine Collisions</u>

Mortality rates from other wind power project studies were used to estimate raptor, passerine, and bat mortality rates associated with the proposed project (Sagebrush Power Partners LLC

2003a, Exhibit 11, 2003f). Actual raptor, passerine, and bat fatality rates described below and summarized on Table 3.2-11 may vary due to several variables, including the number of occupied nests near the project area after construction and other site-specific factors such as weather variables.

To date, research on wildlife mortality associated with wind power projects identifies the number of turbines as the most significant variable in estimating potential mortality rates. Generally, the more turbines in a given project, the higher the range of potential wildlife mortality associated with turbine collisions. While project variables such as turbine height and turbine blade sweep area are typically used in calculating potential mortality, these elements are not considered as significant as the number of turbines in estimating overall potential mortality. For example, raptor surveys, such as those performed for this project, typically document when eagles are observed flying within the general range of the turbine blade sweep area under the middle scenario. Potential mortality rates under the different project scenarios were then estimated based on the ratio of potential fatalities per turbine, per year.

Table 3.2-11: Summary of Projected Annual Mortality of Raptor, Passerine, and Bat Species Associated with Turbine and Meteorological Tower Collisions

Species Group	Lower End Scenario	Middle Scenario	Upper End Scenario
Turbine Collisions			
Raptors	3 to 4	5	6
Passerines	30 to 200	50 to 300	60 to 375
Bats	80 to 160	120 to 240	150 to 300
Meteorological Tower Collisions[1]			
Passerines	73	73	73

Source: Sagebrush Power Partners LLC 2003a and 2003f.

1 Only passerine mortality has been documented at other wind project studies associated with meteorological tower collisions.

Raptors

Based on the level of raptor use within the project area, raptor mortality is expected to be slightly higher compared to other wind projects with similar turbine types. American kestrels and red-tailed hawks account for most of the raptor use at the site, and are expected to be the species with the highest mortality. The potential exists for other raptor species to collide with turbines, including northern harrier, rough-legged hawk, bald eagle, and turkey vulture. However, the mortality risk associated with these species is expected to be lower than the risk for American kestrel and red-tailed hawk. Turkey vultures appear less susceptible to collision that most other raptors (Orloff and Flannery 1992). Few northern harrier fatalities and no rough-legged hawk or bald eagle fatalities have been observed at wind projects to date. Golden eagle use of the site is low relative to other wind sites and the mortality risk for golden eagles is also expected to be low.

Federal and state protected raptor species are also discussed in the Threatened and Endangered Species section below.

Raptor mortality at other wind generation projects has been low. The estimate of raptor mortality at the Foote Creek Rim wind project in Wyoming is the highest observed and is 0.03 raptors per turbine per year based on a three-year study of 69 turbines (Young et al. 2002). No raptor mortality was observed at the Vansycle wind project in Oregon during a one-year study and one raptor mortality was recorded over a four-year study at the Buffalo Ridge wind project (Erickson et al. 2001).

Based on raptor use estimates in the project area, potential raptor mortality associated with the proposed project is estimated at about 25% greater than at the Foote Creek Rim project, or 0.038 raptor fatalities a year per turbine (Young et al. 2002). Based on this assumption, under the upper end scenario (150 turbines), an average of six raptor fatalities per year is estimated to occur (Table 3.2-12). A corresponding reduction of mortality associated with turbine collisions would be expected under the middle scenario (121 turbines) and the lower end scenario (82 turbines). Under the middle scenario, an average of five raptor fatalities per year are estimated to occur, and under the lower end scenario an average range of three to four raptor fatalities per year are estimated to occur. Based on the raptor survey results, the majority of raptor fatalities are expected to be American kestrels and red-tailed hawks, the two most common raptor species documented in the project area.

Passerines

Passerines have been the most abundant avian fatality at other wind projects studied (Johnson et al. 2000a; Young et al. 2002; Erickson et al. 2001), often comprising more than 80% of the avian fatalities. Both migrant and resident passerine fatalities have been observed. Given that passerines make up the vast majority of the avian observations onsite, it is expected that passerines would make up the largest proportion of fatalities. Species most common to the study area would likely be most at risk, including western meadowlark, vesper sparrow and horned lark. Horned larks have been the most commonly observed fatality at several wind projects, including Vansycle and Foote Creek Rim (Erickson et al. 2001; Young et al. 2002). Nocturnal migrating species may also be affected, but it is not expected that they would be found in large numbers based on data collected at other wind power projects (i.e., no large mortality events documented [Erickson et al. 2000]). Based on the per turbine mortality estimates from the other wind power projects studied, between 50 and 300 passerine fatalities may occur per year under the middle scenario (121 turbines) (Table 3.2-12). Under the upper end scenario (150 turbines), approximately 215 passerine fatalities per year are estimated to occur with an estimated range of 60 to 375 fatalities. A corresponding reduction of mortality associated with turbine collisions, an estimated range of 30 to 200 fatalities passerine fatalities per year, would be expected under the lower end scenario (82 turbines).

Bats

It is likely that some bat fatalities would occur at the proposed project site. Bat research at other wind power projects indicates that bat species are at some risk of collision with wind turbines. Wind power project studies, as described below, indicate that most bat fatalities occur during migration, with low mortality associated with resident bat species. Most bat species in Washington migrate south in the fall. Washington bat species that do not migrate are year-round residents that hibernate in the winter. Most bat fatalities found at wind power projects have been tree-dwelling bat species, with hoary and silver-haired bats being the most prevalent fatalities. Both hoary bats and silver-haired bats are migratory species that may use the forested habitats near the project site and may migrate through the project area. Federal and state protected bat species are also discussed in the Threatened and Endangered Species section below.

At the Buffalo Ridge wind power project, Minnesota, based on a two-year study, bat mortality was estimated to be 2.05 bats per turbine per year (Johnson et al. 2000b). At the Foote Creek Rim wind power project, based on two years of study, bat mortality was estimated at 1.51 bats per turbine per year (Young et al. 2001). At the Vansycle Ridge wind power project in Oregon, bat mortality was estimated at 0.74 bats per turbine for the first year of operation (Erickson et al. 2000). Annual bat mortality associated with the project is estimated at 1 to 2 bat fatalities per turbine, or 150 to 300 bats under the upper end scenario (Table 3.2-12). A corresponding reduction of mortality associated with turbine collisions would be expected under the middle scenario (121 turbines) and the lower end scenario (82 turbines). Under the middle scenario, an average range of 120 to 240 bat fatalities per year are estimated to occur and under the lower end scenario an average range of 80 to 160 bat fatalities per year are estimated to occur. The significance of this impact is hard to predict because there is little information available regarding bat populations. Studies suggest that resident bats do not appear to be significantly affected by wind turbines (Johnson et al. 2002; Gruver 2002), since almost all mortality is observed during the fall migration period. Furthermore, hoary bat, which is expected to be the most common fatality, is one of the most widely distributed bats in North America. Pre-construction studies to predict impacts on bats may be relatively ineffective because current state-of-the-art technology for studying bats does not appear to be highly effective for documenting migrant bat use of a site (Johnson et al. 2002).

Other Avian Species

Some waterfowl mortality has been documented at other wind power projects (Erickson et al. 2001). However, studies at Foote Creek Rim, Vansycle, and Buffalo Ridge have not documented mortality of Canada geese, one of the most common waterfowl species observed flying over the project area. Because of the low use of the site by waterfowl, little mortality would be expected from operation of the project.

Other avian groups (e.g., upland game birds, shorebirds, and other migrants) occur in relatively low numbers within the project area and mortality would be expected to be low.

Meteorological Tower Collisions

Carcass search studies at the Foote Creek Rim wind power project, Wyoming, have found avian casualties associated with guyed meteorological towers. Based on searches of five permanent meteorological towers at Foote Creek Rim over a three-year period, it was estimated that these towers resulted in approximately 8.1 avian casualties per tower per year (Young et al. 2002). The vast majority of these avian casualties were passerines. Nine permanent meteorological towers are proposed for the project under each of the three scenarios. These towers would be expected to result in collision deaths for passerines at the site. The use of bird flight diverters on guy wires should reduce the risk of collision.

Elk and Mule Deer

The WDFW has expressed some concern over the potential effects of wind project development on wintering big game. Winter is a crucial period of time for the survival of many big game species. As deer expend more energy than they take in, body condition gradually declines throughout the winter (Short 1981). Unnecessary energy expenditures may increase the rate at which body condition declines, and the energy balance determining whether a deer would survive the winter is thought to be relatively narrow, especially for fawns (Wood 1998). Overwinter fawn survival may decrease in response to human activity or other disturbances (Stephenson et al. 1996). Roads and energy development may also fragment otherwise continuous patches of suitable habitat, effectively decreasing the amount of winter range available for big game. Fragmentation of habitat also may limit the ability of big game populations to move throughout the winter range as conditions change, causing big game to utilize less suitable habitat (Brown 1992).

Two published studies of big game winter use may be relevant to the development of wind turbines and wintering deer and elk (Rost and Bailey 1979; Van Dyke and Klein 1996). Van Dyke and Klein (1996) documented elk movements through the use of radio telemetry before, during, and after the installation of a single oil well within an area used year-round by elk. Drilling activities during their study ceased by November 15; however, maintenance activities continued throughout the year.

Elk showed no shifts in home range between the pre- and post- drilling periods; however, elk shifted core use areas out of view from the drill pad during the drilling and post drilling periods. Elk also increased the intensity of use in core areas after drilling and slightly reduced the total amount of range used. It was not clear if the avoidance of the well site during the post-drilling period was related to maintenance activities or to the use of a new road by hunters and recreational users. The authors concluded that if drilling activities occupy a relatively small amount of elk home ranges, that elk are able to compensate by shifting areas of use within home ranges.

While several authors have documented elk avoiding roads within forested environments during the summer, the effects of roads and associated human activity on wintering elk and mule deer have not been well documented. Rost and Bailey (1979) found that wintering mule deer and elk avoided areas within 600 feet of roads in eastern portions of their Colorado study area, where presumably greater amounts of winter habitat were present. Road avoidance was greater where roads were more traveled. Only mule deer showed a clear avoidance of roads in the western portion of their study area, where winter range was assumed to be more limiting. Mule deer also showed greater avoidance of roads in shrub habitats versus more forested areas. The authors concluded that impacts of roads depended on the availability of suitable winter range away from roads, as well as the amount of traffic associated with roads.

There is little information regarding wind project effects on big game. At the Foote Creek Rim wind project in Wyoming, pronghorn observed during raptor use surveys were recorded year round (Johnson et al. 2000). The mean number of pronghorn observed at the six survey points was 1.07 prior to construction of the wind power project and 1.59 and 1.14 per survey the two years immediately following construction, indicating no reduction in use of the immediate area. Mule deer and elk also occurred at Foote Creek Rim, but their numbers were so low that meaningful data on wind power project avoidance could not be collected.

The elk and mule deer in the project area primarily occupy the grassland and shrub-steppe habitats and riparian corridors. Following completion of the wind power project, the disturbance levels from construction equipment and humans would diminish and the primary disturbances would be associated with operations and maintenance personnel, occasionally vehicular traffic, and the presence of the turbines and other facilities.

Due to the lack of knowledge regarding the potential impacts of wind energy development on big game, it is difficult to predict with certainty the effects of the proposed wind project on mule deer and elk. Van Dyke and Klein (1996) showed wintering elk shifted use of core areas out of view of human-related activities associated with an oil well and access road. Most turbines and roads in the project area would be located on ridges and would be visible over a fairly large area. Where wind turbines would be constructed in elk wintering areas, elk may concentrate use away from the wind development during construction. While human-related activity at wind turbines during regular maintenance would be less than during the construction period, it is not known if human activity associated with regular maintenance activity would exceed tolerance thresholds for wintering elk. If tolerance thresholds during regular maintenance activities are exceeded, elk are likely to permanently utilize areas away from the wind development. Given the amount of disturbance within the project area associated with residential development and existing roads, including US 97 which runs through the middle of the project area, disturbance levels after facility operation begins would not be greatly increased. As described above in the wildlife and habitat section and shown in the traffic analysis (Section 3.10) the proposed project would add an estimated 28 to 40 additional daily commuter trips on local public roads to an area that averages more than 2,000 daily trips.

Seasonal sport hunting of big game is allowed within portions of the project area. Under the proposed project, public safety concerns may result in restricting public hunting within portions of the project area (see Section 3.6, Land Use and Recreation). Big game currently deterred from using the project area because of human disturbance might occupy the area if hunting at or near the project site is eliminated. Unhunted big game populations can habituate to human activities. This is a concern of WDFW because landscaping in developed areas might be attractive to big game during periods of winter stress, especially if big game hunting is eliminated. WDFW is the agency responsible for animal damage control claims caused by deer and elk. When deer and/or elk cause damage to private property, hunting season adjustments are an effective management tool for WDFW to control the size and location of big game populations. If big game damage to private property does occur in the project vicinity, restricting public hunting within the project area would limit WDFW's management options.

The proposed wind facility occurs approximately 3 miles southeast of mapped elk calving areas. The proposed project is not likely to impact the mapped calving area.

Wildlife Migration

No impacts are expected from the project to big game or reptile and amphibian movement or migration. The Quilomene elk migration corridor is outside the project area and no project features or construction would occur within the area identified as this migration corridor. Additionally, no wetlands would be affected that could impede amphibian movements. Migrant birds and bats may be at risk of collision with turbines in the project. Potential impacts on birds and bats are discussed in the Turbine Collision section above.

Fisheries

Operation activities associated with the proposed project that could potentially impact fisheries include stormwater, water use, and wastewater. Potential impacts on fish or fish habitat resulting from operation of the proposed project are unlikely under the upper end, middle, and lower end scenarios due to the absence of potential fish habitat in the proposed project area. Water resources within the proposed project site are limited to intermittent stream channels and wetland habitat with no known fish use. Operation of the project would have no impacts on fish and fish habitat downstream of the project site (Yakima River) if proper drainage, erosion control plans, and stormwater management practices are implemented. The proposed design approach, operational procedures, mitigation measures, BMPs, and other pollution prevention measures described in detail in Section 3.3 would protect water quality associated with the proposed project and freshwater habitat downstream of the proposed project site.

The quantity and quality of stormwater runoff could be affected by operation of the proposed project because of the increase in impervious surfaces, which could result in impacts on fisheries habitats downstream of the project site, if not mitigated. Stormwater from new impervious surfaces associated with the proposed project would be collected and diverted into detention and treatment facilities. No component of the proposed project would be built near fish-bearing aquatic resources and no storm or other surface water would be discharged directly to fish-bearing aquatic resources. Based on the mitigation methods that would be implemented and the distance between the proposed project and the Yakima River downstream of the project site, effects on the Yakima River associated with stormwater runoff are unlikely.

A SWPPP would be developed in accordance with BMPs and would detail the sediment and erosion control measures and accidental spill prevention and control measures. The BMPs would be implemented, inspected, and maintained to minimize the potential for adversely affecting downstream water quality. These may include such things as silt fencing and hay bales, and placement of polyethylene tarps to cover exposed surfaces. Control of fuel storage and equipment fueling operations for spill prevention and control would be detailed in the SWPPP. Stormwater impacts and management are discussed in additional detail in Section 3.3, Water Resources.

Threatened and Endangered Wildlife Species

Birds

It is unlikely that spotted owls would hunt within or disperse through the project area. Operation activity associated with the project under the upper end, middle, or lower end scenarios would not impact northern spotted owl.

Based on the available information about bald eagle use of the site, potential bald eagle mortality due to operation of the wind power project would be confined to the winter and early spring seasons. Bald eagles would not be at risk from the wind power project in the summer or fall. Bald eagles are not expected to frequently occur within the wind power project area and operation of the wind power project should have minimal disturbance on bald eagles under either the upper end, middle, or lower end scenarios. Additionally, proposed mitigation measures are intended to further reduce the possibility of disturbance or displacement.

Because there have been no documented bald eagle fatalities to date at wind power projects (Erickson et al. 2001), potential bald eagle mortality estimates based on other wind power projects could not be calculated. Estimates of bird mortality from wind projects may be based on bird use of a site and the propensity for that species to fly within the rotor swept area or zone of risk. Seven observations of bald eagles were documented during standardized point counts across the project area (Sagebrush Power Partners LLC 2003a, Exhibit 12). Two of these observations were made in areas outside the proposed development. Thirty-three percent of eagles observed within the project site were flying within the zone of risk. While the sample size is relatively small, it does show that wintering bald eagles may have some exposure to turbines by flying within the rotor swept area. While potential bald eagle mortality estimates could not be calculated based on existing information, potential fatalities associated with turbine collisions would be highest under the scenario with the most turbines, the upper end scenario (150 turbines). A corresponding reduction of potential mortality would be assumed under the middle (121 turbines) and lower end scenarios (82 turbines).

As described above, there have been no bald eagle fatalities documented at other wind power projects in the United States. Although the risk is low, the potential exists for bald eagle fatalities during operation of the project. The status of bald eagle in the project area is not expected to change due to the project. Bald eagle populations appear to be generally increasing and the USFWS has proposed the species for delisting (USFWS 1999). Bald eagle populations in Kittitas County, as with greater Washington and throughout North America, would continue to increase during and after the project is constructed.

During operation activities, the possibility of mortality effects to federal and/or state protected bird species is considered very low or negligible. Thirteen bird species with federal or state protected status were observed during the 2002 wildlife surveys (Table 3.2-4). Table 3.2-12 presents documented fatalities at other U.S. wind project sites of these 13 federal and/or state protected bird species.

Table 3.2-12: Summary of Fatalities at Operating Wind Power Projects in the United States of Federal and State Protected Bird Species Observed during 2002 Project Area Wildlife Surveys

Common Name	2002 Survey Results
Bald eagle	No bald eagle fatalities documented at any U.S. wind project
Loggerhead shrike	One fatality observed each at Altamont Pass and Tehachapi Pass (California)
Northern goshawk	No fatalities documented at any U.S. wind project
Golden eagle	One golden eagle was killed during two years of monitoring at the Foote Creek Rim Phase I and II facility
Lewis' woodpecker	Observed as a fatality at Vansycle in 1999
Long-billed curlew	No fatalities documented at any U.S. wind projects
Merlin	No fatalities have been reported at U.S. wind projects
Gyrfalcon	No fatalities documented at U.S. wind projects
Osprey	No fatalities documented at U.S. wind projects
Prairie falcon	One fatality documented at Foote Creek Rim (Wyoming), two at Altamont Pass (California), one at Montezuma Hills, and one at Tehachapi Pass (California)
Sage thrasher	No fatalities documented at any U.S. wind project
Turkey vulture	A few fatalities observed at U.S. wind projects, but apparently not very susceptible to collision due to foraging and scavenging behavior
Vaux's swift	No fatalities documented at any U.S. wind project

Source: Sagebrush Power Partners LLC 2003a, Exhibit 11.

Mammals

No impacts on grizzly bear, gray wolf, wolverine, fisher, western gray squirrel, Townsend's big-eared bat, long-legged myotis, and long-eared myotis associated with operation of the project are likely to occur under the upper end, middle, or lower end scenarios.

Some individuals of white-tailed and black-tailed jackrabbits and Merriam's shrew could be killed by vehicles on roads. Limits on vehicle speeds within the project area would minimize the potential for road kills. Overall, impacts associated with operation of the project to these species under the upper end, middle, or lower end scenarios should be minimal due to the limited nature of traffic expected within the project area.

Suitable foraging habitat for three bat species, fringed myotis, small-footed myotis, and Yuma myotis, is present within the project area. Roosting habitat for these bat species, such as caves, cliffs, and crevices, is not located within the project area. Only general descriptions of potential distributions are available for these three species. Very little is known concerning the ecology of these three species, making it difficult to accurately predict potential impacts on these species. Impacts on bats are discussed in greater detail in the Wildlife and Habitat section above. Documented fatalities of these species at wind projects within the United States were not identified during the analysis for the project.

Amphibians and Reptiles

As described above in the Construction Impacts discussion, suitable habitat for amphibians is very limited in the project area due to the lack of wetland habitat and streams with perennial flows. No significant impacts on protected amphibian species are expected to occur associated with operation of the project under the upper end, middle, or lower end scenarios.

Operations and maintenance activities may occasionally result in a road-killed striped whipsnake or sharptail snake. This is expected to be a rare occurrence due to the limited nature of traffic expected within the project area.

Fish

As described above in the Construction Impacts discussion, potential fish habitat for fish species with federal or state-protected status is not located within the project area. No impacts on fish species associated with operation of the project would occur under the upper end, middle, or lower end scenarios.

Decommissioning Impacts

Vegetation

Impacts on vegetation from decommissioning the project would be similar to but should be lower than impacts identified for construction, assuming that all access roads remained in place. Decommissioning vehicles would travel on established roadways, which would not impact vegetation, except for the possible introduction and/or spread of noxious weeds. Vegetation around project facilities (i.e., turbine, meteorological, and transmission towers) to be removed would likely be affected to the same extent as described for construction.

Foundations would be removed to a depth of 3 feet below grade and unsalvageable material would be disposed of at authorized sites. The soil surface would be restored as close as reasonably possible to its original condition. If the overhead power lines could not be used by the utility, all structures, conductors, and cables would be removed. The Applicant proposes to leave the underground electrical collection system in place subject to landowner approval. At the time of decommissioning, the Applicant would consult with the applicable landowner(s) to determine the appropriate disposition of the O&M facility (Taylor, pers. comm., 2003). Reclamation procedures would be based on site-specific requirements and techniques commonly used at the time the area would be reclaimed and would include regrading, adding topsoil, and revegetating all disturbed areas with native plant species.

Wetlands

Potential impacts on wetlands resulting from decommissioning of the proposed project are unlikely.

Wildlife and Habitat, Fisheries, and Threatened and Endangered Species

Impacts on wildlife and habitat, fisheries, and threatened and endangered species from decommissioning the proposed project would be lower than those for construction, assuming that all access roads remain in place. Dismantling the project would eliminate avian mortality caused by the presence of wind turbines. Wildlife habitat would have the potential to return to pre-project conditions over time; therefore, impacts from decommissioning would be low. Vehicles would travel on established roadways, which would not impact habitat for federal or state protected species. Mitigation for impacts on wildlife would follow procedures in use at the time of decommissioning.

3.2.4 Impacts of No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated. However, development of a different nature could occur under Kittitas County's existing Comprehensive Plan and zoning regulations for the project area. Depending on the location, type, and magnitude of future development at the project site, impacts on vegetation, wetlands, or to threatened or endangered plant and animal species could be similar to or even greater than the proposed action. However, potential impacts on birds would be expected to be less under the No Action Alternative assuming that no tower-like structures are constructed.

Other power generation facilities would be constructed and operated in the region to meet the long-term need for power, most likely a gas-fired combustion turbine. Constructing a gas-fired turbine generator, developing and extracting natural gas, and constructing natural gas pipelines to provide fuel to the generating facility could create impacts on vegetation, wetlands, wildlife, and threatened and endangered species. The significance of such impacts would depend on the site-specific location and design of the facility.

3.2.5 Mitigation Measures

Mitigation Measures Proposed by the Applicant

Thorough Study and Analysis to Avoid Impacts

The Applicant has commissioned extensive studies by qualified biologists of plants and animals at the project site to avoid impacts on sensitive populations. These studies include:

- Rare plant surveys,
- Habitat mapping,
- Avian use point count surveys,
- Aerial raptor nest surveys,
- Wintering bald eagle surveys,
- Non-avian wildlife surveys,
- Biological assessment for threatened and endangered species, and
- Stream and wetland surveys.

The results and recommendations of these studies have been incorporated into the proposed design, construction, operation, and mitigation for the project.

Project Design Features to Avoid and/or Minimize Impacts

The proposed design of the project incorporates numerous features to avoid and/or minimize impacts on plants and wildlife. These features are based on site surveys, experience at other wind power projects, and recommendations from consultants performing studies at the site. Features of the project that are designed to avoid or minimize impacts on plants and animals include:

- Avoiding when possible, construction in sensitive areas such as riparian zones, wetlands, forests, etc.
- Minimizing new road construction by improving and using existing roads and trails instead of constructing new roads.
- Choosing underground (vs. overhead) electrical lines wherever feasible to minimize perching locations and electrocution hazards to birds.
- Choosing turbines with low rotations per minute and using tubular towers to minimize risk of bird collision with turbine blades and towers.
- Using bird flight diverters on guyed permanent meteorological towers or using unguyed permanent meteorological towers to minimize potential for avian collisions with guy wires.
- Equipping all overhead power lines with raptor perch guards to minimize risks to raptors.
- Spacing all overhead power line conductors to minimize potential for raptor electrocution.

Construction Techniques and BMPs to Minimize Impacts

Constructing the project has the potential to impact both habitat and wildlife in a variety of ways. The Applicant proposes using construction techniques and BMPs to minimize these potential impacts. These include the following:

- Using BMPs to minimize construction-related surface water runoff and soil erosion.
- Using certified "weed free" straw bales during construction to avoid introduction of noxious or invasive weeds.
- Flagging sensitive habitat areas (e.g., raptor nests, wetlands, etc.) near proposed areas of construction activity and designation of such areas as "off limits" to all construction personnel.
- Developing and implementing a fire control plan, in coordination with local fire districts, to minimize risk of accidental fire during construction and respond effectively to any fire that does occur.
- Establishing and enforcing reasonable driving speed limits during construction to minimize potential for road kills.
- Properly storing and managing all wastes generated during construction.
- Requiring construction personnel to avoid driving over or otherwise disturbing areas outside the designated construction areas.
- Monitoring raptor nests on site for activity prior to construction and modifying construction timing and activities to avoid impacts on nesting raptors.
- Designating an environmental monitor during construction to monitor construction activities and ensure compliance with mitigation measures.

Post-Construction Restoration of Temporarily Disturbed Areas

The following measures would be taken to restore temporarily disturbed areas after construction:

- All temporarily disturbed areas would be reseeded with an appropriate mix of native plant species as soon as possible after construction is completed to accelerate the revegetation of these areas and to prevent the spread of noxious weeds.
- The Applicant would consult with WDFW regarding the appropriate seed mixes for the project area.

Noxious Weed Control

Because noxious weeds can have numerous detrimental effects on rare plant populations, measures would be implemented to control the introduction and spread of undesirable plants during and after construction. Noxious weed control measures include:

- Cleaning construction vehicles prior to bringing them into the project area from outside areas.
- Quickly revegetating habitats temporarily disturbed during construction.

- Actively controlling noxious weeds that have established themselves as a result of the project.
- Developing a noxious weed control plan prior to construction, and implementing the plan over the life of the project as mitigation.

Dust Control

The Applicant has proposed to implement a comprehensive dust control program. See Section 3.11, Air Quality, for a detailed description of mitigation measures to minimize fugitive dust emissions from construction-related traffic and additional wind-blown dust as a result of ground disturbance.

Fire Protection

Prior to construction, a comprehensive fire control plan would be developed, and implemented project-wide over the life of the project. The fire control plan would take into account the dry nature of the region, and address risks on a seasonal basis. See Section 3.4, Health and Safety, for a detailed description of mitigation measures to minimize or prevent the risk of fire and explosion at the project site during both project construction and operations.

Monitoring and Adaptive Management

The Applicant proposes to convene a Technical Advisory Committee (TAC) to evaluate the mitigation and monitoring program and determine the need for further studies or mitigation measures. The TAC would be composed of representatives from WDFW, USFWS, Kittitas County, local interest groups (e.g., Kittitas Audubon Society), project landowners, and the Applicant. The role of the TAC would be to coordinate appropriate mitigation measures, monitor impacts on wildlife and habitat, and address issues that arise regarding wildlife impacts during construction and operation of the wind power project. The post-construction monitoring plan would be developed in coordination with the TAC and approved by EFSEC prior to construction.

The TAC would evaluate the mitigation and monitoring program and determine the need for further studies and mitigation measures in accordance with the *Wind Project Habitat Mitigation Draft Guidance Document* (WDFW 2003a). Based on a verbal agreement by the Applicant and WDFW coordinated in July 2003, three years of monitoring studies to evaluate impacts from project operations should occur. At the conclusion of these studies, an evaluation should be conducted with further mitigation measures determined, if needed.

Acquisition and Enhancement of Onsite Habitat

The Applicant proposes to purchase and protect, for the life of the project, a large area of habitat in the project area. This privately owned parcel, approximately 550 acres in size, is between proposed turbine strings B and C (Sections 22 and 27, Township 19 North, Range 17 East, WM) and is adjacent to land owned by the Washington DNR. The Applicant proposes to purchase this parcel and implement measures to enhance its value as habitat. Based on an agreement by the Applicant and WDFW, the Applicant proposes to protect and restore replacement habitat for habitat temporarily and permanently disturbed by the project. Proposed mitigation ratios and replacement acres of habitat for the middle scenario are identified in Table 3.2-13 The same replacement ratio would apply under the lower and upper end scenarios.

Based on data provided, WDFW has determined that the proposed mitigation site would provide adequate mitigation for the impacts on wildlife habitat that are expected to result from the proposed project (WDFW 2003f).

Overall, the parcel is in fair to good condition. However, several opportunities for enhancement exist that would be expected to raise habitat quality further. Primary among these is management and control of cattle grazing within the entire parcel, and especially within the riparian zone. A grazing management plan could be developed that reduces or eliminates cattle pressure on the most sensitive portions, and allows for re-establishment of native vegetation in specific problem areas.

Although high concentrations of noxious weeds were not found within the parcel, scattered patches and individuals (primarily diffuse knapweed [*Centaurea diffusa*]) are present throughout. An overall noxious weed control effort for the parcel, developed in coordination with the Kittitas County Noxious Weed Control Board, would likely be effective at reducing or eliminating noxious weeds from the site, increasing the habitat quality and effectiveness.

Replanting shrubs in the burned area on the western ridgetop of the proposed mitigation parcel could hasten the re-establishment of vegetative structure in that area and reduce non-native species encroachment. In addition, implementing riparian replanting designed to re-establish native species would benefit certain problem areas along the unnamed creek in the mitigation parcel.

Loss of Wetlands and Streams

In August 2003, the Applicant submitted a JARPA to the U.S. Army Corps of Engineers and other applicable resource agencies to mitigate for the project's expected minor loss of jurisdictional wetlands and waters of the United States. The Corps issues Nationwide Permits that authorize minimal project impacts on wetlands and waters. NWP 12 addresses Utility Line Activities and specifically addresses utility lines and access roads. NWP 14 addresses Linear Transportation Projects and crossings of waters of the state by roadways. Both permits provide acreage limits of not greater than one-half-acre (21,779 square feet). There are some differences

Table 3.2-13: Proposed Mitigation Ratios and Replacement Acres of Habitat under the Middle Scenario (Acres)

Vegetation Type	Permanently Disturbed Area[1]	Permanent Mitigation Ratio	Permanent Mitigation Area[1]	Temporarily Disturbed Area	Temporary Mitigation Ratio	Temporary Mitigation Area	Total Mitigation Area Needed	Total Mitigation Area Provided
Dense Conifers	<0.1	2:1	0.0	0.1	0.5:1	0.1	0.1	0.0
Deciduous Shrub Thicket	<0.1	2:1	0.1	0.0	0.5:1	0.0	0.1	2.8
Dense Shrub-Steppe	2.4	1:1	4.8	6.0	0.5:1	3.0	7.8	0.0
Moderate Shrub-Steppe	22.6	2:1	45.2	57.2	0.5:1	28.6	73.8	274.9
Sparse Shrub-Steppe	15.9	2:1	31.9	54.0	0.5:1	27.0	58.8	73.1
Low Sagebrush	9.8	2:1	19.6	28.4	0.5:1	14.2	33.8	0.0
Grassland	40.3	1:1	40.3	159.2	0.1:1	15.9	56.2	185.1
Riparian Tree	<0.1	2:1	0.0	0.4	0.5:1	0.2	0.2	8.0
Riparian	0.0	2:1	0.0	0.0	0.5:1	0.0	0.0	0.0
Developed	1.5	0:1	0.0	5.3	0.0:1	0.0	0.0	0.0
Totals	92.5		141.8	310.5		88.9	230.7	543.9

1 Permanent disturbance to low sagebrush habitat assumes disturbance of both the proposed Bonneville and PSE substation sites (3 acres each); therefore, total acreage numbers have been adjusted accordingly.

in the requirements for these two different permits, and the Corps would make the determination of which NWP to apply for the proposed project. EFSEC would provide Section 401 water quality certification to the Corps if the project is approved by the Governor. Depending on the total project impacts and which NWP the Corps assigns, EFSEC may require compensatory mitigation for the project. Therefore, the specific mitigation requirements to compensate for loss of wetlands and water resources at the project site is considered an issue of uncertainty that has yet to be resolved.

Additional Recommended Mitigation Measures

<u>Post-Construction Restoration of Temporarily Disturbed Areas</u>

Existing project design minimizes both permanent and temporary impacts from facilities construction. The Applicant proposes to reseed temporarily disturbed areas with an appropriate mix of native plant species as soon as possible after construction is completed (see Mitigation Measures Proposed by the Applicant, above). WDFW recommends that a broadcast application (4 to 6 pounds per acre) of a lithosol origin biotype such as native Sandberg Bluegrass should be applied to restored areas (WDFW 2003e).

<u>Acquisition and Enhancement of Onsite Habitat</u>

WDFW has encouraged the Applicant to avoid and minimize the impact on lithosols as much as possible (WDFW 2003b). As described above, lithosol habitat is difficult to restore. In addition to the direct avoidance measures identified above, the following measure is recommended to minimize impacts on this unique and sensitive habitat:

- Implement measures to protect and restore existing lithosol habitat along ridgetops in the mitigation parcel. The amount of area required to mitigate for temporary and permanent loss of lithosol habitat should be determined based on further consultation with WDFW. If the appropriate amount of lithosol habitat is not identified at the mitigation parcel, additional lithosol habitat should be identified and acquired for preservation.

<u>Lighting</u>

The following mitigation measures to reduce lighting effects on avian species are recommended by WDFW (WDFW 2003e):

- The use of lights on towers, in accordance with federal, state and local requirements, should be minimized whenever possible, because they may attract birds and bats to the vicinity of the turbines in certain conditions (WDFW 2003d). Further, the USFWS recommends that only white (preferable) or red strobe lights be used at night, and that these should be the minimum number, minimum intensity, and minimum number of flashes per minutes (longest duration between flashes) allowable by the FAA. The use of solid red or pulsating red warning lights at night should be avoided, wherever possible. Current research indicates that solid or pulsating (beacon) red lights attract night-migrating birds at a much higher rate than white strobe lights (USFWS 2003).

3.2.6 Significant Unavoidable Adverse Impacts

With implementation of the recommended mitigation measures and avoidance, when possible, of sensitive areas such as stream and riparian corridors, no significant, unavoidable adverse impacts on wetlands, wildlife and habitat, fish, and threatened and endangered species are identified. Fish-bearing aquatic resources are not located within about 0.5 mile of the project area. Breeding and foraging habitat typically associated with federally listed threatened and endangered species would not be disturbed under the proposed project. While potential bald eagle fatalities associated with operation of the project are possible, the likelihood is considered remote because there have been no documented bald eagle fatalities at other wind power projects in the United States.

Total temporary upland vegetation habitat disturbance would range from 231 acres under the lower end scenario to 370 acres under the upper end scenario. Total permanent habitat disturbance would range from 92.5 acres under the middle scenario to 118 acres under the lower end scenario. The temporary and permanent disturbance of upland vegetation habitat would be compensated for by the mitigation proposal to purchase and protect an approximately 550-acre parcel with equal or better functional habitat characteristics as the project area.

3.3 WATER RESOURCES

This section presents information on existing surface water and groundwater resources in the KVWPP area. It also evaluates potential impacts on stormwater quality and groundwater, and identifies mitigation measures to limit these impacts. Wetlands and other unnamed surface water resources in the project area are discussed in Section 3.2, Vegetation, Wetlands, Wildlife and Habitat, Fisheries, and Threatened and Endangered Species. The analysis in this section is primarily based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Section 3.3). Where additional information has been used to evaluate the potential impacts associated with the proposal, that information has been referenced.

3.3.1 Affected Environment

Surface Water

The project site is located within the Yakima River drainage basin. The southern portions of turbine strings A and B are within approximately one-half mile of the Yakima River. Other portions of the project are located within one-half mile of Dry Creek (an ephemeral creek), other unnamed ephemeral creeks, the North Branch Canal of the Kittitas Reclamation District, and livestock watering ponds.

The project area consists primarily of long north-south-trending ridges. Between the ridges are ephemeral and perennial streams that flow into the Yakima River. Slopes within the project area generally range from 9 to 36%, but can reach 84% or more in some of the canyons.

Precipitation at Ellensburg, approximately 10 miles southeast of the project site, averages 8.9 inches annually. Most precipitation occurs in late autumn, winter, and early spring (Kittitas County Conservation District 2001). Dominant soils at the project site exhibit low permeability and have a high runoff potential.

<u>Yakima River</u>

The Yakima River descends from the foot of Keechelus Dam to its confluence with the Columbia River near Richland. The river is divided into three distinct reaches - upper, middle, and lower - on the basis of its physical characteristics. The project is located on the upper reach of the river. The upper reach, which drains the Kittitas Valley, has an average streambed slope of 14 feet per mile (ft/mi) over the 74 miles from the Keechelus Dam to a point upstream from Umtanum (Sagebrush Power Partners LLC 2003c).

In the Kittitas Valley, seasonal river flow patterns can vary greatly on an annual basis because of releases from irrigation reservoirs and changes in precipitation and snowmelt patterns. The dominant season for high river flow occurs during the irrigation season because of the large quantity of water released from irrigation reservoirs. An example in this range in variation is exhibited by data from the Yakima River at Cle Elum during the 1988 to 1989 water years. The data show post-irrigation flow (October through December) in the river at 271 cubic feet per second (cfs). As the year progresses, the flow gradually increases to 428 cfs in the period from

January through March, to 740 cfs from April through May, and to a high of 2,330 cfs during the irrigation period from June through September (Bauer and Hansen 2000).

The three reaches of the Yakima River exhibit varying water quality conditions resulting from differences in geologic sources of contaminants and land use. Compared to the rest of the basin, the Kittitas Valley has relatively low concentrations and loads of suspended sediment, nutrients, organic compounds, and fecal indicator bacteria (Morace et al. 1999). However, the upper Yakima River and several of its tributaries are included in Washington's 303(d) list of impaired waters because of metals, persistent pesticides in water and fish tissue, fecal coliform bacteria, dissolved oxygen, and temperature water quality criteria violations. It should be noted that Ecology is establishing a total maximum daily load (TMDL) for the upper Yakima River basin, which covers the pollution parameters of turbidity, suspended sediment, and organochlorine pesticides. This TMDL would address potential impairment of beneficial uses of the upper Yakima River and its tributaries.

Dry Creek

Dry Creek is an ephemeral stream in the immediate vicinity of the project site. Because the creek is ephemeral, water quality data are limited. However, data collected by Ecology in 1999 at a downstream location near Dry Creek's confluence with the Yakima River show that turbidity levels in Dry Creek are relatively low. Stream flow measurements collected by Ecology show Dry Creek flow ranges from a low of 1.5 cfs in April to a high of 19 cfs by early summer (at the beginning of the irrigation season) (Evans and Larson 2000).

North Branch Canal

The Kittitas Reclamation District (KRD) operates the North Branch Canal. The canal conveys water from the Yakima River for a distance of 36 miles, traversing the project site and providing irrigation water for much of the Kittitas Valley. Most irrigation occurs south of the canal and the project area. Flow in the canal varies during the irrigation season depending on water deliveries to irrigators. Water quality in the canal is generally good and reflects the water quality of the Yakima River. KRD regularly applies aquatic herbicides to the canal for controlling weeds (KRD 2002).

Groundwater

The project is located within the Yakima Fold Belt subprovince of the Columbia Plateau physiographic province. The variation in the geology of the overburden, multiple basalt flows, and interbedded sedimentary units results in a complex groundwater system in the region. In order to simplify the description of the area's hydrogeology, the aquifers in the project vicinity can be grouped into two main hydrologic units: the overburden and the basalt aquifers discussed below.

The overburden in the basins of the Columbia Plateau readily transmits water and contains water table aquifers. These aquifers are generally coarse-grained and highly permeable in their upper sections and fine-grained and less permeable at depth. Groundwater movement in the overburden is downward from the anticlinal ridges toward the streams and rivers (i.e., Yakima River) in the intervening basins (Bauer and Hanson 2000). The water-level contours for the overburden aquifer roughly parallel land surface (Whiteman 1986; Lane and Whiteman 1986; Hanson et al. 1994). Recharge is from infiltration of applied irrigation water and precipitation, with precipitation being the predominant source of recharge (Bauer and Vaccaro 1990) (Bauer and Hanson 2000).

Groundwater in the basalts occurs in joints, vesicles, fractures, and in intergranulated pores of the sedimentary interbeds. The basalt forms an extremely complex aquifer system with interflow zones that function as small semiconfined to confined aquifers. The basalt transmits water most readily through these interflow zones, which represent about 5 to 10% of the total thickness of a typical basalt flow (Hanson et al. 1994). Deeper basalt aquifers are generally confined. The hydraulic connection between units is sufficient to allow continuous vertical movement of water between them (Bauer and Hanson 2000). Water-level data indicate that the flow in basalts is downward except near discharge areas, located generally along streams and rivers (Lane and Whiteman 1986). Localized anomalies to this pattern are caused primarily by geologic structures of both known and uncertain nature and secondarily by groundwater pumping and irrigation (Bauer and Hanson 2000).

Groundwater in the project area has domestic, irrigation, and other uses. A review of 39 well descriptions in the project vicinity indicates that while some wells potentially draw water from the overburden aquifer, most of the area’s wells penetrate and draw water from the basalt aquifer. Groundwater in the basalt aquifer system is generally suitable for most uses. The dominant water type is calcium magnesium bicarbonate, and sodium bicarbonate is the next most prevalent water type. However, sodium concentrations increase with residence time, and the largest concentrations are found in samples from the deepest wells (Hanson et al. 1994).

As part of a 2002 geotechnical investigation, nine test pits were excavated at the project site (see Figure 3.1-1). Groundwater was not observed in these test pits that were excavated to depths ranging from 5 to 10 feet below ground. Logs maintained by Ecology of local water wells show that even though there are a number of shallow wells in the project area (i.e., some wells have been drilled to depths ranging from 57 to 116 feet), most wells have been drilled deeper than 150 feet and in some cases are as deep as 720 feet deep, which indicates a deep water table for most of the project area.

Floodplains

The 100-year floodplain of the Yakima River is the closest floodplain to the project site. In the project vicinity, the floodplain does not extend beyond State Route (SR) 10 to the west (see Figure 2-1). The closest access road or turbine to the Yakima River would be more than 500 feet in elevation above the level of the river.

3.3.2 Impacts of Proposed Action

This section describes the potential direct impacts on surface water and groundwater from development of the KVWPP. Direct impacts could be associated with construction, operations, and decommissioning of any of the proposed project elements, including wind turbines and meteorological towers, existing and new gravel access roads, additional power lines, and the proposed O&M facility and substations. Impacts associated with or attributable to specific project elements are discussed where applicable. Indirect impacts are not anticipated because the project is not expected to substantially induce regional growth to the extent that it would result in significant changes to offsite water resources. Table 3.3-1 summarizes potential water resource use and impacts under the three project scenarios.

Table 3.3-1: Summary of Potential Water Resources Use and Potential Impacts

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Construction Impacts			
Surface runoff from ground disturbance and exposed soils	231-acre disturbed area	311-acre disturbed area	371-acre disturbed area
Increased demand for water supplies	2.6 to 6.4 million gallons of water for dust control	2 to 5 million gallons of water for dust control	Same as middle scenario
Encountering groundwater during turbine foundation construction	Excavation depth of 22 feet (for spread footing foundations) to 35 feet (for mono-pier foundations) (82 turbines)	Excavation depth of 18 feet (for spread footing foundations) to 35 feet (for mono-pier foundations) (121 turbines)	Excavation depth of 14 feet (for spread footing foundations) to 35 feet (for mono-pier foundations) (150 turbines)
Damage to existing groundwater wells from blasting	Up to 164 blasts for foundation construction	Up to 242 blasts for foundation construction	Up to 300 blasts for foundation construction
Operations and Maintenance Impacts			
Erosion potential/area of permanent ground disturbance	118 acres	93 acres	95 acres
Increased demand for water	Same as middle scenario	<1,000 gallons daily at O&M facility	Same as middle scenario
Decommissioning Impacts			
	Similar to those described for construction	Similar to those described for construction	Similar to those described for construction

Source: Sagebrush Power Partners LLC 2003a, f.

Construction Impacts

<u>Surface Runoff and Erosion</u>

Precipitation during construction could result in sediment-laden surface runoff because of ground disturbance and exposed soils. If not properly mitigated, development under any of the three project scenarios could adversely affect nearby surface waters. This impact would be greatest under the upper end scenario, which would result in the largest amount of ground disturbance during construction (371 acres).

Water Supply

Construction of the project would require water for road construction, concrete preparation, dust control, and other activities. During construction, the EPC contractor would arrange for delivery of water to the site via water trucks from a source with an existing water right. Estimated water use for all construction-related needs other than dust control is 1 million gallons.

Construction of the project could use up to 6.4 million gallons of water for dust suppression activities along roadways. The amount of water for dust control could be reduced to between 2 and 2.6 million gallons if lignin or another environmentally safe, non-toxic dust palliative is used. This impact would be greatest under the lower end scenario because it requires the largest volumes of cut and fill and wider access roads for construction equipment.

The amount of water use during construction would depend on the timing of construction and weather (i.e., the need for dust control would be greater in dry, windy summer conditions than during other times of year). However, the impact is not expected to be significant under any of the three scenarios because of the temporary nature of the impact and the availability of adequate water supplies. The contractor would bring water for construction activities to the site. Water used for dust suppression would be applied using tanker trucks equipped with rear end sprinkler systems. Runoff from dust suppression activities is not expected because only enough water to dampen the soil would be used.

Groundwater Levels and Quality

Encountering significant amounts of groundwater during the construction of the turbine foundations is not expected. Required excavation depths for constructing the turbine towers would depend on the type of foundation used. For example, excavation, drilling, and blasting to construct mono-pier foundations for the wind turbine generators could penetrate to depths of 35 feet. If spread footing foundation designs are used, the depth of excavation would range from 14 feet (under the upper end scenario) to 22 feet (under the lower end scenario). In comparison, foundations for the O&M facility and substations would be shallow, only several feet deep, and would not encounter groundwater (Taylor, pers comm., 2003).

Some localized pockets of saturated subsurface soils could be encountered on ridges in places where surface water infiltrates the subsurface and collects above zones of cementation. Cemented soils have lower porosity and permeability, and were found in the upper 1 to 7 feet at the project area.

In the event of a substantial rainfall, foundation excavations could provide a temporary conduit for surface seepage, resulting in accelerated recharge to the overburden and basalt aquifers and a temporary rise in groundwater turbidity in the immediate vicinity of the foundation construction. However, potential groundwater impacts are not expected to be adverse because of the short duration of foundation construction (two to three months) and the likelihood that this stage of construction would occur during the dry season. If groundwater (perched or otherwise) is encountered during excavation and construction activities and draining (dewatering) is required, the water generated during dewatering activities would be pumped into a settling basin for infiltration, as needed. The exact location and size associated with siting a settling basin at the project site are unknown and would depend upon the amount of groundwater recharge anticipated to be encountered during construction (Taylor, pers. comm., 2003). However, it is unlikely that water generated during excavation pit dewatering would discharge to surface water sources. The overall impact on groundwater is expected to be temporary and unlikely to affect water wells in the project area.

Disruption to Existing Groundwater Wells

During the EIS scoping process, concern was raised that proposed blasting activities required to construct turbine foundations could adversely affect existing groundwater wells in the project area. Because of the rocky conditions on the site, it is anticipated that most wind turbine foundations would require one to two blasts each. Blasting would occur during the foundation excavation phase of construction that would last for approximately two to three months. Potential blasting impacts would be greatest under the upper end scenario because it requires the largest number of turbines (150). As described above, existing water well depths in the project area range from 57 feet to more than 720 feet below ground, with most wells greater than 150 feet deep. Because of the differences in depth between the majority of existing groundwater wells and proposed foundation sites, well damage is not anticipated.

Operations and Maintenance Impacts

Erosion and Sedimentation

No significant erosion or sedimentation impacts on project-area surface waters are expected as a result of operation and maintenance of the KVWPP. Project operation would result in a permanent developed footprint of 93 to 118 acres. This impact would be greatest under the lower end scenario. However, as described in Section 3.1, Earth Resources, operational BMPs would be implemented to control erosion and sedimentation.

Water Supply

Operation of the project would require a domestic well to serve the limited needs of the O&M facility. The well, which would provide water for bathroom and kitchen use and general maintenance purposes, is expected to consume less than 1,000 gallons per day under all three project scenarios. No significant impacts on groundwater supplies are expected because of facility operations.

Decommissioning Impacts

Impacts on water resources and water quality from decommissioning of the project would be similar to those described for construction. Water would be needed for dust control. There would be potential for soil erosion and impacts on stormwater quality. Impacts are expected to be minimal, however, because appropriate construction BMPs would be followed during decommissioning.

3.3.3 Impacts of No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated. However, development by others, and of a different nature, including residential development, could occur at the project site in accordance with the County's existing Comprehensive Plan and zoning regulations. Depending on the location, type, and extent of future development at the project site, impacts on water resources could be similar to or even greater than the proposed action.

If the proposed project were not constructed, the region's power needs could de delivered through development of other generation facilities, most likely a gas-fired combustion turbine. A gas-fired combustion turbine facility generating 60 aMW of power could require approximately 14 acres for the plant site (Bonneville and U.S. Department of Energy 1993). However, gas-fired combustion turbine projects could expose more soil to potential erosion because of the possible need to establish a gas pipeline to the facility and electrical transmission interconnections. Also, substantial amounts of water, estimated at 200 acre-feet (65 million gallons) per year (Bonneville and U.S. Department of Energy 1993) would be needed for cooling water during plant operation. Operation of a water-cooled combustion turbine facility would also result in discharge of large volumes of wastewater.

3.3.4 Mitigation Measures

Mitigation Measures Proposed by the Applicant

<u>Surface Runoff Pollution during Construction</u>

The Applicant proposes to develop and implement, as required by the National Pollutant Discharge Elimination System (NPDES) General Stormwater Permit for Construction Activities, a detailed SWPPP to minimize the potential for discharge of pollutants from the site during construction. See Mitigation Measures in Section 3.1, Earth Resources, for a detailed description of proposed SWPPP activities and measures to be implemented during construction.

<u>Surface Runoff Pollution during Operations</u>

The Applicant proposes to develop and implement a detailed SWPPP to minimize the potential for discharge of pollutants from the site during operations and maintenance activities. See Mitigation Measures in Section 3.1, Earth Resources, for a detailed description of proposed SWPPP activities and measures to be implemented during project operations and maintenance.

Water Supply

A licensed well driller would install a potable water well to serve the O&M facility. The well would be installed consistent with Kittitas County Environmental Health Department and Ecology requirements.

3.3.5 Significant Unavoidable Adverse Impacts

With implementation of the mitigation measures outlined above, significant unavoidable adverse impacts on surface water and groundwater resources resulting from project operation are not anticipated.

3.4 HEALTH AND SAFETY

This section describes existing health and safety hazards at the project site and identifies potential health and safety risks from project construction and operation, including the risk of fire or explosion, potential for release of hazardous materials, ice throw, tower collapse, blade throw, shadow-flicker, dust hazards, vandalism, electric and magnetic fields, and electric shock hazards. Mitigation measures are identified for potential impacts. The analysis in this section is primarily based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Sections 2.9, 4.1, and 7.2). Where additional information has been used to evaluate the potential impacts associated with the proposal, that information has been referenced.

3.4.1 Affected Environment

The proposed project would be constructed on between approximately 93 to 118 acres (depending on the project scenario) of a larger project area that covers approximately 3.5 miles (east-west) by 5 miles (north-south) in a hilly, rural landscape of rangeland. The project site is traversed by multiple sets of electrical transmission lines—one set of PSE lines running east to west and five sets of Bonneville lines also running east to west across the project site.

There are few existing hazards at the project site. Fire is the primary health and safety risk at the site. The project site is generally arid rangeland with a predominant groundcover of grasses and sagebrush. The highest expected fire risks are grass fires during the hot, dry summer season. Under existing conditions, fires could be started by lightning strike or by human activities such as careless disposal of lighted cigarettes or dry vegetation contacting hot exhaust catalytic converters under vehicles. However, lightning strikes at the project site are rare and human use at and around the site is limited.

3.4.2 Impacts of Proposed Action

This section describes the potential direct health and safety impacts in the project area from development of the KVWPP. Direct impacts could be associated with construction, operations, and decommissioning of any of the proposed project elements, including the wind turbines and meteorological towers, existing and new gravel access roads, additional power lines, and the proposed O&M facility and substations. Impacts associated with or attributable to specific project elements are discussed where applicable. Heath and safety risks during construction include potential fire or explosion and release of hazardous materials to the environment. Health and safety risks during project operation include these risks as well as others specific to wind turbine generators such as ice throw, tower collapse, blade throw, and shadow-flicker. Indirect impacts are not anticipated because the project is not expected to substantially induce regional growth to the extent that it would result in significant offsite health and safety risks. Table 3.4-1 summarizes potential health and safety risks identified under the three project scenarios.

Table 3.4-1: Summary of Potential Health and Safety Risks

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Construction Impacts			
Risk of fire or explosion	231 total acres disturbed; Up to 164 blasts for turbine foundation construction	311 total acres disturbed; Up to 242 blasts for turbine foundation construction	371 total acres disturbed; Up to 300 blasts for foundation construction
Release of hazardous materials at construction sites	Same as middle scenario	25,000 gallons fuel (diesel and gasoline) for mobile construction equipment; hydraulic fuel	Same as middle scenario
Operations and Maintenance Impacts			
Risk of fire or explosion	82 turbines and pad mounted transformers, up to 2 substations and 4 meteorological towers	121 turbines and pad mounted transformers, up to 2 substations and 4 meteorological towers	150 turbines and pad mounted transformers, up 2 substations and 4 meteorological towers
Release of hazardous materials	Same volume and potential for release per turbine as middle scenario, but slightly lower probability of release due to lesser number of turbines	50 gallons/turbine glycol-water mix	Same volume and potential for release per turbine as middle scenario, but slightly greater probability of release due to higher number of turbines
		85 gallons/turbine of hydraulic oil	
		105 gallons/turbine of lubricating oil	
	500 gallons/pad mounted transformer of mineral oil; 41,000 total gallons	500 gallons/pad mounted transformer of mineral oil; 60,500 total gallons	500 gallons/pad mounted transformer of mineral oil; 75,000 total gallons
	Same as middle scenario	12,000 gallons/substation transformer of mineral oil; up to 48,000 gallons	Same as middle scenario
Ice thrown from rotating blades	82 turbines; 3 blades/turbine; individual blade length = approx. 150 feet	121 turbines; 3 blades/turbine; individual blade length = approx. 115 feet	150 turbines; 3 blades/turbine; individual blade length = approx. 100 feet
Tower collapse and blade fragments thrown from rotating blades	82 turbines; 3 blades/turbine; individual blade length = approx. 150 feet	121 turbines; 3 blades/turbine; individual blade length = approx. 115 feet	150 turbines; 3 blades/turbine; individual blade length = approx. 100 feet
Shadow-flicker effects (related to number/size of rotor blades and rotor speed)[1]	122.2 shadow-flicker hours/year at Receptor M. Genson (worst-case receptor)	93.6 shadow-flicker hours/year at Receptor M. Genson (worst-case receptor)	Shadow-flicker not modeled under this scenario.
Potential for dust hazards	Same as middle scenario	Negligible	Same as middle scenario
Vandalism	Same as middle scenario	Negligible	Same as middle scenario
Electric and magnetic field hazards	Same as middle scenario	Negligible health and safety effects	Same as middle scenario
Electrical shock hazards	Same as middle scenario	Negligible with proper design	Same as middle scenario

Table 3.4-1: Continued

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Decommissioning Impacts			
Risk of fire or explosion	Similar in nature but less than construction impacts	Similar in nature but less than construction impacts	Similar in nature but less than construction impacts
Release of hazardous materials	Similar to construction impacts	Similar to construction impacts	Similar to construction impacts

Source: Sagebrush Power Partners LLC 2003a, f.

1 The blades would turn at about 10 to 23 rpm. Generally, larger wind turbine generators have slower-rotating blades, but the specific rpm values depend on aerodynamic design and vary across machines.

Construction Impacts

Risk of Fire or Explosion

There is a risk of unintentional or accidental fire or explosion during project construction. The highest expected fire risks are grass fires during the hot, dry summer season. Natural risk of unintentional fire or explosion, such as from a lightning strike would be the same regardless of project scenario. The potential fire risk from human activities would be greatest for the upper end scenario because this scenario would involve the greatest amount of activities such as ground disturbance (approximately 317 acres) and welding (on a per turbine basis) that could lead to accidental fire or explosion.

The Applicant's proposed Fire and Explosion Risk Mitigation Plan, presented in Table 3.4-3 in Section 3.4.4, Mitigation Measures, lists sources of potential fire and explosion during project construction along with measures to mitigate these risks. Implementation of these programs would ensure that project construction would not pose a substantial fire or explosion risk to human health and safety or the environment. Impacts associated with provision of adequate fire protection services to the site during project construction are discussed further in Section 3.13, Public Services and Utilities.

Due to the rocky conditions on site, blasting would be required to excavate foundations for the proposed wind turbines. If solid rock is encountered close to the ground surface while installing the underground cables, blasting may also be performed to excavate the cable trench to the required depth. It is anticipated that most wind turbine foundations would require one to two blasts each. Potential blasting impacts would be greatest under the upper end scenario because it would require constructing the largest number of turbines (150) over the longest period of time (approximately three months). Implementing safety measures proposed by the Applicant as part of its Fire and Explosion Risk Mitigation Plan during blasting activities would minimize risks associated with use of explosives.

Releases or Potential Releases of Hazardous Materials to the Environment

Fuel and lubricating oils from construction vehicles and equipment are potential sources of hazardous materials that could accidentally leak or be spilled during project construction.

However, this type of leak should not create a risk to health and safety or the environment because of the limited quantities of the materials involved. Diesel fuel is the primary potentially hazardous material that would be used in any significant quantity during project construction. Project construction would require the use of diesel fuel for operating construction equipment and vehicles. Estimated fuel consumption during construction would be approximately 25,000 gallons (diesel and gasoline) for mobile construction equipment, construction vehicles, and generators for the three project scenarios.

Mineral oil used to fill substation transformers is another potential source of hazardous materials that could accidentally be spilled during project construction. The project includes up to two substations, each with one or two substation transformers. Because they are delivered without oil in the tank, they would need to be filled with mineral oil onsite. As part of the commissioning process of the main transformers(s), they would be filled and tested. Each substation transformer would contain up to 12,000 gallons of mineral oil. The risk of an accidental spill of mineral oil at the substation construction sites would be low given the design features built into the project (see Section 3.4.4).

There is also a potential for an accidental release of hydraulic fluid or lubricating oils from construction equipment. However, lubricating oils and hydraulic fluids used during construction would mostly be contained in the vehicles and equipment for which they are used. Small quantities of lubricating oils may also be stored in appropriate containers at the construction staging area located at the site of the O&M facility. Implementation of appropriate spill prevention and control measures would ensure that the risk of an accidental release of hazardous materials remains low throughout construction (see Section 3.4.4).

Operations and Maintenance Impacts

Risk of Fire or Explosion

There is a risk of unintentional or accidental fire or explosion during project operations and maintenance. The risk of accidental fires from human activities such as cigarette smoking and use of vehicles off established roadways would be expected to be greatest under the upper end scenario due to the larger number of project employees (see Section 3.7, Socioeconomics, for further discussion of project employment). For mechanical fires, this impact would also be expected to be greatest under the upper end project scenario, which would operate the largest number of turbines (150). Impacts associated with provision of adequate fire protection services to the site during project operations and maintenance is discussed further in Section 3.13, Public Services and Utilities.

Lightning-induced fires are rare in the project area. As shown in the flash density map below (Figure 3.4-1), the Kittitas Valley and interior Washington in general, is not a highly lightning prone area. Furthermore, the wind turbine generators and other mechanical equipment at the substation and meteorological towers would be equipped with specially engineered lightning protection systems that would minimize the risk of lightning-induced fire during project operations (see Section 3.4.4).

Figure 3.4-1

As is the case with complex machines, there is some potential for fire caused by mechanical malfunction inside the wind turbine generators and at other project facilities. Implementation of proposed design measures for specific facilities and equipment and operational procedures would ensure that the risk of mechanical fire in project facilities would not pose a risk to health and safety or the environment (see Section 3.4.4).

The majority of the proposed electrical collection system would be buried underground, although a small portion (about 2 miles) would be constructed as overhead cables. There should be no risk of explosion. However, a brush fire could occur in the rare event that a conductor on a portion of the overhead cable parted and one end of the energized wire fell to the ground. Under this circumstance, fire-fighting capabilities of local fire districts would be called upon according to pre-arranged agreements to respond to the situation (see Section 3.13, Public Services and Utilities). Compliance with the project's Fire Protection and Prevention Plan would ensure that the risk of fire or explosion at the project facilities would not pose a risk to health and safety or the environment (see Section 3.4.4).

Releases or Potential Releases of Hazardous Materials to the Environment

Project operations would not result in the generation of regulated quantities of hazardous wastes. Because no fuel is burned to power the wind turbine generators, there would be no spent fuel, ash, sludge or other process wastes generated. Project operations would not require the use or storage of significant quantities of fuel or other materials that could cause a spill or other accidental release. Potential impacts associated with specific project facilities are described in more detail below.

Wind Turbine Generators

Periodic changing of lubricating oils and hydraulic fluids used in the individual wind turbine generators would result in the generation of small quantities of hazardous waste. These waste fluids would be generated in small quantities because they need to be changed only infrequently and the changing of these fluids is not done all at once, but rather on an individual turbine by turbine basis. The estimated amounts of lubricating oils, hydraulic fluids, and mineral oils required for project operations are presented in Table 3.4-1; the total amount would be slightly larger and smaller under the upper and lower end scenarios, respectively, due to differences in the overall number of turbines. This potential impact would be greatest under the upper end scenario, which would operate the largest number of turbines (150) and require the largest amount of oils and fluids during project operations—7,500 gallons of glycol-water mix, 12,750 gallons of hydraulic oil, and 15,750 gallons of lubricating oil. Based on the limited quantities of fluids contained in the wind turbine generators (50 gallons/turbine glycol-water mix, 85 gallons/turbine hydraulic oil, and 105 gallons/turbine lubricating oil) and the leak detection and containment systems engineered into their design (see Section 3.4.4), the potential for an accidental spill from wind turbine malfunction is low.

Electrical Collection System

Power from the turbines would be fed through a breaker panel at the turbine base inside the tower and would be interconnected to a pad-mounted step-up transformer, which step the voltage up to 34.5 kV. The pad-mounted transformers would contain mineral oil that acts as a coolant. Each pad-mounted transformer would contain up to 500 gallons of mineral oil. This potential impact would be greatest under the upper end scenario, which would operate the largest number of turbines (150) and therefore require a total of 75,000 gallons of mineral oil for project operations. Based on the leak detection and containment systems engineered into their design (see Section 3.4.4), the potential for an accidental spill from malfunction or breach of the pad-mounted transformers is low.

Substations and Interconnection Facilities

The project would be electrically connected to the power grid at a substation(s) that would be equipped with either one or two transformers. Each substation transformer would contain up to 12,000 gallons of mineral oil for cooling. Substation transformer requirements would be the same under the three project scenarios. Mineral oil used to fill substation transformers is a potential source of hazardous materials that could accidentally be spilled during project operations. The substation transformers would have a specifically designed containment system to ensure that any accidental fluid leak does not result in discharge to the environment (see Section 3.4.4).

Operations and Maintenance Facility

Waste fluids would be stored for short periods of time during project operations at the O&M facility. Measures incorporated into the design of the O&M facility would ensure that the risk of accidental spill or release of hazardous materials at the facility would be low and would not be a risk to health and safety or the environment.

Risk of Ice Throw from Turbine Blades

While more than 55,000 wind turbine generators have been installed worldwide, there has been no reported injury from ice thrown from wind turbines. Under icing conditions, all exposed parts of the wind turbine are liable to ice build-up. However, it has been observed that a moving turbine rotor is liable to accrete significantly heavier quantities of ice than stationary components. There are several mechanisms of ice accretion on structures. The most important of these, for wind turbines, is rime icing which occurs when the structure is at a sub-zero temperature and is subject to incident flow with significant velocity and liquid water content. The precise deposition mechanism is the subject of ongoing experimental and theoretical research (Morgan et al. 1998).

Ice throws occur as stationary turbine blades begin to rotate. Any ice shed prior to blade rotation would fall directly below the blade. Blades with ice build up turn slowly (only a few revolutions per minute) because the blade airfoil has been compromised by the ice, and the blades are unable to pick up any speed until the ice is shed. Reported data on ice throws at other projects indicate that ice fragments were found on the ground from 50 to 328 feet from turbines (<33 to 197 feet blade diameter) and were in the range of 0.2 to 2.2 pounds in mass (Morgan et al. 1998).

Studies of long-term weather data for the area by the Applicant's consulting meteorologist indicate that icing conditions occur on average 3 to 5 days per year (Sagebrush Power Partners LLC 2003c, Exhibit 6). This is categorized as a "moderate icing" risk (1 to 5 days of icing per year) according to the Wind Energy in Cold Climates (WECO) study commissioned by the European Union's Environment Directorate (WECO n.d.). In contrast, "light icing risk" is less than 1 day icing per year and "heavy icing risk" is 5 to 25 days per year.

Therefore, based on the results of the Morgan et al 1998 study, potential public health and safety risks caused by ice falling off rotating blades could occur within 50 to 328 feet of an operating turbine tower. Minimum setbacks incorporated into the proposed project layout would reduce the safety risks associated with ice throw and other safety and nuisance concerns (see Section 3.4.4, Mitigation Measures).

Risk of Turbine Tower Collapse

During scoping for this EIS, concern for potential collapse of wind turbine towers was raised. This potential impact would be greatest under the upper end scenario, which would contain the greatest number of turbines (150). Curt Maloy of Worldlink Insurance in Palm Springs, California was contacted by the Applicant to gain comparative information regarding the types and degree of risk associated with wind power projects. He stated that his company (Worldlink) insures more than 12,000 turbines comprising more than 3,400 MW of capacity and that he personally has 15 years of experience with the wind industry. According to the Applicant, he stated that he was not aware of any tubular wind tower structure collapsing (Sagebrush Power Partners LLC 2003c). Review of Internet sites on the topic of wind power risks revealed photographic evidence of wind tower collapse in Europe (Danish Society of Windmill Neighbours 2003; MAIWAG 2003). However, the specific conditions and circumstances supporting this photographic evidence is uncertain. Minimum setbacks incorporated into the proposed project layout would reduce the safety risks associated with tower collapse and other safety and nuisance concerns (see Section 3.4.4, Mitigation Measures).

Risk of Turbine Blade Throw

Concern was raised by the public regarding the risk of blade throw (defined as blade fragments thrown from a rotating machine). The number and size of blades operating at the project site would vary for each project scenario. For example, as described above, under the lower end scenario, 82 turbines would be constructed and each turbine would support an approximate 150-foot diameter 3-blade rotor. Under the upper end scenario, 150 turbines would be constructed but each turbine would support an approximate 100-foot diameter 3-blade rotor (see Table 3.4-1).

According to the Applicant, international experience to date has indicated that there are low risks associated with components falling from towers, including blade throw. Furthermore, risks have been continually reduced as turbine technology has improved (Sagebrush Power Partners LLC 2003c). Review of Internet sites on the topic of wind power risks revealed photographic evidence of wind tower parts such as blades detaching or failing (Country Guardian 2003). Blades were reported broken off on two occasions in 1995 at a facility in Tarifa, Spain (Windpower Monthly 1995), and in 1996, several cases of blade failures were documented in Germany (Country Guardian 2003). However, the specific conditions and circumstances supporting this photographic evidence and these reported cases of blade failure are uncertain. Minimum setbacks incorporated into the proposed project layout and compliance with engineering design and manufacturing safety standards would reduce safety risks associated with blade throw and other safety and nuisance concerns (see Section 3.4.4, Mitigation Measures).

Shadow-Flicker Effects

Shadow-flicker caused by wind turbines is defined as alternating changes in light intensity when the moving turbine blades cast shadows on the ground and objects (including windows at residences). Shadow-flicker is not caused by viewing the sun through rotating wind turbine blades or moving (i.e., driving) through the shadows of a wind farm, nor by sunlight being reflected from the turbine blades. Shadow-flicker can occur in project area homes if the turbine is located near a home and is in a position where the blades interfere with very low-angle sunlight. The most typical effects are the visibility of a pulsating shadow in the rooms of the residence facing the wind turbines and subject to the shadow-flicker. Such locations are typically called shadow-flicker receptors. Visual obstacles such as terrain, trees, or buildings between the wind turbine and a potential shadow-flicker receptor significantly reduce or eliminate shadow-flicker effects.

Shadow-flicker frequency is related to the rotor speed and number of blades on the rotor, which can be translated into a “blade pass frequency” measured in alternations per second, or hertz (Hz).

Two types of concerns have been raised regarding shadow-flicker effects: (1) they can cause epileptic seizures, and (2) that they can be an annoyance to local residences.

The Epilepsy Foundation has stated that frequencies below 10 Hz are not likely to trigger epilepsy seizures (Sagebrush Power Partners LLC 2003c), and current wind turbine technology would not produce frequencies greater than 10 Hz. As identified in Table 3.4-1, the project proposes to construct three-bladed wind turbines. The diameter of the circle swept by the blades would range from approximately 200 to 300 feet under the upper and lower end scenarios, respectively (that is, each blade would be approximately 100 to 150 feet long). The blades would turn at about 10 to 23 rpm. Generally, larger wind turbine generators have slower-rotating blades, but the specific rpm values depend on aerodynamic design and would vary across machines. Initial modeling (models run during April and June 2003) results were based on the NEG-Micon wind turbine model with a 235-foot rotor diameter and a nominal rotor speed of 17.3 rpm which translates to a blade pass frequency of 0.87 Hz (less than 1 alternation per second). This is significantly lower than 10 Hz threshold cited by the Epilepsy Foundation. To identify the level of annoyance effects to nearby receptor residences in the project area, shadow-flicker modeling was conducted by the Applicant between April and July 2003 (Sagebrush Power Partners LLC 2003c). The receptors (houses) that were selected for this analysis are those that represent the potential worst-case scenarios. Based on their locations relative to the proposed turbines, these are the receptors where the greatest shadow-flicker impacts are expected.

The shadow-flicker model used for this analysis is produced by EMD of Denmark and is part of the WindPro modeling software package. The model requires the following inputs:

- Turbine locations
- Shadow-flicker receptor locations
- USGS 1:24,000 topographic map
- USGS DEM (height contours)
- Rotor diameter
- Hub height
- Joint wind speed and direction distribution
- Hours of sunshine (monthly averages)

The model calculates the shadow-flicker time for either a) each receptor, b) everywhere (defined squares), or both (a and b). A receptor is defined as a window at a residence. Azimuth of windows has been estimated for each residence (East, West or 90, 180, 270 degrees from the nearby access road) and the default window size is assumed to be 1-by-1 meter. The sun's path is calculated from the turbine location and the cast shadow derived over the day. Then the run-time for the turbine is derived from wind data (speed and direction measurements collected on site and compared with long-term data available from the Ellensburg Airport to make sure it is representative of long-term conditions). When the turbines are not operating (such as when the wind speed is too low) there is no shadow-flicker. The analysis also included obtaining the number of sunny days from NOAA weather maps that indicate the mean sunshine percentage in the area of the project. Shadow-flicker occurs only on days with sunshine and not on cloudy days.

When the wind direction is perpendicular to the direction of the wind turbine (as seen from the receptor) then the shadow-flicker time is reduced because the cast shadow is narrow, whereas when the wind direction is in line with the direction of the turbine (as seen from the receptor), then the full rotor plane shadow needs to pass the receptor. Cloudiness is also considered in the model (no direct sun means no shadow). Output from the model includes the following information:

- Turbine locations and elevations
- Calculated shadow-flicker time at selected receptors
- Tabulated and plotted time of day with shadow-flicker at selected receptors
- Listing of turbines causing shadow-flicker at each selected receptor
- Map showing turbine locations, selected shadow-flicker receptors, and line contours indicating projected shadow-flicker time (hours per year).

As indicated above, initial modeling (models run during April and June 2003) results were based on the NEG-Micon wind turbine model with a 235-foot rotor diameter and a nominal rotor speed of 17.3 rpm, which translates to a blade pass frequency of 0.87 Hz (less than 1 alternation per second).

The results of the initial shadow-flicker models raised the question of how shadow-flicker effects may vary under the lower end and middle scenarios for "worst-case" receptors. Therefore, the Applicant prepared an additional set of shadow-flicker simulations in July 2003. The July 2003 model compared the shadow-flicker effects of a 235-foot rotor diameter with a 295-foot rotor diameter, including increased turbine spacing for the larger diameter machines. The analysis looked at landowners located closest to the turbines and in the highest zone of influence as potential receptors of shadow-flicker. The results of shadow-flicker modeling for the "worst-case" receptors are summarized in Table 3.4-2 below. Graphics illustrating shadow-flicker effects for the selected 17 receptors can be found in Appendix B.

Table 3.4-2: Kittitas Valley Wind Power Project Wind Turbine Shadow-Flicker Analysis

Residence	Primary Direction to Turbine(s)	# Hour/Year with Shadow-flicker	# Days/Year with Shadow-flicker	Max # Hours in a Day with Shadow-flicker
Project Configuration with 235-foot Rotor Diameter Turbines				
M. Genson	E/W	93.6	255	1.9
N. Andrew	E/W	84.3	236	1.7
Nelson	E/W	84.1	237	1.4
T Gerean	W	83.0	295	1.1
G. Giesick	E/W	54.9	177	1.4
L. Gerean	W	39.4	171	0.7
Anthony	E	38.1	295	0.8
S. Taylor	S/E	33.4	177	1.0
M. Robertson	E	26.1	208	0.7
Schwab	W	21.5	166	0.5
M Capmbell	W	17.0	178	0.5
Gaskill	E	17.0	137	0.5
Darrow	W	16.7	118	0.4
Burt	W	14.7	139	0.4
Zellmer	W	14.0	179	0.6
Pearson	E	10.5	88	0.4
Price	N	0.0	0	0.0
Project Configuration with 295-foot Rotor Diameter Turbines[1]				
M. Genson	E/W	122.2	252	2.3
N. Andrew	E/W	110.1	233	2.2
T Gerean	W	72.3	134	1.3
Nelson	E/W	70.4	222	1.7
G. Giesick	E/W	48.7	128	1.6
S. Taylor	S/E	32.2	202	2.0
M. Robertson	E	25.6	144	0.8
L. Gerean	W	0.0	0	0.0

Source: Young, pers. comm., 2003.

1 295-foot rotor wind turbine casts longer shadow; only residences with more than 48 hours of shadow-flicker were examined

Modeling for the upper end scenario (197-foot meter rotor) was not conducted because it was assumed that modeling the middle and lower end scenarios would adequately evaluate the potential shadow-flicker effects at the site. It is reasonable to assume that although greater in number, the upper end scenario wind turbine generators would exhibit fewer total hours of shadow-flicker and shorter durations than those seen for the middle scenario because the length of shadow cast from a shorter tower would be smaller.

The model demonstrates that potential receptors (houses) to the north or south of wind turbines are not likely to receive shadow-flicker, because the cast shadow is very short in the north and south directions. Receptors (houses) used in the model represent worst-case scenarios, where the greatest shadow-flicker impacts are expected based on their locations relative to the proposed turbines.

According to modeling results for the middle scenario (235-foot rotors), the highest shadow-flicker level is 93.6 hours per year at receptor M. Genson, while the next highest modeled level is 84.3 hours at receptor N. Andrew. Both receptors would experience shadow-flicker in the morning and evening only if windows are present to the east and west. These receptors also exhibited the highest modeled level of shadow-flicker per day at 1.9 and 1.7 hours, respectively, on days that shadow-flicker is present (Sagebrush Power Partners LLC 2003c). Receptor T. Gerean showed the greatest number of days per year with shadow-flicker at 255.

Shadow-flicker modeling for the lower end scenario (295-foot rotors) showed that M. Genson and N. Andrew also had the highest shadow-flicker (122.2 and 110.1 hours/year) and maximum number of hours per day with shadow-flicker (2.3 and 2.2). These receptors also exhibited the greatest number of days per year with shadow-flicker (252 and 233).

The results of the July 2003 modeling demonstrate that the lower end scenario would result in greater shadow-flicker effects than would occur under the middle scenario. This was expected even though this scenario has fewer towers because the taller towers with the greater diameter rotors would cast longer shadows and have a greater shadow-flicker effect area. It is reasonable to assume that although greater in number, the upper end scenario wind turbine generators would exhibit fewer total hours of shadow-flicker and shorter durations than that seen for the middle scenario.

As stated above, shadow-flicker in residences near the wind turbine generators is not expected to result in health effects. It is, however, anticipated that some residents experiencing shadow-flicker may suffer some annoyance. Suggested measures to mitigate for the effects of shadow-flicker are presented in Section 3.4.4.

Dust Hazards

The project's potential to create dust hazards in the project area was raised as an issue of concern during the EIS scoping period. Dust circulation in open fields such as those found in the project area comes from airflow over loose dust particles on open ground. Wind turbines extract energy from the wind through the aerodynamics of the blades. The rotors would be located between 65 feet (under the upper end scenario) and 115 feet (under the lower end scenario) above ground level and ground level airflow disturbance would be negligible. Furthermore, the wind speed downwind of the rotor is slower than wind speed upwind of the rotor, meaning that dust circulation in the area would possibly even decrease (Sagebrush Power Partners LLC 2003f).

Therefore, the wind turbines would not act as a fan, which accelerates wind across the ground causing additional dust.

Vandalism

The potential for vandalism of project facilities, particularly the effect of gun shots at turbine insulators, was raised as an issue of concern during the EIS scoping period. Wind turbines do not have insulators. According to the Applicant, the towers themselves are sturdy and resilient to vandalism. The project design includes extensive site security measures to ensure that vandalism does not pose a health or safety threat to workers at the project site or residents or visitors in the project vicinity, nor adversely affect project operations. As described in Chapter 2, Section 2.2.5, the plant operations group would prepare a detailed security plan to protect the security of the project and project personnel.

Electric and Magnetic Fields

The potential for the project to create electric and magnetic fields was raised as an issue of concern during the EIS scoping period. Magnetic fields are the result of movement of electrons in a wire (current), and electric fields are created by voltage, the force that drives the electrical current. Electric and magnetic fields (EMF) are produced by any device that consumes or conducts electricity, such as electrical transmission and distribution lines, as well as common household lights and appliances. All of the electrical wiring in homes and office buildings, for example, emits EMF when the power is on, as do televisions, cellular phones, and microwaves, to name a few.

Electric field strength for transmission lines is expressed in units of volts per meter (V/m) or kilovolts per meter (kV/m) measured at a height of 1 meter above the ground. The magnetic field strength is expressed in milligauss (mG) and is also measured at a height of 1 meter above the ground. The strengths of the electric and magnetic fields associated with transmission lines generally decrease as the distance from the conductors increases (Bonneville and EFSEC 2002). Typical electrical and magnetic fields for transmission lines are illustrated in Figure 3.4-2 Computed electric field values at the edge of the transmission corridor right-of-way are fairly representative of what can be expected along the transmission line corridor as a whole. However, the presence of vegetation on or at the edge of the right-of-way can reduce the actual electric field strengths below the calculated values. The height and arrangement of the conductors on the transmission line towers can also affect the field strengths. The presence of other transmission lines can also affect the field strengths, producing higher or lower values (Bonneville and EFSEC 2002).

The average home electric appliance typically has an electric field of less than 0.01 kV/m, while at a distance of 3 to 5 feet, the magnetic field from appliances usually decreases to less than 1 mG (Miller 1975; Gauger 1985).

There are currently no national standards in the United States for electrical or magnetic fields. In the Northwest, Bonneville has established an electric field strength standard of 9 kV/m maximum on the right-of-way and 5 kV/m at the edge of the right-of-way. All Bonneville lines

Figure 3.4-2

are designed and constructed in accordance with the National Electrical Safety Code (NESC). The NESC specifies the minimum allowable distances between transmission lines and the ground or other objects. These requirements help determine the width of the right-of-way. Washington State does not have a regulatory standard for EMF exposure.

Numerous health and safety concerns have been raised in association with EMF from electric transmission and distribution lines. Much of the national and international research regarding EMF and public health risks remains contradictory and inconclusive. As a result, the scientific and medical communities have not been able to form a consistent conclusion as to whether there are any adverse health effects from EMFs at the frequencies typically associated with electric power systems (Walla Walla County 2000).

EMF is considered a possible issue when associated with the siting of high voltage (115kV+) overhead transmission lines close to residences. It is not an issue related to wind turbines, which have low voltage drop-cables (575–690V) contained within steel towers and have a predominantly underground collection system also at a low voltage (34.5 kV) (Sagebrush Power Partners LLC 2003c). However, during project operation, the substations and high-voltage overhead power lines would produce EMF in the immediate vicinity of these facilities.

The high voltage transmission lines associated with the project would be short (i.e., less than 200 feet long) lines that would interconnect the substations to existing overhead Bonneville and PSE transmission lines at the transmission level (230 kV or 287 kV for the Bonneville or PSE lines, respectively). The strength of electric and magnetic fields attenuates rapidly as the distance from the source increases. Typical EMF levels for a 230-kV transmission line show that the electric field would be approximately 0.01 kV/m and the mean magnetic field would be approximately 0.8 mG at a distance of about 300 feet from the EMF source (Bonneville 1995). These EMF levels are comparable to what has been recorded for typical household appliances.

The closest residential receptor to either of the proposed substations is located approximately 4,000 feet away. Most residential receptors in the project area are located more than one mile from the proposed substations. At these distances, EMF generated by proposed facilities would diminish to background levels at nearby residences and would not pose a health or safety risk. Therefore, there would be no EMF exposure to residents in the project area and no impacts would result.

Electrical Shock Hazards

The electrical system at the substations could be susceptible to ground faults, lighting, and switching surges that may result in high voltage, which can constitute a hazard to site personnel and electrical equipment, including protective relaying equipment. The substations would be designed and constructed with systems that would protect project personnel and minimize potential risks associated with accidental exposure to high voltage electrical equipment (see Section 3.4.4).

Decommissioning Impacts

Potential health and safety impacts during the project decommissioning process would be similar to risks identified during project construction. Potential fire risks are similar in nature but less than the risks for project construction. Fire prevention measures during decommissioning would be similar to those used during project construction. The potential release of hazardous materials during decommissioning activities would also be similar to those identified for construction activities.

3.4.3 Impacts of No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated and the existing risk of fire caused by natural sources or human activities not associated with the project would remain. However, development by others, and of a different nature, including residential development, could occur at the project site in accordance with Kittitas County's existing Comprehensive Plan and zoning regulations. Depending on the location, type, and extent of future development at the project site, health and safety impacts could be similar to or even greater than the proposed action. However, the risks associated with tower collapse and detachment or failure of turbine parts would not occur if development other than a wind power project were proposed.

It is assumed that a power-generating facility would need to be built at another location should the KVWPP not be built. This would likely be a gas-fired combustion turbine facility. An example of greater potential for health and safety risks associated with a gas-fired combustion turbine plant is the higher risk of fire or explosion associated with the transmission and use of large quantities of natural gas.

3.4.4 Mitigation Measures

Mitigation Measures Proposed by the Applicant

The Applicant and its subcontractors would comply with all applicable local, state, and federal safety, health, and environmental laws, ordinances, regulations, and standards. Some of the main laws, ordinances, regulations, and standards designed to protect human health and safety that would be reflected in the design, construction, and operation of the project include:

- Occupational Safety And Health Act Of 1970 (29 USC 651, et seq.) and 29 CFR 1910, Occupational Safety and Health Standards;
- Washington Industrial Safety and Health Act (RCW 49.17) and associated rules (WAC 296); Uniform Fire Code;
- Americans with Disabilities Act;
- Uniform Fire Code Standards;
- Uniform Building Code;
- National Fire Protection Association, which provides design standards for the requirements of fire protection systems;

- National Institute for Occupational Safety and Health, which requires that safety equipment carry markings, numbers, or certificates of approval for stated standards;
- American Society of Mechanical Engineers, which provides plant design standards;
- American National Standards Institute, which provides plant design standards;
- National Electric Safety Code;
- American Concrete Institute Standards;
- American Institute of Steel Construction Standards;
- American National Standards Institute;
- American Society for Testing and Materials;
- Institute of Electrical and Electronic and Installation Engineers; and
- National Electric Code.

Fire and Explosion Risk Mitigation Plan (Construction and Operations)

Table 3.4-3 presents the potential causes of fire or explosion during both project construction and operations, and mitigation measures that would be employed to minimize or prevent the risk.

Table 3.4-3: Fire and Explosion Risk Mitigation Plan

C/O[1]	Potential Fire or Explosion Source	Mitigation Measures
C & O	General Fire Protection	• All onsite service vehicles fitted with fire extinguishers • Fire station boxes with shovels, water tank sprayers, etc. installed at multiple locations onsite along roadways during summer fire season • Minimum of one water truck with sprayers must be present on each turbine string road with construction activities during fire season
C & O	Dry vegetation in contact with hot exhaust catalytic converters under vehicles	• No gasoline-powered vehicles allowed outside of graveled areas • Mainly diesel vehicles (i.e., w/o catalytic converters) used on site • Use of high clearance vehicles on site if used off road
C & O	Smoking	• Restricted to designated areas (outdoor gravel covered areas)
C	Explosives used during blasting for excavation work	• Only state-licensed explosive specialist contractors are allowed to perform this work; explosives require special detonation equipment with safety lockouts. • Clear vegetation from the general footprint area surrounding the excavation zone to be blasted. • Standby water spray trucks and fire suppression equipment to be present during blasting activities
C & O	Electrical fires	• All equipment is designed to meet NEC and NFPA standards. • Graveled areas with no vegetation surrounding substation, fused switch risers on overhead pole line, junction boxes and pad switches • Fire suppressing, rock-filled oil containment trough around substation transformer

Table 3.4-3: Continued

C/O[1]	Potential Fire or Explosion Source	Mitigation Measures
C & O	Lightning	• Specially engineered lighting protection and grounding systems at wind turbines and substations • Footprint areas around turbines and substation are graveled with no vegetation
C	Portable Generators – hot exhaust	• Generators not allowed to operate on open grass areas • All portable generators to be fitted with spark arresters on exhaust system
C	Torches or field welding onsite	• Immediate surrounding area will be wetted with water sprayer. • Fire suppression equipment to be present at location of welder/torch activity
C & O	Electrical arcing	• Electrical designs and construction specifications meet or exceed requirements of NEC and NFPA.

Source: Sagebrush Power Partners LLC 2003c.
1 Indicates risk during construction (C) and/or operations (O).

Additional Measures to Reduce Risk of Fire and Explosion during Construction

- The Construction Manager would be responsible for staying abreast of fire conditions in the project area by contacting DNR and implementing necessary fire precautions.
- Fire risk reporting by the Washington DNR would be actively posted at the construction job site during the high-risk season.
- A Fire Protection and Prevention Plan would be developed and implemented, in coordination with the Kittitas County Fire Marshal and other appropriate agencies.
- Potential hazards associated with use of flammable liquids such as construction equipment fuels would be reduced by compliance with a Construction Health and Safety Plan. Each contractor would develop its own plan tailored to suit the specific site conditions, design, and construction requirements for the project. These contractors would administer the program to ensure compliance with laws, ordinances, regulations, and standards pertaining to worker safety, including the State of Washington's construction safety standards (Chapter 296-155 WAC) and the requirements of the Occupational Safety and Health Administration (OSHA) (Title 29, Labor, Code of Federal Regulations Part 1926, Safety and Health Regulations for Construction). The Construction Health and Safety Plan would include the following provisions:
  - Injury and illness prevention plan;
  - Written safety program;
  - Personnel protective devices program;
  - Onsite fire suppression program;
  - Offsite fire suppression support; and
  - Emergency plan.

Additional Measures to Reduce Risk of Fire and Explosion during Operations

- The Applicant has committed to developing and implementing emergency response procedures and employee training addressing the following topics:
  - Personnel injury;

- – Construction emergencies;
  - – Project evacuation;
  - – Fire or explosion;
  - – Floods;
  - – Extreme weather abnormalities;
  - – Earthquakes;
  - – Volcanic eruption; and
  - – Facility blackout.
- The project O&M group and third party contractors would receive regular emergency response and safety training to ensure that effective and safe action would be taken to reduce and limit the impact of an emergency (including fires and explosions) during project operations.
- The wind turbine generators would be equipped with specially engineered lightning protection systems that connect the blades, nacelle, and tower to a grounding system at the base of the tower. The blades would be constructed with an internal copper conductor and an additional lightning rod that extends above the wind vane and anemometer at the rear of the nacelle. The Applicant also proposes to keep the areas around each turbine base graveled with no vegetation, to reduce fire risk.
- The turbine control system would detect overheating in turbine machinery. Internal fires would be detected by these sensors, causing the machine to shut down immediately and to send an alarm signal to the central SCADA system which would notify operators of the alarm by cell phone or pager.
- The proposed substations would be equipped with specially engineered lightning protection systems to minimize the risk of fire during substation operations. All electrical designs for the substations and interconnection facilities would comply with the National Electric Code and the National Fire Protection Agency regulations and standards. The substations would be completely enclosed by a locked fence and access would be limited to authorized personnel. The area surrounding the substations would be graveled and no combustible vegetation would be located within the fenced area.
- Permanent meteorological monitoring towers would be installed with a grounding system that protects the meteorological sensors and loggers from electrostatic discharge and provides lightning protection to the tower by bringing the tower and everything mounted on it to ground potential. Lightning dissipaters or rods would be installed at the top of the towers to provide an umbrella of protection for the upper sensors.
- Only qualified personnel would perform maintenance on the electrical cables. Sufficient clearance would be provided for all types of vehicles traveling under the overhead segments of the electrical lines.

<u>Measures to Reduce Potential Releases of Hazardous Materials to the Environment during Construction</u>

- During construction, the EPC contractor would use fuel trucks for refueling construction vehicles and equipment on site. There would be no fuel storage tanks used at the project site. To avoid spills, fueling trucks would be equipped with auto shutoff valves and other safety devices. The fuel trucks would be properly licensed and would incorporate features in equipment and operation, such as automatic shutoff devices, to prevent accidental spills.

- The oil truck used to fill substation transformers would be properly licensed and would incorporate several special features in equipment and operation, such as automatic shutoff devices, to prevent accidental spills.
- The details of how lubricating oils and other materials would be stored and contained at the construction staging area would be documented in a construction spill prevention and control plan developed and approved by EFSEC prior to commencement of construction. This plan would show storage, detention, and response procedures for all potential chemicals used on site. Implementation of appropriate spill prevention and control measures would ensure that the risk of an accidental release of hazardous materials remains low throughout construction.
- The EPC contractor would be responsible for compliance with applicable federal, state, and local laws, ordinances, regulations, and standards to ensure that the risk of release does not create an adverse health and safety or environmental impact. The EPC contractor would also be responsible for training its personnel in spill prevention and control and, if an incident occurs, would be responsible for containment and cleanup. Spills would be addressed in accordance with the construction spill prevention plan.

Measures to Reduce Potential Releases of Hazardous Materials to the Environment during Operations

- The wind turbines would be equipped with sensors to automatically detect loss in fluid pressure and/or increases in temperature; these sensors would enable the turbines to be shut down in case of a fluid leak. The turbines would be designed with fluid catch basins and containment systems to prevent accidental releases from leaving the nacelle. Any accidental gear oil or other fluid leaks form the wind turbines would be contained inside the towers because they are sealed around the base.
- The pad-mounted transformers would be designed to meet stringent electrical industry standards, including containment tank welding and corrosion protection specifications. These transformers would also be equipped with oil level indicators to detect potential spills.
- The substation transformers would have a specifically designed containment system to ensure that any accidental fluid leak does not result in discharge to the environment. The substation design would incorporate an oil containment system consisting of a perimeter containment trough, large enough to contain the full volume of transformer mineral oil with a margin of safety, surrounding the main substation transformers. The trough and/or membrane would drain into a common collection sump area that would be equipped with a sump pump designed to pump rainwater out of the trough to a nearby natural drainage. To prevent the sump from pumping oil out to the surrounding area, it is fitted with an oil detection shutoff sensor that would shut off the sump when oil is detected. A fail-safe system with redundancy is built into the sump controls because the transformers are also equipped with oil level sensors. If the oil level inside a transformer drops due to a leak in the transformer tank, it would also shut off the sump pump system to prevent it from pumping oil and an alarm would be activated at the substation and into the main wind project control (SCADA) system.
- Waste fluids would be stored in appropriate containers on a concrete surface inside the O&M facility for collection by a licensed collection service for recycling or disposal. The storage area inside the O&M facility would be surrounded by a berm or trough to trap any leaks or spills.

Measures to Minimize Risk of Ice Throw

In order to prevent ice from causing any potential danger, the proposed turbines would be located at least 1,000 feet from any residences. For additional safety, selected turbine rows within 328 feet of public roads would also be equipped with a fail-safe icing sensor system, which would shut the turbines down and activate a local alarm during rare icing events. The affected machine(s) would remain dormant until icing conditions are no longer present.

Measures to Minimize Risk of Tower Collapse and Blade Throw

- The Applicant proposes setbacks of at least the height of the tower plus the blade (overall tip-height) from any public roads and residences. The size of this setback would vary depending on the selected project scenario. The tip-height would range from a low of 260 feet under the upper end scenario to a high of 410 feet under the lower end scenario.
- The wind turbines would meet international engineering design and manufacturing safety standards. This includes tower, blade, and generator design. There is an international quality control assurance program for turbines, and a number of relevant safety and design standards. Quality Assurance/Quality Control (QA/QC) inspections of the wind turbine generators and towers would typically include, but not be limited to, the following operations, checks, and review:
  - Inspection of turbines at manufacturer's facilities;
  - Review and inspection of manufacturer's QA/QC procedures;
  - Manufacturing drawing review and verification;
  - Verification of welding procedure specifications compliance ;
  - Material mill certificates tracking system and verification;
  - Overall visual inspection (including assembly, fastening systems and welding);
  - Inspection of flange interface flatness measurements, finishing and protection;
  - Witness or review of turbine run-in load testing;
  - Inspection of paint finishing and protection;
  - Inspection of painting/marking/preparation for shipment;
  - Verification of field wiring and tagging; and
  - Pre-Commissioning field testing and verification.
- Foundation design and commissioning checks would address potential equipment failure due to extreme events such as earthquakes or extreme wind loadings, as well as frequency tuning of the different parts of the structure to avoid failure due to dynamic resonance.

Measures to Minimize Exposure to EMF

Proposed high voltage transmission lines would be designed and built according to industry standards to avoid EMF impacts.

Measures to Minimize Electric Shock

The substations would be designed and constructed to have a robust grounding grid that would divert stray surges and faults. Generally, the substation grounding grid would consist of heavy gauge bare copper conductor buried in a grid fashion and welded to a series of multiple underground grounding rods.

Measures during Decommissioning

An audit would be performed of the relevant operation records and a project site survey would be conducted to determine if a release of hazardous material has occurred. A review of all facilities would be performed to determine if hazardous or dangerous materials (as then defined by regulation) are present as construction materials or materials used in the operation of any facility components such as cleaning and maintenance fluids, lubricating oils, and gases. The project site inspection would determine and record the location, quantity, and status of all identified materials.

Additional Recommended Mitigation Measures

In addition to the mitigation measures proposed by the Applicant above, the following measures would further reduce health and safety related impacts and risks.

Measures to Minimize Risk of Ice Throw

The Applicant proposes to equip selected turbines within 328 feet of public roads with a fail-safe icing sensor system. However, some of the residents in the project area travel on private roads to access their properties. Because some roads appear to be close to the proposed turbines, the Applicant should install a similar icing sensor system on any turbine located within 328 feet of private roads.

Measures to Minimize Risk of Tower Collapse and Blade Throw

The Applicant proposes setbacks of at least the turbine tip-height (ranging from 260 to 410 feet, depending on the project scenario) from public roads and residences as a safety measure to reduce the risk of tower collapse or blade throw. However, some of the residents in the project area travel on private roads to access their properties. Because some roads appear to be close to the proposed turbines, the Applicant should adjust the siting of individual turbines, as necessary, to avoid encroaching upon a 260- to 410-foot setback around private roads.

Measures to Minimize Shadow-Flicker Effects

Shadow-flicker caused from low-angle sun shining through rotating wind turbines would affect several residences in proximity to the project site. Although the number of expected hours of exposure is relatively low, residents may perceive these effects to be significantly disruptive in nature. Recommended mitigation measures to minimize the nuisance effect from shadow-flicker to residents in the project area should include one or more of the following:

- Plant trees between the affected residence and the turbines causing the effect;
- Install fixed shades on affected windows;

- Install automatic shades on affected windows that are opened and closed by electric motor on a timer.

3.4.5 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts on health and safety resulting from the construction, operation, and maintenance of the proposed project have been identified.

3.5 ENERGY AND NATURAL RESOURCES

This section characterizes existing energy and natural resources available at the project site and in the project area, and describes the project's demand for energy and nonrenewable resources. Potential impacts on these resources are discussed, and mitigation measures are identified. The analysis in this section is primarily based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Section 3.5). Where additional information has been used to evaluate the potential impacts associated with the proposal, that information has been referenced.

3.5.1 Affected Environment

Energy Resources

The primary existing energy resources in the project vicinity are electrical transmission lines that traverse the project site. Figure 2-1 presents the existing electrical infrastructure in the project vicinity.

Project Area Electricity

PSE and Kittitas County Public Utility District (PUD) No. 1 provide electrical services within the county, except for within the City of Ellensburg, which provides electrical service within its boundaries. The sources of this power are primarily the Columbia River hydroelectric facilities such as Wanapum Dam operated by the Grant County PUD and the Bonneville Power Administration (Kittitas County 2002a).

Several high-voltage transmission lines traverse the project site (see Figure 2-1) Five sets of Bonneville electrical transmission lines run east to west across the project site, divided into one group of four near the middle of the site and one to the north. One set of PSE electrical transmission lines runs east to west just north of the southern set of Bonneville lines.

- The Applicant has submitted requests for transmission interconnection services for the project to both PSE and Bonneville (Bonneville 2003).

- If connected to PSE's system, the project would interconnect directly with PSE's Rocky Reach to White River 230-kV line.
- If connected to Bonneville's system, the project would interconnect directly with either the Grand Coulee to Olympia 287-kV line or the Columbia to Covington 287-kV line.

Northwest Region Electricity

Regional Demand

Based on data published by the NWPCC, electricity demand for its four-state Pacific Northwest planning region (Washington, Oregon, Idaho, and Montana) was 20,080 average megawatts in 2000 (NWPCC 2003).

As shown in Table 3.5-1, the NWPCC's recently revised 20-year demand forecast shows that electricity demand in the region will grow from 20,080 average megawatts in 2000 to 25,423 average megawatts by 2025 (medium forecast), an average annual growth rate of just less than 1% per year. While the NWPCC's forecast indicates that the most likely range of demand growth (between the medium-low and medium-high forecasts) is between 0.4 and 1.50% per year, the low to high forecast range used by the NWPCC recognizes that growth as low as -0.5% per year or as high as 2.4% per year is possible although relatively unlikely (NWPCC 2003).

Table 3.5-1: Projected Pacific Northwest Electricity Demand, 2000-2025

Forecast Scenario	Electricity Demand (Average Megawatts)			Growth Rates (Percentage of Change)	
	2000	2015	2025	2000-2015	2000-2025
Low	20,080	17,489	17,822	-0.92	-0.48
Medium Low	20,080	19,942	21,934	-0.05	0.35
Medium	20,080	22,105	25,423	0.64	0.95
Medium High	20,080	24,200	29,138	1.25	1.50
High	20,080	27,687	35,897	2.16	2.35

Source: NWPCC 2003.

Bonneville Transmission System

Bonneville owns and operates 15,000 miles of power lines that carry power from the dams and other power plants to utility customers throughout the Pacific Northwest. The Bonneville service area includes Oregon, Washington, Idaho, western Montana, and small portions of Wyoming, Nevada, Utah, California, and eastern Montana.

Generation resources typically require interconnection with a high-voltage electrical transmission system for delivery to purchasing retail utilities. Bonneville owns and operates the Federal Columbia River Transmission System (FCRTS), which comprises more than three-fourths of the high-voltage transmission grid in the Pacific Northwest, and extra regional transmission facilities. Bonneville operates the FCRTS in part to integrate and transmit "electric power from existing or additional Federal or non-Federal generating units." Interconnection with the FCRTS is essential to deliver power from many generation facilities to loads both within and outside the Pacific Northwest.

Public agencies get preference to power from Bonneville. About half the power Bonneville sells goes to Northwest public utility districts, city light departments, and rural electric cooperatives. An additional 15% of Bonneville's annual sales is to investor-owned utilities. Sales to Northwest aluminum companies and a few other large industries account for about one-fourth of Bonneville's annual revenues. After Northwest customers are served, Bonneville sells any surplus power to utilities outside the region.

Bonneville has indicated that portions of the Northwest transmission system are approaching gridlock, resulting in chronic congestion on a number of critical transmission paths, which has curtailed firm power deliveries. One effect of these constraints is that they limit wholesale power trading, which in turn drives up prices for all consumers in the West. As of 2001, approximately 1,000 MW of generation projects under construction had contracted for transferring power over the Bonneville system. An additional 3,000 MW of new generation is proposed by 2004, and developers for nearly 30,000 MW of generation have requested interconnection. While many of the proposed generation projects would not be built, Bonneville has determined that a transmission capacity shortfall of approximately 3,000 MW would occur by 2004 (Bonneville 2001).

Puget Sound Energy Transmission System

PSE is a private company whose electricity services are regulated by the Washington Utilities and Transportation Commission. PSE operates and maintains an extensive electric system consisting of generating plants, transmission lines, substations, and distribution equipment. PSE operates approximately 303 substations, 2,901 miles of transmission, 10,523 miles of overhead distribution, and 8,224 miles of underground distribution lines to serve 958,000 electric customers within a nine-county, 4,500-square-mile service territory in the Puget Sound region.

There are several congestion points in PSE's electrical transmission system. PSE's transmission system, along with the regional high voltage transmission system, is undergoing fundamental restructuring mandated in large part by three different Federal Energy Regulatory Commission (FERC) initiatives – Order 888 and 889, Order 2000, and the Standard Market Design Notice of Proposed Rulemaking.

Released in May 1996, FERC's first initiative, Orders 888 and 889, required all public utilities, including PSE, to file open access transmission tariffs that would make utilities' electric transmission systems available to wholesale sellers and buyers on a nondiscriminatory basis. PSE complied with Orders 888 and 889, and gained FERC approval of its open access transmission tariff.

On December 20, 1999, FERC issued Order 2000 to encourage transmission-owning utilities, such as PSE, to turn operational control of their high voltage power lines over to independent entities called Regional Transmission Organizations (RTOs), while still maintaining ownership of their power-grid assets and receiving revenues from their use. RTOs are intended to provide centralized, unbiased operation of the power grid to promote economic and engineering efficiencies. This regulation required each FERC jurisdictional public utility that owns, operates, or controls facilities for the transmission of electric energy in interstate commerce to file plans for forming and participating in an RTO to FERC by October 15, 2000. In November 2000, PSE and nine other utilities filed the Stage 1 document for the formation of RTO West and received conditional approval to proceed with the development of an RTO. Since the initial filing, a Stage 2 filing has been made with discussions under way on a Stage 3 filing. The filing utilities anticipate several more months of discussion before a more fully developed proposal for RTO West would be filed for FERC approval. Thereafter, the respective company boards would have to decide to proceed and seek state regulatory approvals. Depending on regional support, RTO West could be operational as early as the beginning of 2006 (PSE 2003a).

Planned Generation Projects

As of April 2003, 39 new merchant power generation projects were proposed in the state of Washington, representing more than 10,000 MW of additional generation capacity (see Table 3.5-2). While not all of these would be constructed, it is likely that additional generation capacity would continue to be added in the Northwest during the next two to three years. In 2002, over 1,100 MW of additional capacity has become operational in the region (see Table 3.5-3). Table 3.5-4 lists six additional projects under construction in Washington in late 2003 with their expected commercial operation dates (PSE 2003a).

Table 3.5-2: Proposed Generation Projects in Washington

Facility	Developer	Facility Type	Size (MW)
Bickleton	PacifiCorp Power Marketing, Inc.	Wind	150
Big Horn	PacifiCorp Power Marketing, Inc.	Wind	200
BP Cherry Point Refinery	BP Cherry Point Refinery	Combined Cycle/Cogeneration	720
Columbia River 1	Nordic Electric, LLC	Combustion Turbine	100
Columbia River 2	Nordic Electric, LLC	Combustion Turbine	100
Columbia Wind Ranch	Cielo Wind Power	Wind	80
Cowlitz Cogeneration	Weyerhaeuser Co.	Combined Cycle/Cogeneration	405
Darrington	National Energy Systems Co.	Boiler/Cogeneration	15
Desert Claim	Desert Claim Wind Power LLC	Wind	180
Everett Delta Power Project[1]	FPL Energy, Inc.	Combined Cycle	248
Frederickson (USGECO)	PG&E Generating Co.	Combustion Turbine	100
Frederickson 2	EPCOR	Combined Cycle	290
Goldendale Smelter	Westward Energy LLC	Combined Cycle	300
Horse Heaven	Pacific Winds	Wind	150
Kittitas Valley	Sagebrush Power Partners LLC (Zilkha)	Wind	180
Klickitat Wind[1]	Klickitat County PUD/Wind Turbine Co.	Wind	15
Longview (Mint Farm Industrial Park)[2]	Mirant Corp.	Combined Cycle	286
Longview Power Station[1]	Continental Energy Services, Inc.	Combustion Turbine	290
Maiden Wind Farm	Washington Winds. Inc.	Wind	150
Morgan Stanley, Frederickson	Morgan Stanley Capital Group, Inc.	Combustion Turbine	324
Moses Lake	National Energy Systems Co.	Combined Cycle/Cogeneration	306
Plymouth Generating Facility	Plymouth Energy LLC	Combined Cycle	306
Rainier	National Energy Systems Co.	Combined Cycle	306
Richland (COMPOW)	Composite Power Corp.	Combustion Turbine	2600
Roosevelt (SEENGR)	SeaWest Energy Group, Inc.	Wind	150
Roosevelt Landfill	PUD No. 1 of Klickitat County Intern	Combustion	13
Six Prong	SeaWest Energy Group, Inc.	Wind	150
Starbuck Power Project	Starbuck Power LLC	Combined Cycle	1300
Stateline Wind Project (Wash) Phase III	FPL Energy, Inc.	Wind	200
Sumas Energy 2[1]	Sumas Energy 2, Inc.	Combined Cycle	660

Table 3.5-2: Continued

Facility	Developer	Facility Type	Size (MW)
Sumner (PG&E)	PG&E Dispersed Generating Co.,	Combustion Turbine	87
Tahoma Energy Center	Tahoma Energy Center, LLC	Combined Cycle	270
Underwood	PacifiCorp Power Marketing, Inc.	Wind	70
U.S. Electric Cherry Point	U.S. Electric Power	Coal	249
Waitsburg	SeaWest Energy Group, Inc.	Wind	100
Wallula Power Project[1]	Newport Northwest, LLC	Combined Cycle	1300
Washington (Elcap)	El Cap I	Combustion Turbine	10
Wild Horse Wind Power	Wind Ridge Power Partners (Zilkha)	Wind	165
Zintel Canyon[1]	Energy Northwest	Wind	50

Sources: PSE 2003a; Makarow, pers. comm., 2003; American Wind Energy Association 2003; Northwest Power Planning Council 2003; Washington State University Cooperative Extension Energy Program 2003; Tri-City Herald 2003; Northwest Energy Coalition 2003; and Becker, pers. comm., 2003.

Notes: This project list represents an inventory of projects around the state in various stages of development, but is not intended to be all-inclusive.

1 Project approved.

2 Project approved; construction suspended.

Table 3.5-3: Washington/Oregon Generation Facilities Constructed in 2002

Facility	Developer	Facility Type	Size (MW)	On-Line Date
Boulder Park	Avista Corp	Internal Combustion	25	5/31/2002
Centralia (TRAENE)	TransAlta Energy Corp.	Combined Cycle	248	8/12/2002
Frederickson Power	Frederickson Power (EPCOR)	Combined Cycle	248	8/19/2002
Hermiston	Calpine	Combined Cycle	630	6/1/2002
Klondike	Northwest Wind Power	Wind	25	4/30/2002
Nine Canyon Wind Project	Energy Northwest	Wind	50	9/25/2002

Source: PSE 2003a.

Table 3.5-4: Washington Generation Facilities Currently Under Construction

Facility	Developer	Facility Type	Size (MW)	On-Line Date
Chehalis Power	Tractebel Power, Inc.	Combined Cycle	520	Qtr. 3/2003
Coyote Springs 2	Avista	Combined Cycle	260	Qtr. 3/2003
Goldendale	Calpine Corp.	Combined Cycle	248	Qtr. 2/2004
King County Fuel Cell Plant	Fuel Cell Energy Inc.	Other	1	Qtr. 4/2003
Nine Canyon Expansion	Energy Northwest	Wind	15	Qtr. 4/2003
Satsop CT Project	Duke Energy	Combined Cycle	650	Construction Suspended

Sources: PSE 2003a; King County 2003; Northwest Power Planning Council 2003.

Petroleum Products

Petroleum products, including vehicle and equipment gasoline and diesel fuels, and machinery lubricants are available and would be purchased from numerous commercial outlets in the project vicinity.

Other Nonrenewable Resources

Nonrenewable resources in the project vicinity are primarily gravel extracted from local sources and used locally. Primary consumption of these resources is related to construction projects (sand, gravel, and other mineral resources as used in steel, aluminum, concrete, and other building products). Washington State is ranked seventh in the nation in annual tonnage of extracted sand and gravel. Several gravel pits and quarries are located near the project site, including one just north of proposed turbine F1 off US 97.

Renewable Resources

Renewable resources are materials that can be regenerated, such as wood, other fibers, wind, and sunlight. The primary renewable resource in the project area is wind. The project site sustains a strong wind energy resource that is primarily thermally driven. Warm air rises over the desert-like area east of Ellensburg, and cooler air in the Cascades west of Cle Elum near Snoqualmie Pass is drawn through the Kittitas Valley over the project site in a chimney effect. The rapidly moving cooler air mass is accelerated by the project's ridgelines. The expected 100-year peak wind gust in the Ellensburg area is 73 mph (Wantz and Sinclair 1981). In the 3.5 years that wind data have been collected at the project site, no extreme wind gusts in excess of 73 mph have been recorded.

All markets for wind turbines require an estimate of how much wind energy is available at potential development sites. To provide this information, National Renewable Energy Laboratory (NREL) researchers for the U.S. Department of Energy have been assembling data sets and refining modeling techniques for three decades. In 1981, the program published the *Wind Energy Resource Atlas of the United States*, which was updated in 1987. This wind atlas estimates wind energy resources for the U.S. and its territories, and indicates general areas where a high wind resource may exist.

Areas potentially suitable for wind energy applications are dispersed throughout much of the U.S. Estimates of the wind resource in this atlas are expressed in wind power classes ranging from Class 1 to class 7, with each class representing a range of mean wind power density or equivalent mean speed at specified heights above the ground. Areas designated Class 4 or greater are suitable with advanced wind turbine technology under development today. Exposed areas with a moderate to high wind resource are dispersed throughout much of the contiguous United States. Most of the southeast U.S. and portions of the southwest are not suitable for wind power development.

The Pacific Northwest National Laboratory (formerly known as the Pacific Northwest Laboratory) of the Department of Energy has published estimates of the wind power resource available in the U.S. The laboratory estimates that 9% of the lower 48 states has "good" (Class 4) or "excellent" (greater than Class 4) wind resources. This is reduced to 6% of U.S. land once protected areas, urban areas, wetlands, and other unavailable areas are excluded. While this area does not represent a large percentage of U.S. land, it has the potential to meet more than 1.5 times the present (2003) U.S. power consumption (World Resource Institute 2003).

Compared with other states, Washington is ranked in the bottom tier in terms of wind energy potential (Pacific Northwest Laboratory 1991a). However, the state still has wind potential, as documented in the following studies:

- In the early 1990s, the Pacific Northwest Laboratory estimated that the state could generate 3,700 average megawatts (aMW) of electricity from wind—more than one-third the total amount of electricity the state generated in 1998 (Pacific Northwest Laboratory 1991b).

- NREL made more conservative estimates, measuring wind potential only in areas of the state that met stricter wind classifications and that were located within 10 miles of existing transmission lines. Under these criteria, NREL estimated Washington could generate 3,400 aMW of electricity from wind (NREL 1994).

- In 2002, four research organizations published a survey of renewable resources in 11 Western states called the *Renewable Energy Atlas of the West*. This study found 7,000 aMW of wind potential in Washington. The study used higher resolution data and considered taller and more advanced turbines than those used for the earlier analyses (Land and Water Fund of the Rockies et al. 2002).

- In a 2002 report contracted by the Northwest Energy Coalition, the Tellus Institute identified 1,900 aMW of wind energy potential in Washington looking only at the windiest and most developable locations (Tellus Institute 2002).

An area of good wind energy potential in the state that currently supports wind power projects is the Columbia River corridor along the Oregon-Washington border. The Columbia River gorge provides a low-elevation connection between continental air masses in the interior of the Columbia Basin east of the Cascade Range and the maritime air of the Pacific Coast. Especially strong pressure gradients develop along the Cascades and force the air to flow rapidly eastward or westward through the gorge. Existing wind developments in this area include the 48-MW Nine Canyon Wind Farm in Benton County and the 300-MW Stateline Wind Project in Walla Walla County.

As described above, the Ellensburg corridor in central Washington, where the KVWPP and other wind power projects are proposed (see Section 3.14, Cumulative Impacts), also sustains a strong wind energy resource. Data from several sites throughout the central Washington corridor indicate that exposed areas have a Class 4 to 5 annual average wind resource with a Class 6 resource during the spring and summer seasons (Pacific Northwest Laboratory 1987).

Pacific Northwest Markets for Renewable Energy Resources

Markets for renewable or "green" energy are growing in the Pacific Northwest. RCW 19.29A, Implementation of Retail Option to Purchase Qualified Alternative Power, signed into law in 2001, directed 16 of Washington's electric utilities to offer a voluntary "qualified alternative energy product" (essentially an electricity product powered by green resources) starting January 2002. The law defined a qualified alternative energy resource as electricity fueled by wind, solar energy, geothermal energy, landfill gas, wave or tidal action, gas produced during the treatment of wastewater, qualified hydropower, or biomass. The statute calls for the utilities to report annually on the progress of these voluntary green power programs to the Washington Department of Community, Trade, and Economic Development (CTED) and the Washington Utilities and Transportation Commission (WUTC). In lieu of reports, agency staff surveyed the utilities in October 2002. The survey produced the following key findings (CTED and WUTC 2002):

- Each of the 16 utilities has a green power electricity product to offer its customers, and 14 of the 16 utilities have implemented voluntary green power programs. The two remaining utilities have secured wind power from a new facility and were initiating their programs after agency staff completed this survey.
- Utilities regularly advertised the green power programs to their customers.
- A total of 1.4 aMW (12.4 million kilowatt-hours) of green power was sold during the first nine months of 2002 to participants in these voluntary programs.
- Wind power represented the vast majority of the green power sales in this year's program (approximately 90%). The remaining resources were landfill gas, hydropower, and solar.
- The resources in the green power programs either have zero carbon dioxide emissions or, in the case of landfill-gas-fueled power, release only 5% of the carbon dioxide that would have been released if the landfill methane gases were emitted directly into the atmosphere.
- Nearly all of the public utilities participating in the survey, as well as seven smaller public utilities that do not offer green power programs to their customers, have added renewable resources to their utility system mix above and beyond that required by the green power option.
- A total of 118 aMWs (1 billion kilowatt-hours) of electricity fueled by wind, landfill gases, and biomass were included in the system fuel mix reports by electric utilities in Washington in 2001.

The results of this survey demonstrate that local and regional markets for green power have been increasing. In particular, there has been a proliferation of requests from Pacific Northwest electric utilities to purchase wind power. Several electric utilities have recently issued RFPs to acquire wind power, including those summarized below:

Puget Sound Energy

On September 9, 2003, PSE issued a draft RFP to acquire approximately 150 MW of capacity from wind power for its electric resource portfolio. The draft RFP is the first step toward achieving the utility's goal of establishing renewable energy as a 10% share of its electric supply mix by 2013 (PSE 2003b).

Avista Corporation

Avista Corporation's 2003 Integrated Resource Plan (IRP) includes wind within its acquisition strategy beginning in the 2008-2010 time frame. The IRP includes an action item for Avista to investigate wind integration issues. In support of an integration issues study, Avista is interested in purchasing between 25 MW and 50 MW of installed nameplate wind-generating capability over a term of between two and five years, and in August 2003 Avista issued an RFP soliciting proposals for wind energy (Avista Utilities 2003).

Portland General Electric

On June 18, 2003, Portland General Electric (PGE) released an RFP to prospective bidders who could meet the company's future power supply needs. The RFP process is part of the company's 2002 IRP, which forecasts PGE's future energy needs and identifies low-cost supply strategies that enable the company to fulfill them (Portland General Electric 2003). In response to the RFP, PGE received more than 90 offers to supply energy. Of the proposals, it was estimated that 20% of the projects are for renewable energy, and by far the greatest numbers of those are wind generation (The Business Journal Portland 2003).

3.5.2 Impacts of Proposed Action

This section describes impacts on energy and natural resources under the proposed action. Direct impacts would result from use of energy and natural resources such as fuel, water, and electricity to construct, operate and maintain, and decommission the project. Direct impacts associated with or attributable to specific project elements such as the proposed turbine towers, O&M facility, and substations are discussed, where applicable. Indirect impacts on energy and natural resources are not anticipated because the project is not expected to substantially induce regional growth to the extent that would result in significant changes to offsite energy and fuel consumption. Table 3.5-5 summarizes potential energy and natural resource requirements under the three project scenarios. Potential water resource impacts are evaluated in more detail in Section 3.3, Water Resources.

Table 3.5-5: Summary of Potential Energy and Natural Resources Requirements

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Construction Impacts			
Increased demand for electricity	Same as middle scenario	Electricity provided by portable generators	Same as middle scenario
Increased demand for petroleum products	Same as middle scenario	25,000 gallons (diesel and gasoline) for mobile construction equipment	Same as middle scenario
Increased demand for water	6.4 million gallons for dust control, compaction, wetting concrete[1]	5 million gallons for dust control, compaction, wetting concrete	5 million gallons for dust control, compaction, wetting concrete
	2.6 million gallons with dust palliative[1]	2 million gallons with dust palliative	2 million gallons with dust palliative
Increased demand for steel	12,000 tons for turbine towers	11,000 tons for turbine towers	13,000 tons for turbine towers
	1,600 tons for tower foundation reinforcement	2,000 tons for tower foundation reinforcement	2,400 tons for tower foundation reinforcement

Sources: Sagebrush Power Partners LLC 2003a, 2003f.

1 For turbines larger than 1.5 MW, roads would be wider (approx. 34 feet wide) to accommodate larger cranes and would require more water for compaction and dust control.

Table 3.5-5: Continued

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Increased demand for gravel (aggregate)	153,417 cubic yards for roads[1]	108,294 cubic yards for roads	Same as middle scenario
	9,111 cubic yards for turbines and crane pads	13,444 cubic yards for turbines and crane pads	16,667 cubic yards for turbines and crane pads
	23,797 cubic yards for other project facilities	23,797 cubic yards for other project facilities	23,797 cubic yards for other project facilities
Increased demand for concrete	25,000 cubic yards for turbine foundations	30,000 cubic yards for turbine foundations	35,000 cubic yards for turbine foundations
Operations and Maintenance Impacts			
Increased demand for electricity	800 MWh/year	800 MWh/year	850 MWh/year
Increased demand for petroleum products	Same as middle scenario	8,500 gallons annually for O&M facility vehicles	Same as middle scenario
Increased demand for water	Same as middle scenario	<1,000 gallons daily at O&M facility	Same as middle scenario
Increased demand for lubricating oils, hydraulic fluids, and mineral oil	Slightly less than the middle scenario	50 gallons/turbine of glycol-water mix	Slightly more than the middle scenario
		85 gallons/turbine of hydraulic oil	
		105 gallons/turbine of lubricating oil	
		500 gallons/pad-mounted transformer of mineral oil	
		12,000 gallons/substation transformer of mineral oil	
Decommissioning Impacts			
	Similar to those described above for construction	Similar to those described above for construction	Similar to those described above for construction

Sources: Sagebrush Power Partners LLC 2003a, 2003f.

1 For turbines larger than 1.5 MW, roads would be wider (approx. 34 feet wide) to accommodate larger cranes and would require more water for compaction and dust control.

Construction Impacts

Energy Resources

The proposed wind turbines and associated facilities, including access roads and underground and overhead collection infrastructure, would be constructed using materials that require energy for their production. Energy would also be required to transport these materials to the project site and to operate construction equipment such as cranes, trucks, tools, and vehicles. Energy consumption is predominantly in the form of gasoline, diesel fuel, and electricity.

Electricity

Substantial amounts of electricity are not required during project construction. Portable generators would produce the electricity required for construction activities. The level of electrical energy consumption required during project construction would not significantly affect locally available energy resources.

Petroleum Products

Fuel consumption during construction would be approximately 25,000 gallons (diesel and gasoline) for mobile construction equipment, construction vehicles, and generators for the three project scenarios. Petroleum fuel for construction equipment would be supplied by existing licensed fuel distributors or local gas stations in nearby communities (Ellensburg or Cle Elum). The EPC contractor would use fuel trucks to refuel construction vehicles and equipment onsite; no fuel tanks would be used or stored at the project site. The level of petroleum products consumed during project construction would not significantly affect locally available resources.

<u>Other Nonrenewable Resources</u>

As identified in Table 3.5-5, nonrenewable resources used to construct the KVWPP would include fuel (diesel and gasoline, discussed above), water, steel, concrete, and gravel (aggregate). Approximately five million gallons of water would be consumed for dust suppression and other construction purposes under the middle and upper end scenarios, while an estimated 6.4 millions gallons of water would be required under the lower end scenario because of the larger roadway footprint. However, if lignin (a non-toxic, non-hazardous compound derived from trees) or another dust palliative is used, it is anticipated that between 2 million gallons (under the middle and upper end scenarios) and 2.6 million gallons (under the lower end scenario) of water would be required. Water would be delivered to the project site by water trucks and obtained from a local source with a valid water right.

Steel would be required to construct the turbines and towers. The estimated amount of steel required would range from 11,000 tons under the middle scenario to 13,000 tons under the upper end scenario. Concrete would be consumed to build roads, crane pads, and turbine foundations. The estimated amount of concrete required for project construction would range from 25,000 cubic yards (under the lower end scenario) to 35,000 cubic yards (under the upper end scenario). Concrete would be purchased from existing suppliers near the project site. Gravel (aggregate) would be required to construct roads, turbine and crane pads, and other project facilities such as the O&M facility, substations, turn-around areas, and meteorological towers. The estimated amount of gravel required for construction would range from 145,535 cubic yards under the middle scenario to 186,325 cubic yards under the lower end scenario. Aggregate would be obtained from existing, permitted local quarries. Several gravel pits and quarries are located near the project site in Kittitas County. For example, there is an existing permitted quarry north of proposed turbine F1. The EPC contractor would make the final decision regarding the source of these materials.

The impacts on nonrenewable resources under the three project scenarios would vary depending on the specific resource. For example, demand for water for dust control and gravel to construct project facilities would be greatest under the lower end scenario because of the larger area required for access roads. However, demand for concrete and steel would be greatest under the upper end scenario because of the greater number of turbines (see Table 3.5-5). The project's nonrenewable resource requirements during construction would not significantly affect local supply.

Operations and Maintenance Impacts

Energy Resources

Electricity

The project would generate energy using the kinetic energy in wind. That energy would be transformed by the wind turbine generators into electricity. Depending on the make and model of wind turbine generator selected, the KVWPP would be rated for 181.5 to 246 MW. MW hours (MWh) are derived by multiplying the project's capacity factor (0.3333) by its nameplate capacity (181.5 to 246 MW) and the number of hours in one year (4,760 hours). Therefore, the project would generate between 287,979 and 390,316 MWh of electricity annually and would increase the availability of renewable energy in the Pacific Northwest, a beneficial effect.

On an annual basis, the project (under all three scenarios) is expected to consume less than 1% of the electricity it generates to support auxiliary systems at the wind turbines such as hydraulic systems, pumps, heaters, fans, controller electronics, and lighting. The projected increased demand for electricity would range from 800 MWh per year under the lower end scenario to 875 MWh per year under the middle scenario (see Table 3.5-5).

The project would not consume a large amount of power for startup. Each wind turbine would be activated randomly depending on the local wind speed at each turbine location. Power consumption would generally result from auxiliary systems at each turbine. The transformers and auxiliary systems at the substation would also consume a small amount of power to stay energized. Electricity for project operations would mostly be generated by the project itself. During periods when the wind turbines are not generating electricity, power would be purchased from the regional utility.

Petroleum Products

Expected fuel consumption under all three project scenarios is estimated to be 8,500 gallons per year to operate O&M facility vehicles. Fuel would be purchased from local gas stations. The level of energy consumption required during project operation would not significantly affect locally available energy resources and would be beneficial to the region by generating an additional source of energy.

Other Nonrenewable Resources

As shown in Table 3.5-5, the project would consume nonrenewable natural resources including fuel and electricity (described above), water, and lubricating oils, greases, and hydraulic fluids. As described in Section 3.3, Water Resources, a new water well would be installed to provide a nominal water supply to the O&M facility. This well, which would provide water for bathroom and kitchen use and for general maintenance purposes, is expected to consume less than 1,000 gallon per day under all three project scenarios.

The estimated amounts of lubricating oils, hydraulic fluids, and mineral oils required for project operation are presented in Table 3.5-5; the amounts would be slightly larger and smaller under the upper and lower end scenarios, respectively, because of differences in the overall number of turbines. Lubricating oils and hydraulic fluids used to operate project equipment and to maintain the wind turbine generators would be purchased from distributors of such materials. The final selection of these distributors would depend on the specific turbine model chosen for the project. The estimated quantities of fuel and other nonrenewable resources required for project operation and maintenance activities would affect the availability of these resources locally or regionally.

Decommissioning Impacts

Impacts attributable to energy consumption during project decommissioning would be similar to those described for the construction phase of the project. Energy consumption, predominantly in the form of gasoline, diesel fuel, and electricity, would be required to operate equipment such as cranes, trucks, tools, and vehicles used to dismantle and remove most project facilities and reclaim disturbed areas. Demolition or removal of equipment and facilities would occur, to the extent necessary, to salvage economically recoverable materials such as steel towers.

3.5.3 Impacts of No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated. However, development by others and of a different nature, including residential development, could occur at the project site in accordance with the County's existing Comprehensive Plan and zoning regulations. Depending on the location, type, and magnitude of future development at the project site, impacts on energy and natural resources could be similar to or even greater than the proposed action.

If the proposed project were not constructed, the region's power needs could de delivered through development of other generation facilities, most likely a gas-fired combustion turbine. The specific type and magnitude of impacts on energy and natural resources would depend on the type and location of facility proposed. For example, if a 60 aMW natural gas-fired combustion turbine facility replaced the proposed wind turbine project, energy consumption impacts during both project construction and operation would increase substantially. Anticipated land requirements for a 60-aMW combustion turbine facility would be more than two times greater than the KVWPP (see Table 2-9). Therefore, the anticipated energy demands to transport materials and operate construction equipment would probably also be greater. Furthermore, unlike wind, which is natural renewable energy source, a combustion turbine project of similar generating capacity would use substantial quantities of natural gas, a nonrenewable resource, as its primary energy source. A combustion turbine facility could also require a significant quantity of water for cooling purposes.

3.5.4 Mitigation Measures

The Applicant proposes to implement energy conservation measures during project construction and operation including, but not limited to, the following:

- Use lignin (a non-toxic wood byproduct) as a dust palliative to reduce water consumption for dust suppression during construction;
- Encourage carpooling of onsite construction crews;
- Use high-efficiency electrical fixtures and appliances in the O&M facility and substation
- control house; and
- Use low-water-use flush toilets in the O&M facilities.

3.5.5 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts on energy or natural resources would occur from project construction, operation, maintenance, or decommissioning.

3.6 LAND USE AND RECREATION

This section describes existing land use and parks and recreation resources in the KVWPP area. It also evaluates potential impacts on land use and recreation that would occur with proposed development, and identifies mitigation measures designed to limit or reduce those impacts. Consistency with relevant land use plans and policies is also assessed.

The analysis in this section is primarily based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Section 5.1). Where additional information has been used to evaluate the potential impacts associated with the proposal, such as the Kittitas County Comprehensive Plan and Zoning Code, that information has been referenced. Existing land use information was confirmed in the field during site visits (March 2003). Land use plans and policies addressed for project consistency include relevant adopted state, county, and local plans and policies.

3.6.1 Affected Environment

The following discussion provides an overview of existing land use in the project vicinity. The study area for the land use analysis is within 1 mile on either side of the wind turbine strings. The project would be located entirely within unincorporated Kittitas County.

Existing Land Use

The KVWPP site is located in central Kittitas County, approximately 10 miles northwest of the City of Ellensburg. The project area is characterized by a rural landscape of rolling hills and rangeland with scattered residences. The size of the project area is roughly 7,000 acres. Approximately 5,000 acres of the project area is in private ownership, with the remaining 2,000 acres owned by the state of Washington and managed by the Washington DNR (2003). The overall population density in the project area is low. There are approximately 60 dwellings within 1 mile of the proposed project. The closest residence, located in the northeast portion of the project area (Township 19 North, Range 17 East, Section 1), is approximately 790 feet from the nearest proposed wind turbine (H23) (see Table 3.12-5 in Section 3.12, Noise).

Land use in the project area consists of cattle grazing interspersed with some rural residential development. None of the land in the project area is irrigated and no crops are grown. Most grazing use is seasonal in nature (primarily in the spring). About half of the private property owners within the project area currently use their land for grazing; those owners primarily raise cattle, but one owner raises bison and horses. About half of the Washington DNR parcels within the project area are currently used for grazing.

Forested lands are north and east of the project site. The Wenatchee National Forest, which encompasses 2.2 million acres along a 135-mile segment of the eastern front of the Cascade Mountains, includes lands on the slopes of Table Mountain to the north and east of the project site. No commercial forestry operations are in the project vicinity.

Existing land use within 1 mile of the proposed turbine strings is shown in Figure 3.6-1. In addition to grazing, other uses in the project area include:

- A commercial gravel quarry on US 97 just south of the northern junction with Bettas Road operated by Ellensburg Cement Products;
- An inactive gravel quarry on Bettas Road north of the junction with Hayward Road owned by the Washington State Department of Transportation;
- Five Bonneville electric transmission lines traversing east to west across the project area, divided into one group of four near the middle of the project and one to the north;
- One PSE electric transmission line traversing east to west across the project area just north of the southern set of Bonneville lines;
- Three communication towers;
- Two state highways: US 97, running through the middle of the project area, and SR 10 south of the project area;
- Two county roads: Bettas Road, a paved, two-lane road near the western edge of the project area, and Hayward Road, an unpaved road in the southern portion of the project area;
- Five parcels of land totaling approximately 2,075 acres owned by DNR, located in Township 19 North, Range 17 East, Sections 2, 10, 16 and 22, which are currently leased for grazing;
- An approximate 550-acre parcel of private land in the Swauk Creek drainage currently under a conservation easement with the Nature Conservancy of Washington; and
- Agricultural lands south of SR 10 along the Yakima River.

Existing Zoning

The project area contains two Kittitas County zoning designations—Agriculture-20 and Forest and Range. The areas east of US 97 are zoned Forest and Range while those west of US 97 are zoned Agriculture-20. Figure 3.6-2 shows the location of county zoning designations within the project area.

According to the County's zoning code, the Agriculture-20 zone is dominated by farming, ranching, and rural lifestyles. The purpose of the zoning classification is to preserve fertile farmland from encroachment by nonagricultural land uses and to protect the rights and traditions of those engaged in agriculture. Permitted uses include residential, agriculture, and forestry practices. The minimum lot size is 20 acres (Kittitas County Code [KCC] 17.29.020).

The Forest and Range zone is intended to provide areas where natural resource management is the highest priority and where the subdivision and development of lands for uses and activities incompatible with resource management are discouraged. Permitted resource management uses include logging, mining, quarrying, and agricultural practices. Several residential uses are also allowed in the Forest and Range zone including single-family residences, duplexes, and cluster subdivisions. The minimum lot size is 20 acres (KCC 17.56.020).

Parks and Recreation

The Kittitas Valley area offers opportunities for a variety of recreational activities. Table 3.6-1 lists recreational facilities and activities available within a 25-mile radius of the project site (see

Figure 3.6-1:

Figure 3.6-2:

Figure 3.6-3). This area includes forests and wilderness areas, wildlife areas and refuges, boat launches, beaches and other water use sites, state parks, town parks, campsites, and museums. Ski areas beyond the 25-mile radius are located at Snoqualmie Pass and Mission Ridge.

Table 3.6-1: Parks, Recreational Facilities, and Activities within 25 Miles of the Project

Distance (Miles)	Facility
Ellensburg	
6	Thorp Mill (located in Thorp)
12	KOA Campground (private campground)
13	Kittitas County Museum
13	Burlington Northern Square
13	Kiwanis Park
13	McElroy Park
13	Memorial Park
13	Reed Park
13	Rotary Pavilion
13	South Main Entry Park
13	West Ellensburg Park
13	Skate Park
13	Children's Activity Museum
13	Clymer Museum and Gallery
14	Lions/Mountain View Park
14	Catherine Park
14	Irene Rinehart Riverfront Park
14	Whitney Park
14	Wippel Park
15	Paul Rogers Wildlife Habitat Park
15	Sagebrush Trail
16	Olmstead Place State Park and Heritage Center
Cle Elum/Roslyn	
5	Trailer Corral (private campground)
15	Cle Elum City Park
15	South Cle Elum City Park
15	Carpenter Museum
15	Cle Elum Historical Telephone Museum
15	South Cle Elum Depot Restoration
15	Whispering Pines (private campground)
20	Roslyn City Park
20	Roslyn Museum
25	Salmon La Sac Guard Station Restoration
Washington State	
1	Iron Horse State Park (no camping)
10	LT Murray Wildlife Area
15	Squilchuck State Park
16	Olmstead Place State Park
32	Lake Easton State Park
40	Ginkgo State Park (no camping)
40	Wanapum State Park

Table 3.6-1: Continued

Distance (Miles)	Facility
U.S. Forest Service (Okanogan and Wenatchee National Forests)	
8	Red Top
8	Mineral Springs
8	Lion Rock
8	Taneum
12	Ken Wilcox at Haney Meadows
12	Icewater
12	Tamarack Spring
15	Swauk
15	Taneum Junction
17	Beverly
17	Manastash
20	Riders Camp
20	Wish Poosh
20	De Roux
21	Quartz Mountain
25	Salmon La Sac
25	Red Mountain
25	Cle Elum River
28	Kachess
30	Owhi
30	Cayuse
30	Crystal Springs
40	Fish Lake
40	South Fork Meadow

Source: Sagebrush Power Partners LLC 2003a.

The Wenatchee National Forest is a major recreational destination in central Kittitas County. The National Forest encompasses 2.2 million acres extending from Lake Chelan on the north to Rimrock Lake on the south. In the project area, the National Forest encompasses the lands on the slopes of Table Mountain to the north and east of the project site (see Figure 3.6-3). Although Table Mountain has relatively few developed recreational facilities, it is a popular destination for valley residents for winter sports, hiking, camping, picnicking, and other recreational activities. The best known feature on Table Mountain is Lion Rock, approximately 5.25 miles north of the National Forest boundary and 6.75 miles northeast of the project site. Lion Rock's attraction is the panoramic view it offers of the central Cascade Mountains to the north (Sagebrush Power Partners LLC 2003d).

The primary access from the Kittitas Valley into the National Forest is via Reecer Creek Road, which becomes National Forest Primary Route 35 at the forest boundary. From the National Forest boundary, Route 35 switches back numerous times up the slopes of Table Mountain. On these switchbacks, the landscape is generally open, and the project site is often visible approximately 3.25 miles to the southwest.

Another important recreation resource in the project vicinity is the John Wayne Trail, a hiking, biking, and equestrian trail developed in the Iron Horse State Park. This park was created on the former right-of-way of the Milwaukee Road railroad, which was acquired by Washington State

Parks in the 1980s. The John Wayne Trail extends 109 miles from a trailhead near North Bend on the west to the Columbia River on the east. In the project area, the trail extends along the south side of the Yakima River. The only formal entrance to the trail in this area is on Thorp Depot Road south of the community of Thorp. The ridges proposed for turbine development are approximately 1 to 5 miles from the trail. At its closest point, the project (turbine string B) is approximately 4,500 feet northeast of the trail.

Washington State campgrounds are operated on a first-come, first-served basis, and state regulations limit overnight stays to 10 days. The National Forest campgrounds exceed their capacity almost every weekend during the summer and often turn people away (Schmidt, pers. comm., 2002).

Summer recreational activities available near the project area include water sports such as fly fishing, swimming, boating, river rafting, gold panning, and water skiing, as well as camping, mountain biking, hay rides, hiking, horseback riding, hunting, cycling, picnicking, bird watching, rock hounding, berry and mushroom picking, softball, and other team sports. During the fall and winter, recreational activities include hunting, cross-country skiing, horse-drawn sleigh rides, inner-tubing, snowshoeing, downhill skiing, sledding, snowboarding, and snowmobiling. No fishing sites are within the project boundaries.

Some hunting occurs in the project area on both private and public lands. Hunting on private lands occurs at the discretion of the individual landowners. Two of the DNR sections within the project area (Sections 2 and 22) do not currently allow public access. The other two sections (Section 16 and Section 10) allow public access (Sagebrush Power Partners LLC 2003c).

3.6.2 Impacts of Proposed Action

Potential direct impacts of the proposed KVWPP would include conversion of rural lands to utility-related uses, potential conflicts between the project and onsite and offsite recreation activities, and increased demand for park and recreational resources. These types of direct impacts could be associated with construction, operations, and decommissioning of any of the proposed project elements, including wind turbines and meteorological towers, existing and new gravel access roads, additional power lines, and the proposed O&M facility and substations. Impacts associated with or attributable to specific project elements are discussed where applicable. Indirect land use and recreation impacts are not anticipated because the project is not expected to substantially induce regional growth to the extent that it would change offsite land uses or use of offsite resource-based recreation areas. Table 3.6-2 summarizes potential impacts on land use and recreation under the three project scenarios. Potential impacts on adjacent land uses from construction-related noise and dust are discussed in Section 3.12, Noise, and Section 3.11, Air Quality.

Figure 3.6-3:

Table 3.6-2: Summary of Potential Land Use and Recreation Impacts

	82 Turbines/2.5 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Construction Impacts			
Temporary conversion of existing land uses at construction sites	231 acres of disturbance	311 acres of disturbance	371 acres of disturbance
Conflicts between onsite and offsite recreation and construction activities	231 acres of disturbance; <31 turbines on DNR property where hunting may occur	311 acres of disturbance; 31 turbines on DNR property where hunting may occur	371 acres of disturbance; >31 turbines on DNR property where hunting may occur
Increased demand for recreational resources by construction employees	Same as middle scenario	160 employees during peak construction month.	Same as middle scenario
Operations and Maintenance Impacts			
Permanent conversion of existing land uses	118 acres of disturbance	93 acres of disturbance	95 acres of disturbance
Conflicts between onsite and offsite recreation and operations	118 acres of disturbance; <31 turbines on DNR property where hunting may occur	93 acres of disturbance; 31 turbines on DNR property where hunting may occur	95 acres of disturbance: >31 turbines on DNR property where hunting may occur
Increased demand for recreational resources by O&M employees	Same as middle scenario	6-7 new permanent employees in project area	9-10 new permanent employees in project area
Decommissioning Impacts			
Temporary land disturbance	Similar to those described for construction; no permanent land use impacts	Similar to those described for construction; no permanent land use impacts	Similar to those described for construction; no permanent land use impacts
Conflicts between recreation and decommissioning activities	Similar to those described for construction	Similar to those described for construction	Similar to those described for construction

Source: Sagebrush Power Partners LLC 2003f.

Construction Impacts

Temporary Land Use Conversion

During project construction, from 231 acres to 371 acres of land would be altered. Construction activities would temporarily interfere with existing rangeland uses. Temporary land use disturbance would result from construction of turbines, roads, substations, meteorological towers, overhead poles, and the O&M facility. The estimated amount of temporary land disturbance would be the same under the three project scenarios for all project facilities with the exception of turbine laydown areas and roadways (see Chapter 2, Table 2-2).

Direct construction impacts are anticipated to be moderate but temporary, lasting approximately one year under the three project scenarios. However, conflicts between proposed construction activities and existing grazing operations are anticipated, and cattle or other livestock would need to be removed from areas where blasting or heavy equipment operations are taking place.

Construction impacts would be greatest under the upper end scenario because it would involve the largest amount of land use disturbance.

Parks and Recreation Resources

Project construction activities would be intermittent and temporary (extending over portions of one recreation season). Construction would not likely have significant adverse effects on existing recreation resources or their users in the project area. Temporary impacts on private landowner-approved activities such as hunting or rock hounding could occur during project construction.

Potential conflicts between recreation users on DNR property and wind turbine construction activities could impair the use and enjoyment of recreational activities such as hunting and hiking in the project area. Approximately 31 turbines and two permanent meteorological towers would be constructed on DNR property under the middle scenario. Because more turbines would be constructed under the upper end scenario, it would have the greatest potential impacts.

Project construction would not have significant adverse direct effects on offsite recreation resources or their users in the nearby Wenatchee National Forest. Recreation opportunities in the National Forest are more than 3 miles from the project site, and access to the National Forest does not extend through the project site. Although the John Wayne Trail is located as close as 1 mile from the closest turbine under the upper end scenario, construction-related disturbance would be temporary and is not anticipated to have a significant adverse effect on the experience of park visitors.

Some parks and campsites may experience increased use by temporary (transient) workers who seek temporary accommodations during project construction. Transient workers could displace recreational users. However, recreational demands are typically higher on weekends, while workers would be more likely to use the facilities on weekdays.

There are approximately 1,150 hotel and motel rooms, recreational vehicle park spaces, and campground sites available in Kittitas County. During the peak summer season, approximately 240 rooms or sites are vacant at any one time, compared to 760 rooms during the off-peak months. In addition, many of the construction workers would not require overnight lodging if they come from the local area or commute from the Yakima metropolitan area (within a 1-hour drive). There would be an adequate supply of recreational lodgings to accommodate the temporary increased demand for facilities by the project's transient workforce, and no significant impact on parks and recreation use would occur in the project area.

Operations and Maintenance Impacts

Permanent Land Use Conversion

Proposed project facilities would result in the permanent conversion of 93 to 118 acres of land from cattle grazing/rangeland to energy production. (The term permanent, in the context of land use impacts, means for the life of the project or for at least 20 years.) The estimated amount of permanent land disturbance would be the same under the three scenarios for all project facilities except turbine sites and roadways (see Chapter 2, Table 2-1).

The acreage converted for the project would no longer be available for rangeland use, including approximately 46 to 59 acres used for grazing (Sagebrush Power Partners LLC 2003c). This potential impact would be greatest under the lower end scenario, which would have the greatest amount of permanent land use conversion.

Permanently converted acreage would represent a small portion of the 7,000 acres of rangeland within the project area and the 445,000 acres of pasture or unimproved grazing land in Kittitas County (Kittitas County 2002a). In this context, loss of grazing land on the project site would not likely adversely affect the productivity of cattle grazing operations. According to the Applicant, wind turbine operations are highly compatible with grazing activities, and cattle, sheep, and other domestic animals routinely graze underneath operating wind turbines (Sagebrush Power Partners LLC 2003a, Section 5.1.7). However, the permanent conversion of rangeland uses to wind energy production would result in an unavoidable impact.

Parks and Recreation Resources

Impacts on private landowner-approved recreation activities such as hunting or rock hounding could occur during project operation. However, these impacts are expected to be minimal. Hunting on private lands leased for the wind project would continue to be at the discretion of the individual landowners. Public access to private property would continue to be restricted under future lease agreements between the Applicant and those property owners.

The presence of wind turbines on publicly accessible DNR property could impair the use and enjoyment of recreational activities in the project area. As described above, 31 turbines and two meteorological towers would operate on DNR property under the middle scenario. However, this potential impact would be greatest under the upper end scenario, which would have the largest number of turbines. Because of liability and safety concerns, it is anticipated that recreational activities would be either not allowed or restricted on DNR lands leased for wind energy use (see Section 3.6.5, Mitigation Measures).

Operating wind turbines would be visible from the southern portion of the Wenatchee National Forest and from the John Wayne Trail (see Section 3.9, Visual Resources, for a detailed discussion of the anticipated aesthetic effect of the project). Based on distances to the project site and the assessment of visual sensitivity from these recreational viewpoints, it is unlikely that views of the new wind turbines would have significant adverse impacts on recreational users in the project vicinity.

The operating workforce for the project would range from 6 under the lower end and middle scenarios to 10 staff under the upper end scenario. Because of the small size of the operating work force, no significant increase in the demand for recreational services and opportunities would occur in the project area.

Decommissioning Impacts

If the KVWPP facility were decommissioned, temporary land disturbance of the type and magnitude described for project construction would be anticipated. Temporarily disturbed lands would be restored to their original condition through grading and planting. Upon decommissioning, land use impacts from facility operations would be largely reversible. Once facilities were removed, acreage taken out of open space and rangeland use could be returned to these prior uses. An exception might be some of the access roads, which local landowners may decide to continue to use and maintain. No permanent land use impacts would result from decommissioning.

Limited impacts on recreational activities on the site could occur during project decommissioning activities. However, once the site is reclaimed to pre-project conditions, recreational use in the affected area could resume.

3.6.3 Impacts of No Action Alternative

Under the No Action Alternative, the project would not be constructed and existing land and recreation uses in the project area would continue without the influence of the proposed project. The specific type, nature, and extent of future development at the project site are unknown, and would depend primarily on county growth trends. The Kittitas County Comprehensive Plan and Zoning Code would govern development at the project site. As described under Affected Environment, permitted land uses in the project area include ranching, resource management uses such as agricultural practices, and residential. Existing informal uses of the land for hunting and rock hounding would likely continue. However, this does not preclude other development allowed under permitted uses in the project area.

Under the No Action alternative, the region’s power needs could be addressed through development of a gas-fired combustion turbine. Such a combustion turbine facility would likely be developed on land zoned for industrial development of a similar type and nature. A combustion turbine facility generating 60 aMW of power would require approximately 14 acres for the plant site (Bonneville and U.S. Department of Energy 1993). To operate, gas-fired turbines may also require on-shore gas extraction and transportation of the gas to the power plant (via pipeline). Although the specific acreage requirement for these facilities as part of the No Action Alternative is unknown, they could result in potential land use impacts. The specific type, nature, and extent of land use impacts under the No Action Alternative would depend on the location of the combustion turbine plant and its associated facilities.

3.6.4 Consistency with Plans and Policies

The purpose of this section is to evaluate the consistency of the KVWPP with adopted land use plans, policies, and regulations. Applicable elements of each plan, policy, or regulation are summarized and followed by an analysis of project consistency.

State of Washington

<u>Growth Management Act</u>

The Growth Management Act (GMA) contains a comprehensive framework for managing growth and coordinating land use planning and infrastructure. Urban and rapidly growing local government jurisdictions are subject to GMA. Kittitas County opted into the GMA voluntarily on December 27, 1990 (Kittitas County 2002a). Some of the relevant goals of the GMA are to: (1) encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner, (2) reduce the inappropriate conversion of undeveloped land into sprawling, low-density development, (3) encourage economic development that is consistent with adopted comprehensive plans, (4) maintain and enhance natural resource-based economies, and (5) support the economic development of public facilities and services necessary to support development (RCW 36.70A.020).

Consistency Discussion

The Kittitas County Comprehensive Plan and Zoning Code are the primary mechanisms for implementing the requirements of the GMA. To the extent that the proposed project is inconsistent with the Comprehensive Plan and Zoning Code, it is also inconsistent with the GMA.

The proposed project is currently inconsistent with the Kittitas County Comprehensive Plan. The Applicant submitted a Comprehensive Plan amendment to Kittitas County in June 2003 that would change the land use designation in the project area from Rural to Wind Farm Resource overlay district. County approval of this land use designation change would make the project consistent with the County's Comprehensive Plan.

Neither of the current Agricultural-20 or Forest and Range zones in the project area allow for wind power projects either as a permitted or conditional use. For the project to be considered consistent with the current County Zoning Code, KCC 17.61A.040(B) requires a site-specific rezone of the zoning map to Wind Farm Resource overlay zone (Kittitas County 2002b). The Applicant submitted a rezone application in June 2003 to Kittitas County that would reclassify the project area (roughly 7,000 acres) from the existing Agriculture-20 and Forest and Range zones to Wind Farm Resource overlay zone. County approval of this rezone application would make the project consistent with the Zoning Code. Additional discussion of project consistency with the Comprehensive Plan and Zoning Code is presented below.

<u>Shoreline Management Act</u>

The Shoreline Management Act regulates development within 200 feet of the ordinary high water mark of marine shorelines, streams with a mean annual flow in excess of 20 cfs, and lakes of 20 acres or more in size (as well as to the edge of wetlands associated with these water features). Ecology (Chapter 173-22 WAC) regulates shorelines of the state through local agencies. Each county or city in the state, including Kittitas County, has developed a Shoreline

Master Program (SMP) (Kittitas County 1975) specifying restrictions that may apply to a given water body and outlining steps necessary to obtain approval for alteration or development.

Consistency Discussion

In the project area, two water bodies are under the jurisdiction of the SMP: Swauk Creek and the Yakima River. The project site is outside the designated shoreline of both water bodies. Therefore, the project is not subject to compliance with the Shoreline Management Act or Kittitas County SMP.

<u>Washington State Energy Facility Site Evaluation Council</u>

The siting of large thermal energy facilities is regulated by EFSEC under Chapter 80.50 RCW (Energy Facilities—Site Locations) and Title 463 WAC. Applicants for 100% renewable energy resource projects may chose to receive certification from EFSEC, as is the case for this project. An applicant requesting certification from EFSEC is required to submit detailed information on the proposed project and impacts the project may have on the natural and built environments. The applicant is also required to describe the means to be used to minimize or mitigate possible adverse impacts on the physical or human environment (WAC 463-42-085). Further, the applicant is required to set forth insurance, bonding, or other arrangements proposed to mitigate damage or loss to the environment (WAC 463-42-075).

WAC 463-28 requires EFSEC to determine whether the proposed project is consistent and in compliance with local land use plans or zoning ordinances. Should EFSEC find that land use is not consistent, WAC 463-28 provides procedures for EFSEC to follow to determine whether to recommend that the state preempt local land use plans or zoning ordinances for a site or portions of a site for an energy facility. An applicant is required to make every effort, including changes to the project design, to comply with all local land use plans, zoning ordinances, and shoreline management plans in effect at the date of the application filing. An applicant who is unable to resolve the issue of noncompliance related to consistency with land use and zoning regulations may file a written request for state preemption of those regulations (WAC 463-28-020). Should preemption be requested, and should EFSEC approve the request and recommend to the governor that the state preempt local land use plans and ordinances, EFSEC must include conditions that give due consideration to state or local governmental or community interests affected by the construction and operation of the facility, as well as to the purposes of laws or ordinances, or rules or regulations superseded (WAC 463-28-070).

Consistency Discussion

EFSEC's certification of the proposed project is subject to a finding of land use consistency with Kittitas County land use plans and zoning ordinances, or to a preemption process. At the land use hearing on May 1, 2003, EFSEC determined that the project is not consistent with the Kittitas County Comprehensive Plan or Kittitas County Zoning Code, and that the Applicant is responsible for requesting the necessary change to, or permission under, the land use plans and all reasonable efforts to resolve the noncompliance. The Applicant has submitted applications to the County for a Comprehensive Plan amendment and rezone of the project area in order to bring the project proposal into compliance with local land use plans and zoning ordinances.

Kittitas County

Kittitas County Comprehensive Plan

Consistent with the GMA, Kittitas County's Comprehensive Plan contains goals and policies for growth and development in the county. It includes elements for land use, housing, transportation, capital facilities, utilities, and rural lands.

Land use designations establish the general location and types of permitted uses. The project area is designated in the Comprehensive Plan as Rural. Generally, this designation includes a diverse range of land uses and housing densities that are compatible with rural character. The most common uses in this land use designation are agriculture and logging.

The plan's goals, policies, and objectives for land uses on rural lands are "established in an attempt to prevent sprawl, direct growth toward the urban Growth Areas and Nodes, provide for a variety of densities and uses, respect private property rights, provide for residences, recreation, and economic development opportunities, support farming, forestry and mining activities, show concern for shorelines, critical areas, habitat, scenic areas, and open space while keeping with good governance and the wishes of the people of Kittitas County, and to comply with the GMA and other planning mandates" (Kittitas County 2002a).

Consistency Discussion

The proposed project is inconsistent with the Kittitas County Comprehensive Plan. In June 2003, the Applicant submitted a Comprehensive Plan amendment to Kittitas County that would change the land use designation at the project area from Rural to Wind Farm Resource overlay district. County approval of this land use designation change would make the project consistent with the County's Comprehensive Plan.

The Comprehensive Plan was reviewed to assess the project's consistency with County policies. Each Goal, Policy, and Objective (GPO) listed below was determined to be potentially relevant to the proposed project. The text of each policy is followed by an analysis of the project's consistency.

Chapter 2: Resource Lands—Commercial Agriculture Land Use

- "GPO 2.114B. Economically productive farming should be promoted and protected. Commercial agricultural lands includes those lands that have the high probability of an adequate and dependable water supply, are economically productive, and meet the definition of 'Prime Farmland' as defined under 7 CFR Chapter VI Part 657.5…."

The proposed project is not located on or immediately adjacent to land designated for commercial agriculture land use in the County Comprehensive Plan. The project would be developed on non-irrigated land, about half of which is used for cattle grazing. This land does not satisfy the Comprehensive Plan's definition of Prime Farmland.

- "GPO 2.118. Encourage development projects whose outcome will be the significant conservation of farmlands."

Even though the project is not located on lands defined as "Prime Farmland," the permanent footprint of the project would convert 93 to 118 acres of land from grazing and rangeland uses to utility uses. However, this reduction would have an overall negligible impact on cattle operations given the county's abundance of pasture and unimproved grazing lands.

Chapter 2: Resource Lands—Commercial Forest Land Use

- "GPO 2.140. Land use activities within or adjacent to commercial forest land should be sited and designed to minimize conflicts with forest management and other activities on commercial forest lands."

Although forest lands are located to the north and east of the project site, there is no commercial forest land or activities immediately adjacent to the project site. Therefore, impacts on forest management or other activities on commercial forest lands are not anticipated.

Chapter 5 Capital Facilities Plan

- "GPO 5.110B. Electric and natural gas transmission and distribution facilities may be sited within and through areas of Kittitas County both inside and outside of municipal boundaries, UGAs, UGNs, Master Planned Resorts, and Fully Contained Communities, including to and through rural areas of Kittitas County."

The project would construct an electrical collection system consisting of approximately 23 miles of underground cable and about 2 miles of overhead, single-pole 34.5-kV distribution line in an area that the County designated as Rural in its Comprehensive Plan (Kittitas County 2002a). Therefore, to the extent that the proposed underground cables and overhead lines are considered electrical transmission and/or distribution facilities, the project would be consistent with this policy.

- "GPO 5.120. To recognize the Swiftwater Corridor Vision Plan as a planning tool that provides recommendations for specific strategies to improve, enhance, and sustain the corridor's unique intrinsic qualities and the many enjoyable experiences it offers. Selected projects within the vision plan shall not place additional management policies or regulations on private property or adjacent landowners beyond those that already exist under federal, state, regional, and local plans and regulations."

The Swift Water Corridor Vision Plan applies to the area along SR 10 that runs along the southern edge of the project area. It is a corridor management plan intended to identify unique and special features within the corridor and to assess eligibility for different types of grants for improvements and enhancements, as well as economic development and tourism programs. This section of SR 10 is designated on the American Automobile Association's State of Washington map as a scenic route. The plan recognizes that one of the most scenic viewpoints along the corridor is located just west of the intersection of SR 10 and the North Thorp Highway (the North Thorp Highway turns into Hayward Hill Road on the north side of SR 10).

The plan identifies measures to develop improvements and amenities that would enhance the corridor's scenic qualities. In this portion of the corridor, the plan recommends developing a formal scenic vehicle pullout at the bend in the Yakima River (Kittitas County 2002a).

Several short segments of SR 10 lie within 0.5 mile of the closest proposed turbine. Because the highway carries a moderately high level of traffic and has been recognized as having scenic qualities, and because efforts have started to enhance the highway's role as a scenic corridor, the sensitivity of views from the highway toward the project site is considered high. Proposed turbines would be visible on the ridgeline from portions of SR 10 and could degrade the intrinsic qualities of the landscape that make this portion of the corridor unique.

Chapter 6 Utilities

- "GPO 6.7. Decisions made by Kittitas County regarding utility facilities will be made in a manner consistent with and complementary to regional demands and resources."

Recent national and regional forecasts predict increasing consumption of electrical energy will continue into the foreseeable future, requiring development of new generation resources to satisfy the increasing demand. The Energy Information Administration published a national forecast of electrical power through the year 2025. In it, the administration projected that total electricity demand would grow between 1.8 and 1.9% per year from 2001 through 2025 (U.S. Energy Information Administration 2003).

The WECC forecasts electricity demand in the western United States. According to WECC's most recent coordination plan, the 2001-2011 summer peak demand requirement is predicted to increase at a compound rate of 2.5% per year (WECC 2002).

Based on data published by the NWPCC, electricity demand for the NWPCC's four-state Pacific Northwest planning region (Washington, Oregon, Idaho, and Montana) will grow from 20,080 average megawatts in 2000 to 25,423 average megawatts by 2025 (medium forecast), an average annual growth rate of just less than 1% per year (NWPCC 2003).

In the Pacific Northwest Electric Power Planning and Conservation Act, Congress established that development of renewable resources should be encouraged in the Pacific Northwest (16 USC § 839[1][B]). The Act defines wind power as a renewable resource (§ 839a[16]). The proposed project would rely on wind, a renewable resource, to provide energy to meet current and future regional power demands. Therefore, development of the project would be consistent with GPO 6.7.

- "GPO 6.10. Community input should be solicited prior to county approval of utility facilities which may significantly impact the surrounding community."

EFSEC is making substantial efforts to solicit community input on the proposed project. As lead agency under SEPA, EFSEC is responsible for including the public early in the EIS process to help identify public issues of concern, establish communication lines, and facilitate trust. Public involvement, consultation, and coordination efforts undertaken by EFSEC for this project are discussed further in Chapter 1, Summary.

- "GPO 6.18. Decisions made regarding utility facilities should be consistent with and complementary to regional demand and resources and should reinforce an interconnected regional distribution network."

Refer to the discussion of GPO 6.7 regarding the project's consistency with regional energy demands and resources.

- "GPO 6.21. Avoid, where possible, routing major electric transmission lines above 55 kV through urban areas."

The only high voltage transmission lines associated with the project would be short (i.e., less than 200 feet long) lines that would interconnect the substations to the existing overhead Bonneville and PSE transmission lines at the transmission level (230 kV or 287 kV for the Bonneville or PSE lines, respectively). No transmission lines are proposed in urban areas.

- "GPO 6.34. Wind Farms may only be located in areas designated as Wind Farm Resource overlay districts in the Comprehensive Plan. Such Wind Farm Resource overlay districts need not be designated as Major Industrial Developments under Chapter 2.5 of the Comprehensive Plan."

The project is inconsistent with GPO 6.34 because the project area is not designated as a Wind Farm Resource overlay district. In June 2003 the Applicant submitted a Comprehensive Plan amendment to Kittitas County to change the land use designation at the project area from Rural to Wind Farm Resource overlay district. Approval of the amendment by the Kittitas County Board of County Commissioners would achieve consistency with this policy.

Kittitas County Zoning Code

The Kittitas County Zoning Code regulates the use and development of property within the unincorporated areas of the county. The KVWPP site contains two zoning designations—Agriculture-20 and Forest and Range. The areas east of US 97 are zoned Forest and Range while those west of US 97 are zoned Agriculture-20.

Permitted uses in the Agriculture-20 zone include residential, agriculture, and forestry practices. The minimum lot size is 20 acres (KCC 17.29.020), while permitted uses in the Forest and Range zone include logging, mining, quarrying, and agricultural practices. Several residential uses are also allowed in the Forest and Range zone including single-family residences, duplexes, and cluster subdivisions (KCC 17.56.020).

Table 3.6-3 summarizes the specific project facilities proposed in the two zoning districts.

Table 3.6-3: Project Facilities by Zoning District

Proposed Project Facilities	
Agricultural-20 Zoning District	Forest and Range Zoning District
Turbine Strings A, B, C, D, and F (43 turbines under middle scenario) Electrical Collection System Substations and Interconnection Facilities Access Roads Three Proposed Meteorological Tower Sites O&M Facility	Turbine Strings G, H, I, and J (78 turbines under middle scenario) Electrical Collection System Access Roads 6 Proposed Meteorological Tower Sites

Source: Sagebrush Power Partners LLC 2003a.

Consistency Discussion

Neither the Agricultural-20 nor Forest and Range zones allow for wind power projects either as a permitted or conditional use. For the project to be considered consistent with the current County Zoning Code, a site-specific rezone of the zoning map to Wind Farm Resource overlay zone pursuant to KCC 17.98 would be required (Kittitas County 2002b).

On May 1, 2003, EFSEC held a land use hearing, pursuant to Chapter RCW 80.50.090 and WAC Chapter 463-26, for the purpose of determining if the proposed project is consistent with Kittitas County or regional land use plans and zoning ordinances. At that hearing, EFSEC determined that: (1) in accordance with WAC 463-26-110, the proposed project is not consistent with nor is it in compliance with Kittitas County land use plans or zoning ordinances, and (2) the Applicant shall make all reasonable efforts to resolve the noncompliance (EFSEC 2003).

In June 2003 the Applicant submitted an application to Kittitas County to rezone the project area from Agriculture-20 and Forest and Range to Wind Farm Resource overlay zone. County approval of this rezone application would result in project consistency with the County Zoning Code.

The Kittitas County Board of County Commissioners will review the proposed Comprehensive Plan amendment and rezone and approve them if they satisfy the following criteria: (1) the proposal is essential or desirable to the public convenience; (2) the proposal is not detrimental or injurious to the public health, peace, or safety or to the character of the surrounding neighborhood; and (3) the proposed use at the proposed location(s) will not be unreasonably detrimental to the economic welfare of the County and it will not create excessive public cost for facilities and service (KCC 17.61A).

Other Entities

Mountains-to-Sound Greenway Plan

The Mountains-to-Sound Greenway Trust is a private, non-profit organization formed in 1991 to promote protection of a regional greenway. The greenway extends along I-90 from Elk Heights in central Kittitas County to Puget Sound. It is conceived of as a scenic, historic, and recreational corridor intended to function as a scenic gateway to the Seattle metropolitan area and a pathway to nature for the metropolitan area's population. The plan provides a framework within which the Trust and state and federal agencies have been able to plan and implement measures to acquire, protect, and develop lands along the corridor that provide recreational opportunities and/or protect natural, historic, and scenic resources. However, the plan is not legally binding because local, state, and federal agencies have not adopted it (City of Cle Elum 2001).

Consistency Discussion

In a meeting between the Applicant and representatives of the Mountains-to-Sound Greenway Trust, the Trust raised two issues. There were concerns about the potential visibility of the turbines from I-90, which at that time were being proposed for locations on Lookout Mountain. The Trust also asked the Applicant to consider using different paint colors so that the turbines would blend in with their surroundings. After that meeting and in response, in part, to the concerns expressed by the Trust, the Applicant removed the alternative that called for turbines on Lookout Mountain from further consideration (see Section 2.6, Alternatives Considered but Rejected, and Section 3.9, Visual Resources).

Swift Water Corridor Vision Plan

The Swift Water Corridor Vision Plan (Kittitas County 1997a) extends along SR 10 from Ellensburg to Salmon La Sac over a distance of 42 miles. The plan is a planning document that provides recommendations for specific strategies to improve, enhance, and sustain the corridor's unique intrinsic qualities and the many enjoyable experiences it offers.

Consistency Discussion

Refer to the discussion of Comprehensive Plan policy GPO 5.120, above.

3.6.5 Mitigation Measures

Mitigation Measures Proposed by the Applicant

- During project construction, it would be necessary to remove cattle from areas where blasting or heavy equipment operations are taking place. The Applicant proposes to make arrangements with property owners and livestock owners to keep livestock out of these areas during those periods.

- After construction is completed, disturbed areas would be returned as closely as possible to their original state, excluding service and access roads, which would remain in place for the life of the facility.

Additional Recommended Mitigation Measures

In addition to measures proposed by the Applicant and inherent in the project design, the following mitigation measure is recommended to minimize potential conflicts between project construction and operation activities and onsite recreation users:

- In June 2003, DNR and the Applicant executed a lease agreement that would permit the Applicant to construct and operate portions of the proposed wind turbine project on DNR property (DNR 2003). Under the terms of the agreement, DNR's activities on this property, and any grant of rights DNR makes to any person or entity, shall not unreasonably interfere with the construction, installation, maintenance, operation, or removal of the project, access to the project, or the undertaking of other permitted activities allowed by the lease. If DNR determines that potential conflicts between turbine construction and/or operations and existing recreational uses on DNR property would occur, the agency could take steps to limit access to its property. For example, DNR could post appropriate signs on its property limiting public pedestrian and/or vehicle access to portions of the project area during construction or operation.

3.6.6 Significant Unavoidable Adverse Impacts

The permanent conversion of approximately 93 to 118 acres of rangeland to commercial utility use (i.e., wind energy production) would be an unavoidable impact of the project. However, this reduction would have an overall negligible impact on cattle operations given the county's abundance of pasture and unimproved grazing lands. Therefore, no significant unavoidable adverse impacts are expected for land use as a result of the proposed project construction, operations and maintenance, and decommissioning.

3.7 SOCIOECONOMICS

This section characterizes population, housing, and economic conditions, including employment, income, local government revenues, and property values in Kittitas County. It identifies and discusses potential population in-migration and housing impacts. Employment demand and resulting economic impacts generated by the KVWPP are also evaluated, as well as the project‘s estimated revenue and cost impacts on Kittitas County agencies and potential impacts on property values.

The analysis in this section is based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Section 8.1). Population and housing data for this section were collected, reviewed, and summarized from a variety of sources. They included state government publications and U.S. Census Bureau data.

The primary source of economic data reviewed was the October 2002 study entitled *Economic Impacts of Wind Power in Kittitas County* prepared for the Phoenix Economic Development Group (Phoenix Group) (ECONorthwest 2002). The Phoenix Group is a cooperative public/private nonprofit association established to provide leadership that stimulates business and promotes economic opportunities to support the needs of Kittitas County (Washington State Employment Security Department 2002a). The ECONorthwest report evaluated the potential economic impacts of both the KVWPP and the Desert Claim projects, based on an initial proposal that the KVWPP consisted of 110 wind turbines and the Desert Claim project consisted of 150 wind turbines. The ECONorthwest data were modified to extract information specific to the KVWPP for inclusion in the Application to EFSEC (Sagebrush Power Partners LLC 2003a, Section 8.1).

Since these reports were published, the sizes of both the KVWPP and Desert Claim projects have been modified; therefore, relevant data were updated for inclusion in this EIS based on an assumed linear relationship between jobs, income, taxes, and revenue estimates and the number of wind turbines to be constructed. Several studies that evaluated the effect of wind development on nearby property values were also reviewed and summarized (Renewable Energy Policy Project 2003; ECONorthwest 2002; Jørgensen 1996; and Damborg 2002).

3.7.1 Affected Environment

Population

Population estimates for Kittitas County and Washington State are presented in Table 3.7-1. In 2000, the population of Kittitas County was 33,362. Between 1990 and 2000, the county population increased at an annual rate of 2.2%. During the same period, the state’s population increased at an annual rate of 1.9%.

The State of Washington’s Office of Financial Management (OFM) currently projects that the county population will continue to grow through the year 2020. However, the actual rate of growth is projected to slow to approximately 1.1% annually. During the same period, the state’s population is forecast to grow at an annual rate of about 1.2%.

Table 3.7-1: Kittitas County and Washington State Population

Area	1990	2000	Average Annual Growth, 1990-2000	2020 Forecast	Forecast Average Annual Growth, 2000-2020
Kittitas County	26,725	33,362	2.2%	41,776	1.1%
Washington State	4,866,692	5,894,121	1.9%	547,276	1.2%

Source: Washington State Office of Financial Management 2002a, 2002b.

As shown in Table 3.7-2, nearly 92% of the county's population is Caucasian. The state's population is 82% Caucasian. The project area's population has a lower percentage of people of Hispanic origin than the state has. Approximately 5% of the county's residents are of Hispanic origin, compared to approximately 7.5% for the state (Sagebrush Power Partners LLC 2003a, Section 8.1.2.2).

Table 3.7-2: Kittitas County Demographic Breakdown of Population by Race

Area	Caucasian	African-American	American Indian, Eskimo, or Aleutian	Asian or Pacific Islander	Other Race	Two or More Races
Kittitas County	91.8%	0.7%	0.9%	2.3%	2.3%	2%
Washington State	81.8%	3.2%	1.6%	5.9%	3.9%	3.6%

Source: U.S. Census Bureau 2002.

Housing

Table 3.7-3 displays the estimated number of housing units for Kittitas County and for Washington State. From 1990 to 2000, housing in the county grew at an average annual rate that was slightly greater than the state's rate of growth. The number of housing units increased at an average growth rate of 2.2%, with the number of housing units increasing from 13,215 in 1990 to an estimated 16,475 in 2000 (Sagebrush Power Partners LLC 2003a, Section 8.1.2.1)

Table 3.7-3: Housing Units in Kittitas County and Washington State

Location	Housing Units		% Average Annual Growth 1990-2000	Number of Vacant Units, 2000	
	1990	2000		Total Vacant Units	Seasonal, Recreational, or Occasional Use
Kittitas County	13,215	16,475	2.2%	3,093	1,791
Washington State	2,032,378	2,451,075	1.9%	179,677	60,355

Source: U.S. Census Bureau 2002.

As of the 2000 Census, Kittitas County had 3,093 vacant housing units. Of the total vacant units, 1,791 were classified as seasonal, recreational, or occasional use. The occasional use units represent approximately 10.9% of the total units in the county. These units are generally lake or hunting cabins, quarters for seasonal workers, or time-share units. In Washington State, 2.5%, were designated as seasonal, recreational, or occasional use units (U.S. Census Bureau 2002). The higher percentage of occasional use units in the county is attributed to the recreational areas located in the Cascades and other areas of the county (Sagebrush Power Partners LLC 2003a, Section 8.1.2.1).

Of the total units available for rent in the county in 2000, the U.S. Census reported a vacancy rate of 6.8% for Kittitas County. This vacancy rate is consistent with the vacancy rate reported by the Washington Center for Real Estate Research, which reported an apartment vacancy rate range from a high of 7% in September 2001 to a low of 3.9% in March of 2002. The higher vacancy rate experienced in September could be explained by the fact that Central Washington University's academic year generally begins at the end of September (Sagebrush Power Partners LLC 2003a, Section 8.1.2.1). By comparison, the statewide rental vacancy rate was 5.9% (U.S. Census Bureau 2002).

The estimated number of people per household in the county was 2.3 in 2000. This is less than the state's average of approximately 2.5 persons per household (U.S. Census Bureau 2002).

Employment

Table 3.7-4 displays average employment by industry for Kittitas County and Washington State. In 2000, an estimated 11,822 people were employed in the county. Employment in the study area was concentrated in the government, trade, and service sectors. The government sector (including local, state, and federal employees) accounts for approximately 31% of total employment in the study area, while trade (including wholesale and retail) and services account for 28 and 19%, respectively.

Table 3.7-4: Kittitas County and Washington State Employment by Industry, 2000

Industry	Kittitas County		Washington State	
	Employment	Percentage of Total	Employment	Percentage of Total
Agricultural, Forestry, and Fishing	811	6.9	91,530	3.4
Construction and Mining	433	3.7	152,790	5.7
Manufacturing	683	5.8	345,830	12.8
Transportation, communication, and utilities	432	3.7	139,684	5.2
Trade (wholesale and retail)	3,279	27.7	633,936	23.5
Finance, insurance, real estate, and services	2,194	18.6	880,985	32.6
Government	3,717	31.4	458,482	17
Not Elsewhere Classified	273	2.3	NA	NA
Total	11,822	100	2,703,237	100

Source: Washington Employment Security Department 2002.

Recent unemployment rate trends for Kittitas County and Washington State are shown in Table 3.7-5. In 1996, the average unemployment rate for the county exceeded the state's rate by more than 2 percentage points, 8.6% versus 6.5%. By 1999, strong economic growth had resulted in decreases in the unemployment rates for both the county and state to 5.6% and 4.7%, respectively. With the recession beginning in 2001, unemployment rose in both the county and state. The 2001 unemployment rate was 6.5% in Kittitas County and 6.4% in Washington State (Sagebrush Power Partners LLC 2003a, Section 8.1.2.3). However, the 2002 average unemployment rate for Kittitas County dropped to 6.2% while the state unemployment rate rose to 7% (U.S. Bureau of Labor Statistics and Real Estate Center at Texas A&M University 2002).

Table 3.7-5: Unemployment Rate Trends in Kittitas County and Washington State, 1996-2001

Area	1996	1997	1998	1999	2000	2001
Kittitas County	8.6%	6%	6%	5.6%	5.8%	6.5%
Washington State	6.5%	4.8%	4.8%	4.7%	5.2%	6.4%

Source: Washington Employment Security Department 2002.

Economic Conditions

Per Capita Income

In 2000, the per capita income of Kittitas County residents of $21,196 was about 68% of the state average of $31,230 (Table 3.7-6). From 1997-2000, the county's per capita income grew at an annual rate of 3.1%, compared to the statewide rate of 4.2%. In 1999, approximately 19.6% of county incomes were below the 1999 federal poverty level of $8,240 for one person less than age 65 or $16,700 for a family of four. This exceeded the state average of 10.6% (Kittitas County 2002c).

Table 3.7-6: Kittitas County Per Capita Income (1997-2000)

Area	1997	1998	1999	2000	% Average Annual increase (1997-2000)	% of State Total (2000)
Kittitas County	18,781	19,738	20,164	21,196	3.1	67.9
Washington State	26,469	28,285	29,819	31,230	4.2	NA

Source: U.S. Bureau of Economic Analysis 2002.

Tax Rates and Distribution

Kittitas County depends primarily on sales and property tax revenues to fund government operations and services. Recent trends in taxable retail sales in Kittitas County and Washington State are compared in Table 3.7-7. In 2001 (the last year complete data were recorded), retail sales in the county totaled approximately $388 million (Washington Department of Revenue 2002a). From 1998 to 2001, retail sales in the county increased at an average annual rate of 1.5%. Over the same period, sales statewide increased at an annual rate of 3.4%. Both the county and the state experienced a decline in taxable retail sales from 2000 to 2001. This decrease in retail sales is likely attributed to the overall slowdown in the regional and national economies (Sagebrush Power Partners LLC 2003a, Section 8.1.2.6).

Table 3.7-7: Kittitas County and Washington State Taxable Retail Sales, 1998-2001 ($000s)

Area	1998	1999	2000	2001	Avg. Annual % Change 1998-2001
Kittitas County	365,318	367,900	392,536	387,724	1.5
Washington State	73,865,218	79,683,553	84,747,510	84,356,940	3.4

Source: Washington Department of Revenue 2002c.

The Kittitas Valley Wind Power Project site lies within unincorporated Kittitas County. The total assessed value of property in Kittitas County in 2001 was approximately $2.2 billion (Washington Department of Revenue 2002b). Private property within the unincorporated county is taxed at a variety of individual levy rates for state government and multiple-county government purposes, and includes levy rates for applicable fire district, school district, and other special purposes. The 2001 average consolidated tax per thousand dollars of assessed value for the county was about $10.67.

Revenues from property taxes are used to fund Kittitas County government, local school districts, local fire departments, libraries, and emergency medical services. These property tax revenues are also a major source of revenue for the local governments. Incorporated into the consolidated tax levy are local levies collected by the County Assessor and returned to the local jurisdictions as general fund revenues (Sagebrush Power Partners LLC 2003a, Section 8.1.2.5).

In 2001, the Kittitas County general fund had revenues of about $11 million (Washington State Auditor 2001). As shown in Table 3.7-8, approximately 48% of the revenue is expected to come from taxes. Other sources of revenue include licenses and permits, fines and forfeits, and intergovernmental transfers. Real and personal property taxes are forecast to be the largest contributors to revenues. Property taxes, which account for about 28% of total revenues, generated about $3.1 million in revenues. Sales and use taxes are expected to total approximately $2 million in 2001, providing approximately 18% of total revenues for the general fund (Sagebrush Power Partners LLC 2003a, Section 8.1.2.7).

Table 3.7-8: Kittitas County General Fund, Total Resources (2001)

Resources	2001	Percentage of Total Resources
General Property Tax	$3,113,040	28
Sales and Use Tax	$2,010,140	18.1
Other Local Taxes	$241,668	2.2
Licenses and Permits	$593,398	5.3
Charges and Fees for Service	$823,701	7.4
Interest on Investments	$596,142	5.4
Fines and Forfeits	$1,387,397	12.5

Table 3.7-8: Continued

Resources	2001	Percentage of Total Resources
Miscellaneous	$208,728	1.9
Intergovernmental Revenues	$2,131,520	19.2
Total Resources	$11,105,734	100

Source: Washington State Auditor 2001.

3.7.2 Impacts of Proposed Action

This section describes impacts on housing, population, and economic conditions under the proposed action. Direct impacts would result from increases in population, increased demand for housing (both from construction and operational employment in-migration), and increased income and jobs added to the local economy. The project's direct effect on property values also is discussed. Indirect impacts would result from increases in indirect and induced income and jobs added to the local economy. However, project-induced economic activity is not expected to result in indirect population growth and a related demand for housing capacity.

The project would generate both direct and indirect effects on local tax revenues. However, because tabular data are presented for projected total revenues (includes the sum of direct and indirect effects), the projects' effects on local government taxation and revenues are addressed below under "Indirect Operations and Maintenance Impacts." Table 3.7-9 summarizes potential socioeconomic impacts for the three scenarios under the proposed action. Detailed socioeconomic tables, including tables that distinguish direct versus indirect and induced employment and income impacts, are presented in the sections that follow.

Table 3.7-9: Summary of Potential Socioeconomic Impacts

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Construction Impacts			
Increased temporary population	Same as middle scenario	Construction workforce of 253 employees; maximum 177 workers would be in-migrants to project area	Same as middle scenario
Increased demand for temporary housing	Same as middle scenario	Maximum 160 construction workers (112 non-local) during peak construction month	Same as middle scenario
Increased jobs added to local economy (Kittitas County)	+/- 10 to 15% compared to middle scenario	82 total jobs	+/- 10 to 15% compared to middle scenario
Increased income added to local economy (Kittitas County)	+/- 10 to 15% compared to middle scenario	$5.7 million total income	+/- 10 to 15% compared to middle scenario

Table 3.7-9: Continued

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Operation Impacts			
Increased permanent population in Kittitas County	Same as middle scenario	Maximum 16 individuals would be in-migrants to Kittitas County	Maximum 23 individuals would be in-migrants to Kittitas County
Increased demand for permanent housing in Kittitas County	Same as middle scenario	6-7 new families in Kittitas County	9-10 new families in Kittitas County
Changes to local property values	Negligible	Negligible	Negligible
Increased jobs added to local economy (Kittitas County)	+/- 10 to 15% compared to middle scenario	24 jobs annually	+/- 10 to 15% compared to middle scenario
Increased income added to local economy (Kittitas County)	+/- 10 to 15% compared to middle scenario	$1.9 million total income annually	+/- 10 to 15% compared to middle scenario
Increase in local property tax revenue	+/- 10 to 15% compared to middle scenario	$1.34 million total property tax revenue annually	+/- 10 to 15% compared to middle scenario
Increase in additional local tax revenue	+/- 10 to 15% compared to middle scenario	$323,400 million total additional indirect tax revenue annually	+/- 10 to 15% compared to middle scenario

Source: Sagebrush Power Partners LLC 2003a, Section 8.1.3, as amended by Sagebrush Power Partners LLC 2003c.

Although economic effects are fully quantified for the middle scenario, quantifiable economic impacts for the lower and upper end scenarios are not available at this time. Indirect and induced employment and income impacts to Kittitas County for both the construction and operations phases of the project for the middle scenario were determined using the IMPLAN input-output model developed by the U.S. Department of Agriculture (in cooperation with other federal agencies) with data specific to Kittitas County. This model requires the input of several discrete variables, including the amount of local spending on construction materials and on equipment and materials to operate the wind turbines, and the amount of spending on food and lodging for non-local labor brought to Kittitas County for the construction period. Another model input variable is the amount of income to property owners that rent land for the wind turbines.

Specific model inputs have not been developed for the lower end (i.e., 82 turbine) or upper end (i.e., 150 turbine) scenarios. Therefore, estimates for employment and income effects in Kittitas County from the lower end and upper end scenarios have not been quantified. Similarly, an estimate of potential tax revenues generated under the lower and upper end scenarios has not been conducted; therefore, the potential effects on the local tax base under these two scenarios have not been quantified. However, it is reasonable to assume that the margin of error surrounding the value of the model inputs used for the middle scenario would be about +/- 10 to 15%, and that the input values for the lower and upper end scenarios would fall within this range. Therefore, the employment, income, and tax revenue effects of the lower and upper end scenarios during construction and operations would be +/- 10 to 15% of the quantified middle scenario (Taylor, pers. comm., 2003). Further quantification would resolve uncertainty associated with this issue (see Section 1.7, Issues to be Resolved).

Direct Construction Impacts

The planned construction schedule for the project spans approximately 12 to 14 months from the time of site certification to commercial operation (Taylor, pers. comm., 2003). Construction of the substation transformers and wind turbines would require the longest lead time, usually requiring 8 to 12 months from time of order to delivery of the transformers, and 5 to 7 months for the wind turbines (Sagebrush Power Partners LLC 2003a, Section 2.12.2).

The total workforce required during project construction would be approximately 253 employees under all three project scenarios. During the peak construction month, it is expected that about 160 personnel would be onsite at once as multiple disciplines of contractors complete their work simultaneously (Sagebrush Power Partners LLC 2003a, Section 2.13.2). The size and duration of the peak workforce would not change as a result of using larger or smaller turbines. The size of the peak workforce is driven more by the completion deadline than the size of the turbines. For example, while larger turbines would require more labor hours to construct, there would be fewer of them, so the number of employees required would be approximately equivalent (Taylor, pers. comm., 2003).

The project site is within commuting distance of Ellensburg in Kittitas County (approximately 12 miles away) and Yakima in adjacent Yakima County (within a one-hour drive). The Applicant's *Application for Site Certification* asserts that the majority of the construction workers would originate from the Ellensburg and Yakima area (Sagebrush Power Partners LLC 2003a, Section 5.2.2.1.1). However, construction personnel would also likely be hired from the Seattle/Tacoma area, in which case the commute distance would be somewhat longer (about 1.5 to 2 hours). These workers would probably be "weekend commuters" staying in recreational vehicle (RV) parks and motels near the job site during the workweek. In addition, because more specialized skills required for certain construction activities, such as turbine erection and turbine testing, may not be available in the local or state labor pools, a small percentage of the workforce may be brought in from out of state. These employees would likely work on a short-term basis, residing in nearby motels or RV parks for the duration of their assignments, or arranging monthly rentals.

During the EIS scoping process, several commentors expressed concern about the source of the labor pool that would construct the project. For example, some commentors requested that the document address impacts under different scenarios, including a scenario with only out-of-area contractors building the project and a scenario with local contractors and local craftsmen performing the majority of construction work. Other commentors asked if the Applicant would provide assurances that local craftsmen would perform the majority of construction work or would require that construction workers be paid prevailing wages set by the state for Kittitas County. The Applicant has not hired a contractor at this time but would select one through a competitive process prior to construction. Any additional details on hiring, training, wages, and other aspects of the construction labor force are beyond the scope of this EIS.

Assumptions in this analysis regarding construction workforce origins were derived from data on the Stateline Wind Project in nearby Walla Walla County (Walla Walla County 2002). The Stateline EIS assumed that 50% of construction workers would be hired locally (for that project, from within Benton and Yakima counties, Washington) and the remainder from outside the local area. For the purposes of this EIS, it is conservatively assumed that 50 to 70% of construction workers would originate from outside Kittitas and Yakima counties, and that these employees would have a demand for temporary accommodations in the project area. Given these assumptions, it is expected that during the peak month of construction, a maximum of approximately 80 to 112 construction workers would require temporary housing in the general vicinity of the project site. A subset of the estimated total of 80 to 112 non-local workers would be workers who would temporarily relocate to the project area from outside the region. It is also expected that up to 10% (16 individuals) of the peak month construction workforce for the KVWPP would be specialized craftsmen from out-of-state areas.

Population

Project construction would require a total workforce of 253 employees. As shown in Figure 3.7-1, labor requirements would vary monthly during the estimated 12- to 14-month construction period. In the first month of the construction period, the project would employ approximately 6 workers. The construction workforce would increase rapidly to 130 workers in the fifth month of construction, then climb to a peak of 160 in the ninth month. Construction employment would then decrease rather rapidly, falling to 90 workers in the tenth month and 30 workers by the fourteenth month. Average monthly employment over the entire construction period would be approximately 75 workers.

Temporary population impacts from the project would be a function of the extent of worker relocation and in-migration needed to meet project labor demands. In turn, the project is dependent upon the ability of the local labor supply to meet this demand. As described above, it is assumed that between 30 to 50% of the construction workforce would originate from the Ellensburg and Yakima areas. In 2001, Kittitas and Yakima counties had an aggregate civilian labor force of over 122,000 people (Washington State Employment Security Department 2002a, b). This figure broadly represents the size of the local labor pool from which the Kittitas Valley Wind Power Project would draw workers for project construction.

The local construction labor force available when the KVWPP begins, including both workers currently employed in construction and unemployed workers with construction skills, represents one of the primary sources of workers for the project. However, given the unique project requirements, some construction labor would need to be imported from outside the region to fill specialized jobs. The EPC contractor would bring in additional employees with sufficient skills in constructing wind power projects to ensure that sufficient critical skilled labor is available. For example, turbine erection, including hoisting the nacelle and securing the blades, would require highly specialized labor that would be temporarily imported from out-of-state during the wind turbine assembly and erection phase of construction (estimated to last approximately 6 months) (Taylor, pers. comm., 2003). For purposes of this analysis, it is assumed that approximately 25 out-of-state workers (about 10% of the total construction workforce) would be required during the course of construction.

Figure 3.7-1:

Temporary population impacts in the project area would be minimal as a result of project construction. Assuming that 30% of the construction workers would reside within Kittitas or Yakima County and that they would commute daily to the project site, a maximum of 177 new workers would be temporary residents (in-migrants) in the project area. Given the accelerated construction schedule (about one year) and the fact that many workers would be present at the project site only during certain construction phases, it is assumed that the majority of workers would not be accompanied by families or others. Because the projected number of temporary in-migrants (177 employees) would be small compared to overall county population (33,362 in 2000), no significant impacts on population are anticipated. Because the project would not generate additional development, no indirect impacts on population are anticipated.

Housing

As many as 177 non-local workers could be employed at the project site over the course of construction, with an estimated peak month non-local workforce of up to 112 workers. At time of hire, these workers would likely reside in relatively distant employment centers such as the Seattle-Tacoma metropolitan area, beyond normal daily commuting distance from the project site, or would be temporarily imported from outside the state. Project construction workers originating from outside the local area (i.e., Kittitas and Yakima counties) would probably choose one of two options with respect to residence and work location:

1. They could retain their current residence and commute to the project area on a weekly basis, staying in short-term (transient) accommodations during the work week; or
2. They could temporarily relocate to rental housing (non-transient accommodations) in the project area for the duration of their employment.

Either scenario would depend primarily on the length of the individual's assignment. Those with relatively short-term jobs requiring their presence on the project site for only a few months would be more likely to commute on a weekly basis, while those with longer-term jobs would be more likely to relocate temporarily.

It is not known where the new temporary residents associated with project construction would settle and what type of housing they would select. It is assumed that residents would select housing based on a variety of factors including cost, accessibility to the project site, and accessibility to goods and services. Typical temporary worker housing options include campgrounds and other areas where workers can park trailers or other mobile housing, motels and hotels, and apartments or other short-term rental homes.

As discussed in Section 3.6, Land Use and Recreation, the results of a telephone survey conducted in 2002 of hotel, motel, RV Park, and campgrounds in Kittitas County to identify the supply of transient accommodations indicated that there are 1,150 rooms or sites available in the county. The results indicate further that during the peak summer season, there are typically about 240 rooms or sites vacant at any one time. During the non-summer months, vacancy rates are higher and it is estimated that there are usually around 760 rooms or sites vacant at any one time (CH2M Hill and Sagebrush Power Partners LLC 2002). This analysis assumes that as many as 112 non-local workers could be employed at the project site during the peak construction month (this includes potential out-of-state workers). Even if all non-local workers (including out-of-state employees) were to seek transient accommodations, it is anticipated that there would be an adequate supply of short-term lodgings to accommodate this temporary increased demand for housing.

Of the peak construction workforce, approximately 16 out-of-state workers are expected to seek temporary (non-transient) housing in Kittitas County. There were more than 1,000 vacant seasonal, recreational, or occasional-use housing units in Kittitas County in 2000 (see Section 3.7.1). Given the recent rental vacancy rates of between 3.9 to 7% in Kittitas County, it is anticipated that there would be an adequate local housing supply available to accommodate project-related demand for temporary rental housing (Sagebrush Power Partners LLC 2003a, Section 8.1.3.1).

Employment

Project construction would result in increased employment in Kittitas County. Direct employment refers to the number of workers directly employed in project construction. Indirect and induced employment is discussed later in this section under the header "Indirect Construction Impacts."

As described above, the direct construction employment impact of the project would be approximately 253 new temporary jobs. The level of direct construction impact would vary during the construction period, reaching a short-term peak estimated at 160 construction workers. The project's direct construction employment would represent a temporary increase in employment for the local and regional economy. It is estimated that about 30 to 50% of this direct employment impact (76 to 127 jobs) would occur within Kittitas and Yakima counties, with the remainder distributed among other local economies in the Northwest. The Applicant assumes that local Kittitas County residents would fill approximately 40 full- and part-time construction jobs (including construction management) (Sagebrush Power Partners LLC 2003a, Section 8.1.3.2). Direct employment impacts from construction would be temporary effects associated with the construction phase of the project. The number of direct construction jobs generated by the project is anticipated to be the same under the three different project scenarios.

Construction jobs created by the project would result in short-term benefits to overall county and regional employment. No significant direct impacts on employment are anticipated. Creation of new jobs could have secondary impacts on population, housing, and the economy; these potential impacts are analyzed in relevant subsections of this chapter.

Construction Income

Total direct income generated during the construction phase of the project is estimated to be $4,577,100 (in 2002 dollars) under the middle scenario. Total income consists of personal income in the form of wages, profits, and other income received by workers and business owners, plus income from other sources such as royalty payments to land owners who lease land for the turbines (Sagebrush Power Partners LLC 2003a, Section 8.1.3.2). The direct income impact from project construction would be a temporary but beneficial effect to the Kittitas

County economy. The amount of direct construction income generated under the lower and upper end scenarios is estimated to be +/- 10 to 15% of the quantified middle scenario.

Indirect Construction Impacts

Employment and Income

While the KVWPP is expected to create construction employment, economic impacts are not limited to those directly created jobs. Direct economic impacts produce a ripple effect through an economy in the form of indirect impacts and induced impacts. Indirect and induced impacts represent the second and third stages of job creation, respectively, as a result of any direct activity. A project or action that results in new spending, or a reduction in existing spending, is called a direct effect. The businesses that make the final sales must in turn purchase goods and services from other businesses; these indirect purchases are called indirect effects. For example, a construction contractor working on a project will lease some equipment or purchase supplies locally. Finally, workers at the producing businesses spend their wages in the local economy and purchase additional goods and services; these purchases are referred to as induced effects. For example, project employees who use their income to buy groceries or take their family to the movies generate economic impacts for workers and businesses in these sectors. The total economic impact of an action is the sum of direct, indirect, and induced effects. Indirect and induced construction employment impacts for the project were determined using an input-output model of Kittitas County (ECONorthwest 2002).

The direct, indirect, and induced employment and income impacts in Kittitas County during project construction (under the middle scenario) are shown in Table 3.7-10. The table identifies the number of full- and part-time jobs expected to result from the project and from the increase in spending in other sectors of the economy. The Applicant assumes that the project would directly generate 40 full and part-time construction jobs (including construction management) that would be filled by local workers in Kittitas County (Sagebrush Power Partners LLC 2003a, Section 8.1.3.2) under all three project scenarios. The total indirect and induced employment impact of the project under the middle scenario is predicted to be 14 and 28 jobs, respectively. The number of indirect and induced construction jobs generated under the lower and upper end scenarios is estimated to be +/- 10 to 15% of the quantified middle scenario. It is important to note that indirect and induced employment created by construction employment would not necessarily also be new construction jobs; everyday spending for construction materials and other similar needs could create new jobs in other markets sectors such as retail and wholesale. Direct, indirect, and induced employment impacts from construction would be temporary effects associated with the construction phase of the project.

The construction phase of the project for the middle scenario is projected to result in over $5.7 million in total income in Kittitas County (Sagebrush Power Partners LLC 2003a, Section 8.1.3.2). The amount of direct, indirect, and induced construction income generated under the lower and upper end scenarios is estimated to be +/- 10 to 15% of the quantified middle scenario.

Table 3.7-10: Summary of Direct, Indirect, and Induced Employment and Income Impacts during Project Construction (2002$) for the Middle Scenario

Impact Type	Jobs	Total Income
Direct	40	$4,577,100
Indirect	14	$518,100
Induced	28	$701,800
TOTAL	82	$5,797,000

Source: ECONorthwest 2002, as amended by Sagebrush Power Partners LLC 2003c.

Direct Operations and Maintenance Impacts

Population

Table 3.7-11 shows the estimated staffing for operations and maintenance of the completed wind power project under the three project scenarios. Operation of the Kittitas Valley Wind Power Project is projected to require between 12 to 14 full-time employees under the lower end and middle scenarios and between 18 to 20 full-time employees under the upper end scenario. Based on past experience for similar projects, it is estimated that approximately one-half of the total workforce employed to operate and manage the wind power project would be represented by local workers from Kittitas County (Sagebrush Power Partners LLC 2003a, Section 8.1.3.3; Taylor, pers. comm., 2003). The remaining workers would represent a net increase in local population. Using a typical household size factor of 2.3 persons per household (the Kittitas County average in 2000), the estimated total additional population related to project operations and maintenance would range from 16 (under the lower end and middle scenarios) to 23 individuals (under the upper end scenario).

Table 3.7-11: Operations and Maintenance Labor Force (Number of Personnel)

Position	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Plant/Site Manager	1	1	1
Operations Manager	1	1	1
Operating Technicians	8-10	8-10	14-16
Administrative Manager	1	1	1
Administrative Assistant	1	1	1
Total	12-14	12-14	18-20

Source: Sagebrush Power Partners LLC 2003a, Section 2.12.4

Housing

Assuming that the local (Kittitas County) labor market would supply about half of the project's operations employment needs, the projected demand for local housing would be nominal. The largest demand for housing would be generated under the upper end scenario, which is expected to result in a maximum net in-migration of 10 families. Given the number of vacant housing units in Kittitas County reported in the 2000 census (3,093 units) and a vacancy rate of 6.8% for rental units, there appears to be sufficient housing supply available to accommodate the slight increase in direct housing demand generated by project operations.

Employment

The addition of between 12 to 20 full-time positions to operate the Kittitas Valley Wind Power Project would be less than 0.2% of total county employment. Nonetheless, the permanent jobs created through the project would translate into a small increase in local employment opportunities and would result in long-term benefits to overall county employment. No significant direct impacts on county employment are anticipated.

Property Values

Whenever land uses change, the concern is often raised about the potential effect on nearby property values. Zoning is the primary means that most local governments use to protect property values. By allowing some uses and disallowing others, or permitting them only as conditional uses, conflicting uses are avoided. Some residents in the project area consider the proposed wind turbines to be an incompatible use adjacent to rural residential areas. At the EFSEC land use hearing on May 1, 2003 in Ellensburg, Washington, the Applicant acknowledged the proposed project is not consistent with existing Kittitas County zoning for the project site (see Section 3.6, Land Use and Recreation, for further detailed discussion).

Several comments were raised during the EIS scoping period concerning the proposed project's effects on nearby property values. Some commentors requested that the EIS consider the effect of aesthetics and impacts to viewsheds on property values and that the property value study include interviews with tax assessors, real estate brokers, and bankers. Other commentors requested that the EIS include information on the probability and amount of change expected to local property values affected by the project and that the property value discussion be based on a hedonic analysis of properties surrounding the proposed project. (Note: a hedonic analysis requires that site-specific data on a number of quantitative and qualitative variables be used to predict housing values.)

A new analysis of impacts to property values of wind energy projects was beyond the scope of this EIS. However, a literature search was conducted to identify existing studies that addressed the relationship between wind development and property values. Based on this literature search, five studies relating wind development and property value effects were identified. The results of those five studies are summarized below.

Renewable Energy Policy Project

In May 2003, a study conducted by the Renewable Energy Policy Project (REPP) of Washington D.C. with funding from the U.S. Department of Energy, entitled *The Effect of Wind Development on Local Property Values,* was published (REPP 2003). Prior to publication of the REPP study, no systematic study on the effect of wind development on property values had been conducted in either the United States or Europe. The REPP study reviewed data on property sales in the vicinity of wind projects and uses statistical analysis to determine whether and the extent to which the presence of a wind power project has had an influence on the selling prices of surrounding properties. The hypothesis underlying the report is that if wind development can reasonably be claimed to impair property values, then sales data should show a negative effect on property values within the viewshed of the projects.

The first step in the report's analysis required assembling a database covering every wind development that became operational after 1998 with 10 MW installed capacity or greater. For the purposes of the analysis, the wind developments were considered to have a visual impact for the area within 5 miles of the turbines. The 5-mile threshold was selected because review of the literature and field experience suggests that although wind turbines may be visible beyond 5 miles, beyond this distance they do not tend to be highly noticeable, and they have relatively little influence on the landscape's overall character and quality.

Records for all property sales for the viewshed surrounding the wind projects were gathered for a period of approximately 6 years (1996-2001). Similar data were gathered for a "comparable community," defined as a reasonably close community with similar demographic, economic, and geographic characteristics and trends compared to properties within the viewshed, but one that is outside of the viewshed area and does not contain large wind turbines. The study used standard simple statistical regression analyses to determine how property values changed over time in the viewshed and the comparable community.

The REPP study examined price changes for ten different wind projects throughout the country in three ways:

- Case 1 examined the price changes in the viewshed and comparable community for the entire period of the study (3 years preceding and 3 years following the on-line date of the project). For the ten projects analyzed, property values increased faster in the viewshed in eight of the ten projects. In the two projects where the viewshed values increased slower than for the comparable community, special circumstances made the results questionable. For example, Kern County, California, has had wind development since 1981. Because of the existence of old wind machines, the site does not provide a look at how the new wind turbines would affect property values. For Fayette County, Pennsylvania, the statistical explanation was very poor; for the viewshed the statistical analysis could explain only 2% of the total change in prices.
- Case 2 examined how property values changed only in the viewshed before and after the project came on line. For the ten projects analyzed, in nine of the ten cases the property values increased faster after the project came on line than they did before. The only project to have slower property value growth after the on-line date was Kewaunee County, Wisconsin. However, because Case 2 looked only at the viewshed, it is possible that external factors drove up prices faster after the on-line date and the analysis is therefore picking up a factor other than the wind development.
- Case 3 examined how property values changed in the viewshed and comparable community after the project came on line. For nine of the ten projects analyzed, property values increased faster in the viewshed than they did for the comparable community. The only

project to see faster property value increases in the comparable community was Kern County, California. The same caution applied to Case 1 is necessary in interpreting these results.

In summary, the study found that for the great majority of projects, the property values rose more quickly in the viewshed than they did in the comparable community. Moreover, values increased faster in the viewshed after the projects came on line than they did before. Finally, after projects came on line, values increased faster in the viewshed than they did in the comparable community. In all, of the 30 individual cases analyzed, the study found that in 26 of those, property values in the affected viewshed performed better than in the comparable community (REPP 2003).

<u>ECONorthwest</u>

A 2002 qualitative study titled *Economic Impacts of Wind Power in Kittitas County* (ECONorthwest 2002) involved conducting a telephone survey of property tax assessors throughout the country in counties that recently had wind turbines installed in their areas. This survey covered 22 projects in 13 counties. Of the 13 counties, six had residential properties with views of a wind farm, six had no residential properties with views of a wind farm, and one reported that the wind project was too new to assess property value impacts. The results of this survey concluded that there is no evidence that views of wind turbines decreased property values (ECONorthwest 2002). The weakness of the study is that it relies on subjective comments to arrive at its conclusion (REPP 2003).

<u>Sinclair Knight Mertz</u>

A 2001 qualitative study titled *Social Economics and Tourism* (Sinclair Knight Mertz 2001) concluded that for highly sought after properties along Salmon Beach, Australia, closer than 200 meters from wind turbines, the general consensus among local real estate agents was that "property prices next to generators have stayed the same or increased after installation." However, the study concluded that while properties with wind turbines on them may increase in value, other properties may be adversely affected if within sight or audible distance of the wind turbines.

<u>Jørgensen</u>

A 1996 quantitative Danish study, *Social Assessment of Wind Power* (Jørgensen 1996) applied statistical regression analysis to determine the effect of 102 windmill installations, including individual wind turbines, small wind turbine clusters, and larger wind parks on the value of 74 residential properties. The regression used the hedonic method, in which site-specific data on a number of quantitative and qualitative variables is used to predict housing values. The study concluded that homes close to a single wind turbine or a windmill park with 12 windmills ranged in value from Danish kroners 16,200 to 94,000 [approximately $2,900 to $16,800 in 1996 dollars] less than homes further away. The study cautions, however, that not all of its results are statistically significant, mainly because the data set (74 properties) is not sufficiently large (Jørgensen 1996).

Damborg

The qualitative study *Public Attitudes Towards Wind Power* (Damborg 2002) summarizes the results of a public opinion poll about wind power in the Danish municipality of Sydthy (Andersen et al. 1997). Sydthy has 12,000 inhabitants and more than 98 percent of the total electricity consumption is covered by wind power, making Sydthy one of the places in the world with the highest concentration of wind turbines. The Sydthy opinion poll shows that people with a high degree of knowledge about energy generation and renewables tend to be more positive about wind power than people with little knowledge.

The study indicated that distance to the nearest turbine has no effect on people's attitudes towards wind turbines in general. This indicates that people living close to wind turbines do not consider noise and visual impact to be significant problems; in particular, people living closer than 500 meters to the nearest wind turbine tend to be more positive about wind turbines than residents further away (Damborg 2002).

Conclusions

The REPP study is the most recent and most comprehensive statistical study evaluating the correlation between wind development projects and nearby property values in the United States. The findings of most of the prior studies reviewed for this EIS were based on qualitative data. The only quantitative study of those reviewed (*Social Assessment of Wind Power*) cautioned that its results were not statistically significant.

The REPP study cautions that it is an empirical review of changes in property values over time and does not attempt to present a model to explain all influences on property values. However, the statistical analysis provided in the REPP study provides no evidence that wind development had harmed property values within the viewshed (REPP 2003). Furthermore, non-project factors, including the presence of the existing Bonneville and PSE transmission line towers, along with other general market factors, are already reflected in the market value of properties in the KVWPP area. Therefore, based on the evidence presented in the REPP study, no long-term impacts to property values are expected as a result of the proposed project.

Indirect Operations and Maintenance Impacts

Employment and Income

The estimated number of direct, indirect, and induced jobs created in Kittitas County as a result of project operations under the middle scenario are shown in Table 3.7-12. During operations, it is estimated that 9 local workers from Kittitas County would be employed to operate and manage the wind project. The total indirect and induced employment impact during project operations is predicted to be 1 and 13 jobs, respectively, for a total of 24 additional jobs in Kittitas County (Sagebrush Power Partners LLC 2003a, Section 8.1.3.3).

Table 3.7-12: Annual Employment and Income Impacts in Kittitas County during Operations (2002$) for the Middle Scenario

Impact Type	Jobs[1]	Total Income
Direct	9[2]	$1,489,400
Indirect	1	$59,400
Induced	13	$436,700
TOTAL	24	$1,985,500

Source: ECONorthwest 2002, as amended by Sagebrush Power Partners LLC 2003c.

1 Total may not add because of rounding.

2 Note that the estimated number of direct operations jobs assumed in the county input-output model is consistent with the Applicant's estimate under the upper end scenario (see Table 3.7-11). However, the difference between the Applicant's estimates regarding the number of direct operation jobs under the middle and upper end scenarios is minor (two to four jobs), and this number is only a rough estimate. Therefore, for purposes of this analysis, the input-output model results are considered an adequate representation of the middle scenario.

Spending on equipment and other materials would be necessary to operate and maintain the wind turbines. The ECONorthwest study assumed that property owners who lease land for the wind turbines would receive a combined $544,000 per year in income (approximately $4,500 per turbine). Table 3.7-12 also shows the projected annual direct, indirect, and induced income created by the project during operations under the middle scenario. The project is projected to result in nearly $2 million per year in added income (Sagebrush Power Partners LLC 2003a, Section 8.1.3.3). The amount of direct, indirect, and induced income created during project operations under the lower and upper end scenarios is estimated to be +/- 10 to 15% of the quantified middle scenario. Induced Effects of Tourism

During the EIS scoping process, members of the public requested that the economic impacts associated with tourism generated by project operations be addressed as part of the EIS analysis. New tourists who visit and spend money in the project area could generate induced economic effects in the local economy.

According to the Applicant, experience suggests that wind power projects increase tourism. One wind power project in England had over 350,000 visitors in its first eight years. In Washington State, the Stateline Wind Power Project near Walla Walla had more than 1,600 visitors who took guided tours in its first three months of operation (Sagebrush Power Partners LLC 2003d). Based on this experience, it is likely that tourists would be attracted to the KVWPP area. However, the projected volume of visitors to this project area , either on a daily or annual basis, is unknown. Similarly, it is unknown to what extent visitors attracted to the project area would represent new tourists that otherwise would not have visited.

The Kittitas County economy is characterized by seasonal employment. In 2000, seasonal industries accounted for 20% of all private covered employment in Kittitas County, considerably higher than the state's 14.1%. This higher concentration of workers in seasonal industries compared to the state is primarily due to its large agricultural sector (Washington State Employment Security Department 2002a). In an economy such as Kittitas County's it would be expected that induced employment would tend to be absorbed. That is, rather than mobilizing and demobilizing to service particular projects or seasonal events, the local economy and infrastructure can absorb and respond to temporary economic events. For example, swings in revenue are experienced by local businesses but do not necessarily result in constant hiring and firing (Golder Associates 2002). Based on this assumption, impacts from induced employment during proposed project operations, including employment induced through a potential increase in local tourism, are not considered to be significant, although local businesses are likely to experience increases in income. However, in the absence of specific data, the potential induced economic effects of tourism are uncertain (see Section 1.7, Issues to be Resolved).

Local Government Taxation and Revenues

The proposed KVWPP would increase the amount of annual property tax revenue to Kittitas County. The tax revenue analysis prepared by ECONorthwest was based on review of Kittitas County budgets and spending and assumes a value of $750,000 per turbine and a property tax rate of 1.35 for Kittitas County. The results of the ECONorthwest study have been updated to reflect the proposed wind turbine configuration under the middle scenario.

Under this scenario, the project would generate an increase of $1,249,600 in annual property tax revenue to Kittitas County. In addition, project development would have a beneficial indirect effect on the value of other local properties because of the increase in wages and overall economic activity in Kittitas County. This secondary, indirect effect would result in an additional $93,500 in property taxes annually in the county. Thus it is estimated that Kittitas County would receive an estimated total of $1,343,100 in added property tax revenue each year under the middle scenario (Sagebrush Power Partners LLC 2003a, Section 8.1.3.5, as amended by Sagebrush Power Partners LLC 2003c). The effects of the lower and upper end scenarios on local tax revenues have been estimated at +/- 10 to 15% of the quantified middle scenario.

Assuming that revenue would be distributed consistent with the spending patterns in Kittitas County's 2002 budget, the added revenue would be distributed as shown in Table 3.7-13. As shown, the largest beneficiaries of the added revenue would be local and state schools, followed by county government, county roads, local communities, and hospitals and other local services.

Table 3.7-13: Allocation of Added Annual Property Tax Revenue in Kittitas County for the Middle Scenario

Spending Category	Amount
Local schools	$407,000
State schools	$376,200
Fire districts	$80,300
Local communities	$112,200
County roads	$135,300
County government	$168,300
Hospitals/other local services	$63,800
Total	$1,343,100

Source: ECONorthwest 2002, as amended by Sagebrush Power Partners LLC 2003c.

Kittitas County would receive other fiscal benefits from the project such as increased sales and use taxes, license and permit fees, and charges for services. The additional tax revenues to

Kittitas County for the middle scenario are shown in Table 3.7-14. In addition to $304,700 in property taxes for county government and roads, Kittitas County would receive $18,700 from other sources. The effects of the lower and upper end scenarios on local tax revenues have been estimated at +/- 10 to 15% of the quantified middle scenario. These indirect effects would have a positive impact on the local economy.

Table 3.7-14: Additional Kittitas County Government Tax Revenues for the Middle Scenario

Spending Category	Amount
Property taxes - county government and roads	$304,700
Sales and use taxes	$3,300
All other taxes	$1,100
Licenses and permits	$1,100
Charges for services	$4,400
Fines and forfeits	$1,100
State collected taxes distributed to the county	$7,700
Total	$323,400

Source: ECONorthwest 2002, as amended by Sagebrush Power Partners LLC 2003c.

During the EIS scoping process, many comments were received on the issue of tax revenues generated by the proposed project. For example, one commentor requested that the EIS describe how a “compatible” commercial use would be taxed on land currently designated as open range. The same commentor also asked if project area lands would be reclassified to reflect the new commercial use, and requested a discussion of how the tax base would increase and if increased tax revenues would stay in the area. Another commentor asked if property taxes would go down if the project is built under Initiative 747 (I-747). Classification of the project area for taxing purposes is a decision made by the Kittitas County Assessor. Potential tax revenues generated by the proposed project, and the effects of I-747, are discussed below.

The ECONorthwest study acknowledged that a possible effect of the added tax base would be to reduce other taxes, thereby reducing the projected increase in tax revenue discussed above. Washington State Initiative I-747 limited property tax levy increases to 1% per year. Assuming that $500,000 of the value of a wind turbine would be assessed as personal property, installing 121 wind turbines under the middle scenario would increase the total property value of Kittitas County by $60.5 million, which is a 2.6% increase (Sagebrush Power Partners LLC 2003a, Section 8.1.3.5). Because this is greater than the one-percent increase limit imposed by I-747, it is possible that other taxes would need to decline to remain under the 1% limitation. However, the ECONorthwest study concluded that regardless of whether the new turbines would result in an increase in property tax revenue or enable a reduction in other taxes, the project would bring substantial property tax benefits to Kittitas County (Sagebrush Power Partners LLC 2003a, Section 8.1.3.5).

Decommissioning Impacts

Upon decommissioning, the project site would be restored according to plans developed by the Applicant and reviewed and approved by EFSEC, in compliance with WAC 463-42, 655-665. If subsequent economic uses of the project site were not developed, facility closure would represent a long-term loss of employment and associated economic activity for the local and regional economy and a loss of tax base. For example, up to 20 full-time jobs created as part of the project (under the upper end scenario) would be eliminated. It is assumed that individuals employed in these jobs would seek employment from other sources and that this loss of employment would have adverse impacts on the individuals involved. However, the number of jobs eliminated would be small compared to the number of jobs in Kittitas County as a whole (11,822 in 2000). Therefore, a very minor adverse impact to county employment would be anticipated as a result of project decommissioning.

If the project were decommissioned and facilities were removed from the study area, property tax revenues would decrease accordingly. This loss of revenue would likely have a slight adverse impact on the local economy. Decommissioning the facility would require removing most project facilities and reclaiming disturbed areas. These activities would result in beneficial but temporary construction employment similar to that projected for facility construction.

3.7.3 Impacts of No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated and the region’s socioeconomic conditions would remain unchanged from current patterns and trends. Local providers of transient housing and other goods and services would not experience temporary increases in demand for their facilities, and Kittitas County would not benefit from the tax revenues and employment opportunities resulting from the proposed project.

If the project were not constructed, the region’s power needs could be delivered through development of other generation facilities such as a gas-fired combustion turbine. Although the impacts of a combustion turbine would depend on its location, the specific socioeconomic impacts would likely be of a similar magnitude to the proposed project. For example, operation of a combustion turbine generating about 60 MW would employ about 10 people, slightly less than the project’s anticipated level of full-time operations and maintenance workers.

3.7.4 Mitigation Measures

To minimize the potential increase in visitors to the project site, the Applicant proposes to construct an information kiosk and public viewing area near the proposed O&M facility off Bettas Road. Signs would be provided to direct tourists to this viewing area (see Chapter 2, Proposed Action and Alternatives, Section 2.2.3, Facilities). No other mitigation measures are required or have been identified for potential socioeconomic impacts.

3.7.5 Significant Unavoidable Adverse Impacts

The proposed action would have no significant unavoidable adverse impacts to the socioeconomic health of the project region. Although the specific employment, income, and tax revenue effects under the lower and upper end scenarios during construction and operations have yet to be quantified, they would likely be beneficial to the local economy. Furthermore, while the potential induced economic effects of tourism are uncertain, impacts from employment induced through a potential increase in local tourism are not considered significant or adverse.

3.8 CULTURAL RESOURCES

This section describes and summarizes archaeological and cultural resources within the KVWPP study area, identifies potential impacts on these resources, and suggests mitigation measures designed to limit those impacts. The analysis in this section is primarily based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Section 5.1.6). Where additional information has been used to evaluate the potential impacts associated with the proposal, that information has been referenced.

3.8.1 Background

Historic Preservation Criteria

Cultural properties or resources may include prehistoric or historic sites, districts, buildings, structures, or objects that are listed in, or eligible for listing in, the National Register of Historic Places (NRHP). Artifacts, records, and material remains associated with these properties and traditional cultural properties, which include archaeological, traditional procurement, history or landmark, and religious sites, are also important resources. Several federal and state laws protect cultural resources, such as Section 106 of the National Historic Preservation Act (NHPA) and RCW chapters 27.44 and 27.53.

The NRHP of Historic Places was authorized by the NHPA of 1966 and is the nation's official list of historic properties worthy of preservation. Properties listed in the NRHP include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and culture, at a local, state, or national level of significance. Within the state of Washington, the Office of Archaeology and Historic Preservation (OAHP), under the direction of the State Historic Preservation Officer, administers the NRHP program.

The following criteria are used in evaluating cultural properties that are more than 50 years old or that have achieved significance in the last 50 years for listing in the NRHP (36 CFR 60.4):

- Properties that are associated with events that have made a significant contribution to the broad patterns of our history; or
- Properties that are associated with the lives of people significant in our past; or
- Properties 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 values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- Properties that have yielded, or may be likely to yield, information important to prehistory or history.

Applicable Regulations

Under SEPA, OAHP is the sole agency with technical expertise on cultural resources; it provides formal opinions to local governments and other state agencies on a site's significance and the impact of proposed projects upon such sites.

The American Indian Religious Freedom Act of 1978, as amended in 1996, requires agencies to consult with Indian tribes to determine if an undertaking may affect the practice of traditional religions and the places and physical paraphernalia needed for those practices.

The Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 requires that federal agencies repatriate Indian ancestral human remains to tribes with cultural or genetic affiliation with such remains and funerary items.

Executive Orders (EOs) 13084 and 13175 establish government-to-government relationships between Indian tribes and the federal government and its agencies. EO 13175, signed in 2000 and revoking the earlier EO 13084, requires that agencies have an accountable process for tribal officials to provide comment and input on regulatory policies that have tribal implications.

The RCW has two chapters that protect cultural resources in the state. RCW chapter 27.44 requires that Indian burial sites, cairns, glyptic markings, and historic graves located on public and private land be protected because they are finite, irreplaceable, and nonrenewable cultural resources. The law encourages voluntary reporting and respectful handling in cases of accidental disturbance. Any person who knowingly removes, mutilates, defaces, injures, or destroys these resources is guilty of a class C felony. Human remains from native Indian graves inadvertently disturbed by construction, mining, logging, agricultural activity, or any other activity shall be reinterred under the supervision of the appropriate Indian tribe. RCW chapter 27.53 states that it is unlawful for any historic or prehistoric archaeological object, resource, or site to be knowingly removed, altered, or excavated, from private and public lands. Disturbance of these resources, without a written permit from OAHP, is a class C felony.

3.8.2 Affected Environment

Area of Potential Effect

The assessment of historic, archaeological, and traditional-use resources was conducted within the Area of Potential Effect (APE) or the geographic area within which the proposed project may affect cultural resources. The APE for cultural resources includes the approximately 231- to 371-acre temporary construction footprint of the project including access roads; turbines, meteorological towers, and electrical pole foundation pads; operation and maintenance, and substation building locations; and construction staging areas. The indirect visual impacts on potentially affected resources in the immediate project vicinity have yet to be determined because information from OAHP regarding the boundaries of the APE is still outstanding. In addition, the OAHP needs to clarify the NRHP eligibility status of the North Branch Canal tunnel to determine indirect visual impacts on this resource (see below for further discussion).

Archaeology, Ethnohistory, and History

Prehistory

The project area is located in the Columbia Plateau physiographic region or the Southern Plateau culture region (Ames et al. 1998; Franklin and Dyrness 1988). The prehistoric record for this region is divided into three broad chronological periods, summarized below:

- Period I (approximately 11,500-6,350 years Before Present [BP]). Period I is subdivided into two sections. Period IA, also known as the Clovis Paleo-Indian, dates between 11,500 and 11,000 years BP, while post-Clovis sites date to Period IB (11,000-6,350 BP). Archaeologists have recorded the majority of post-Clovis sites in the central and eastern portions of the region, with the largest occupations located along the Columbia and Snake rivers and their tributaries (Ames et al. 1998).
- Period II (6,950/6,350-3,850 BP). This period is marked by a decline in quality of stone tools, increased use of varieties of roots and salmon, and the development of semi-subterranean pit houses (Ames et al. 1998).
- Period III (3,850-250 BP). The beginning of Period III saw the widespread reappearance of pit houses; permanent winter village sites described by Euro-American settlers and ethnographers were established late in this period and persisted into the historic period (Ames et al. 1998).

Ethnohistory

During late historic times, the Kittitas Indians occupied the upper Yakima River drainage. Neighboring groups included the Wanapum to the east, the Yakama immediately to the south, and the Mishnapam, Taitnapam, and Klickitat farther south (Schuster 1998). The proposed project is situated in an area ceded by the Kittitas, which is now a part of the Yakama Nation (Ruby and Brown 1986).

Archaeologists and ethnographers have recorded at least nine villages and a network of trails in the Kittitas Valley. Two villages were near the project area. The largest, *Klakla*, had a population of 500 people and was located about 1 mile north of Thorp, opposite the mouth of Taneum Creek, which is about 5 miles south of the project site. *Ti'plas* had a population of 50 and was located at the mouth of Swauk Creek, approximately 2 miles southwest of the project site (Ray 1936).

A trail leading from a section of Swauk Creek north of this village led southeast to Reecer Canyon and Naneum Creek. Another followed the southern bank of the Yakima River west to the upper reaches of the Cle Elum River, with a branch of it extending north into the mountains to reach Wenatchee (Ray 1936). Portions of I-90 follow trail routes used by the Kittitas and other Southern Plateau groups to reach the west side of the Cascades (Glauert and Kunz 1976; Prater 1981).

The arrival of Euro-Americans in the Columbia Plateau was presaged by outbreaks of epidemics that decimated native populations. Euro-American fur traders were followed by incursions of missionaries and settlers who dislocated native groups (Boyd 1998; Schuster 1982). The first Euro-American settlers arrived in the Plateau around 1853 and by 1855, Isaac Stevens, the first governor of Washington Territory, had compelled the Kittitas, Yakama, and other groups to cede 11 million acres of their territory and agree to relocate to a reservation (Sagebrush Power Partners LLC 2003a, Section 5.1.6.5).

<u>History</u>

Although the horse and trade items arrived in the Kittitas Valley by 1740, the first documented contact between Euro-Americans and indigenous people occurred during the Lewis and Clark expedition in the fall of 1805. Exploration was followed by incursions of Euro-American fur traders under the North West and Hudson's Bay companies.

Euro-American settlers of the Kittitas Valley established cattle ranches in the area, particularly around Thorp, in the 1860s, taking advantage of the abundant grass for feed. Cattle drives reached into Canada and the Puget Sound area via the Snoqualmie Wagon Road and other trails by 1867 (General Land Office 1874, 1892; Prater 1981). Completion of the Northern Pacific Railroad in 1887 caused the wagon road to be used less frequently for moving cattle and farm goods. The road continued to be used and much of its original route is now part of I-90. Other routes, such as the Ellensburg to Cle Elum Road became US 97 (Prater 1981).

Upland logging and valley agriculture spurred the development of sawmills and irrigation features in the Kittitas Valley by the late 1800s and continues to be of importance today (Henderson 1990). The U.S. Reclamation Service began surveys for major irrigation dams and canals in 1905. The Kittitas Reclamation District's main canal system was constructed between 1926 and 1932 and was inventoried by the OAHP in 1985. A tunnel for the North Branch Canal, which is a branch of this system, is located just south of the project's proposed turbine string B. This canal irrigates approximately 2,830 acres southeast of Ellensburg (Soderburg 1985). The NRHP eligibility of this tunnel is not known at this time.

Agency and Tribal Consultation

The Yakama Nation was identified as the primary tribe with ceded lands in which the Kittitas Valley Wind Power Project is located. The Applicant contacted the Yakama Nation during the application development phase. The purpose of communication was to scope and address tribal concerns relative to cultural resources that could be affected by the proposed project.

In the spring and fall of 2002, the Applicant and its representatives initiated interactions with the Yakama Nation through written correspondence. The purpose of these initial tribal communications was to:

- Provide a general description of the proposed Kittitas Valley Wind Power Project;
- Invite the Tribe to participate in cultural resource investigation work at the project site, including development of an oral history of the area and participation in field surveys and construction monitoring; and

- Set up meetings between the Applicant and Tribe to more specifically discuss project features, and to solicit and identify tribal concerns associated with sensitive areas and potential impacts on cultural resources. To date, no meetings have taken place.

EFSEC has also been actively coordinating with the Yakama Nation on this project. For example, the Yakama Nation is on EFSEC's project mailing list, and the Tribe has been notified of all public meetings concerning this project, including the March 12 agency scoping meeting and public hearing, and May 1 land use consistency hearing. EFSEC has also informally consulted with the Tribe in telephone conversations undertaken in the spring of 2003. During these conversations, a representative of the Yakama Nation indicated concerns regarding the cumulative effect of multiple wind power projects on tribal lands (see Section 3.14, Cumulative Impacts, for further discussion).

Previous Cultural Investigations in the Project Area

Archaeologists have conducted relatively few investigations in the upper Yakima River basin. Eastern Washington University (EWU) surveyed a Puget Sound Energy transmission line corridor between Hyak and Vantage in 1990, locating several archaeological sites on the opposite side of the Yakima River from the KVWPP (DePuydt 1990). EWU also surveyed a portion of US 97 located about 2 miles northwest of turbine string G, where a prehistoric stone flake site was recorded on a river terrace (Holstine and Gough 1994). Central Washington University surveyed 17 sections in the Reecer Canyon U.S. Geological Survey quadrangle, east of US 97, where one site composed of stone flakes was recorded (Bicchieri 1994).

Historical Research Associates (HRA) surveyed a proposed 235-mile-long pipeline corridor from western Washington to the Tri-Cities area. This survey recorded one prehistoric and 61 historic period isolates (fewer than 10 artifacts) and three historic period sites from just east of Snoqualmie Pass to Swauk Creek. None of these finds is located in the proposed project area (HRA 1996). HRA also surveyed a proposed Bonneville Seattle-to-Spokane fiber-optic cable line, recording historic can fragments that are located outside of the proposed project area (Thompson 1998).

Lithic Analysts conducted the archaeological survey for the proposed KVWPP. The work consisted of a background records search and pedestrian survey of the proposed turbine string locations, proposed and existing access roads, proposed underground and overhead electrical lines, proposed O&M facility, and proposed substation locations where ground disturbance could occur. As a result of the survey, Lithic Analysts recorded two prehistoric stone tool and flake sites. Site 1 appears to be a scatter of formed tools and several types of lithic material (chalcedony, chert, jasper, and opal) exhibiting initial stages of flaking. Site 2 consists of several nodules of different material and hundreds of small flakes, possibly representing a single flintknapping event. No remnants of the trails noted on the 1874 and 1892 General Land Office maps were observed during the survey (Flenniken and Trautman 2002).

3.8.3 Impacts of Proposed Action

This section describes the potential direct and indirect impacts on known cultural resources from development of the KVWPP. Direct impacts would result from construction, operation, or decommissioning-related activities that would physically disturb a cultural resource. Indirect impacts would be caused by development located near a cultural resource that does not directly disturb the site, but changes the setting of the area or offers increased opportunities for human disturbance. These types of direct and indirect impacts could be associated with construction, operations and maintenance, or decommissioning of any of the proposed project elements, including the wind turbines and meteorological towers, 19 miles of new gravel access roads, additional power lines, O&M facility, and substations. Indirect impacts on offsite cultural resources are not anticipated because the project is not expected to substantially induce regional growth to the extent that it would result in significant changes to offsite cultural resources. Table 3.8-1 summarizes potential cultural resource impacts under the three project scenarios.

Table 3.8-1: Summary of Potential Cultural Resources Impacts

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Construction Impacts			
Potential for direct disturbance to archaeological sites	Slightly less than middle scenario because of smaller construction footprint	Two recorded prehistoric archaeological sites identified at project site	Slightly more than middle scenario because of larger construction footprint
Potential for direct effects on Native American Resources	Unknown; tribal consultation ongoing	Unknown; tribal consultation ongoing	Unknown; tribal consultation ongoing
Operations and Maintenance Impacts			
Potential for direct impacts on cultural resources	None anticipated	None anticipated	None anticipated
Potential for indirect visual impacts on North Branch Canal tunnel and other NRHP-eligible resources	Unknown; waiting to consult with OAHP	Unknown; waiting to consult with OAHP	Unknown; waiting to consult with OAHP
Decommissioning Impacts			
	Similar to those described for construction, above	Similar to those described for construction, above	Similar to those described for construction, above

Source: Sagebrush Power Partners LLC 2003a, f.

Construction Impacts

Ground-disturbing activity during construction could potentially affect the two prehistoric archaeological sites recorded at the project site. These two sites are located near proposed turbine string G and the Bonneville substation. Potential direct impacts would occur under the upper end scenario because it would involve the greatest extent of excavation activity along and in the vicinity of turbine string G. Construction requirements at the proposed Bonneville substation would be the same under all three scenarios. These archaeological sites should be avoided during construction to prevent any damage to either of them. Implementation of the Applicant's proposed mitigation measure (see Section 3.8.5) would ensure that potential impact to known and unknown resources in the project area during construction activities would be minimized.

Representatives of the Yakama Nation did not comment on the archaeological survey process or observe the pre-construction fieldwork, and tribal consultation is ongoing. If no significant tribal resources, such as natural resource gathering, or history, cultural, and religious areas are discovered or if they would not be affected by the project, construction of the proposed facilities would not affect cultural resources and no mitigation would be necessary. However, if significant resources were found that would be affected by the project, appropriate mitigation measures should be devised before construction begins (see Section 3.8.5, Mitigation Measures).

Direct Operations and Maintenance Impacts

No direct impacts to any known cultural resources would occur during normal operation and maintenance of the project. Assuming that resources were identified but significant adverse effects were successfully avoided during construction, it is unlikely that operation and maintenance activities would result in direct harm to avoided cultural resources.

Indirect Operations and Maintenance Impacts

Project operations under the three project scenarios could lead to indirect impacts on potentially significant cultural resources in the project area. In particular, indirect impacts could involve the loss of integrity in the historic setting of the North Branch Canal tunnel caused by changes in the visual environment. The severity of this potential indirect impact is unknown because the comparative visual effect of 150 smaller turbines versus 82 larger turbines is inherently subjective and would depend upon the individual viewer. Furthermore, the NRHP-eligibility status of the North Branch Canal tunnel is presently unknown, although additional information on the status of this resource and the potential APE for visual impacts has been requested from the OAHP. In the absence of this information, the potential for indirect impacts on cultural resources in the KVWPP area is identified as an unresolved issue.

In addition, tribal consultation is ongoing. If significant resources, such as areas important in Yakama history or cultural and religious practices, were found that would be indirectly affected by the project, appropriate mitigation measures should be devised before construction begins (see Section 3.8.5, Mitigation Measures).

Decommissioning Impacts

Impacts from decommissioning of the project are similar to those described above for construction activities. The two prehistoric sites recorded near proposed turbine string G and the proposed Bonneville substation should be avoided during facility removal to prevent any damage to the sites.

3.8.4 Impacts of No Action Alternative

Because no construction is proposed under this alternative, no impacts on cultural resources would occur, as long as land use in the project area remains the same. Other energy generation facilities would likely be constructed in the region and could cause impacts on cultural resources, but specific impacts would depend on the location and design of the facility.

3.8.5 Mitigation Measures

Mitigation Measures Proposed by the Applicant

A qualified archaeologist would monitor the ground-disturbing activities; the Yakama Nation would be contacted prior to these activities and invited to have representatives present during all ground disturbances. If intact archaeological resources or human burials are encountered during construction, the construction foreman would immediately direct activities that could further disturb the deposits away from their vicinity. The construction foreman or Sagebrush Power Partners LLC would then contact Dr. Robert G. Whitlam, Washington State Archaeologist, the Yakama Nation, and other pertinent parties who would determine how the materials should be treated. The area would be secured and placed off limits for anyone but authorized personnel.

Additional Recommended Mitigation Measures

Because tribal consultation is ongoing and cultural resources significant to the Yakama Nation may yet be identified, mitigation measures appropriate for these resources should be developed by the Applicant and approved by EFSEC and the Yakama Nation before construction begins. It is recommended that the Yakama Nation be involved in establishing procedures to be followed in the event of any unanticipated finds during the construction and decommissioning phases of the proposed project.

3.8.6 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts on cultural resources have been identified at this time. Any unforeseen direct disturbance of cultural resource sites would be mitigated through the process described in Section 3.8.5. However, if OAHP determines that: (1) the boundaries of the APE for visual impacts extend beyond the ground disturbance areas and (2) the North Branch Canal tunnel is an NRHP-eligible historic resource, there is the potential for the project to result in significant unavoidable indirect adverse impacts from changes in the visual setting of this and other resources. The ability to avoid or mitigate this visual change would depend on the severity and nature of this potent indirect impact. Should consultation with the Yakama Nation identify significant tribal resources, such as natural resource gathering, or history, cultural, and religious areas, there is the potential for the project to result in significant unavoidable direct or indirect adverse impacts from construction or operation. Since the potential for both direct and indirect impacts on cultural impacts is an issue to be resolved, the likelihood of significant unavoidable adverse impacts is similarly unresolved.

3.9 VISUAL RESOURCES

This section describes the existing visual environment (aesthetics plus light and glare) in and around the KVWPP area. It assesses the potential for aesthetics and light and glare impacts using accepted methods of evaluating visual landscape quality and predicts the type and degree of changes the KVWPP would likely have. This section also identifies mitigation measures designed to minimize those impacts.

The analysis in this section is primarily based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Section 5.1.4 and Exhibit 22) and verified through site visits by the EIS consultants conducted in March and May 2003. Where additional information has been used to evaluate the potential impacts associated with the proposal, that information has been referenced. The visual impact assessment used the Scenery Management System defined in *Landscape Aesthetics, A Handbook for Scenery Management* (U.S. Forest Service 1995) and *Visual Impact Assessment for Highway Projects* (Federal Highway Administration 1988).

3.9.1 Study Methodology

Visual Sensitivity Assessment

Each of us views the outdoor environment differently based on who we are as individuals. Although visual impacts are challenging to gauge quantitatively, there are some common qualitative characteristics of beautiful (and not-so-beautiful) scenery on which most people can agree.

Assessing visual sensitivity involves predicting a general impact on the quality of views from a given viewpoint. A combination of three factors determines how sensitive a landscape scene is:

- The number and type of viewers;
- The viewing conditions; and
- The quality of the view.

For example, a dense residential area with unobstructed views of a regionally important and memorable scene would be very sensitive to objects or structures that would impede views. Conversely, a view from a seldom-traveled rural road where motorists have only distant, oblique views of wind turbines in an unremarkable setting would likely qualify as an area of low sensitivity.

The principal types of viewers in the KVWPP area who have predictably high levels of sensitivity to visual impacts include:

- Resident viewers;
- Roadway viewers (drivers and passengers); and
- Recreating viewers such as hikers, rock hounds, and mountain bikers.

Other types of viewers, such as outdoor workers, typically have a low sensitivity to changes in the visual landscape.

This analysis of visual sensitivity defines three levels as follows:

- High levels of sensitivity were assigned in those cases where turbines would be potentially visible within 0.5 mile or less from residential properties, heavily traveled roadways, or heavily used recreational facilities.
- Moderate levels of sensitivity were assigned to areas where turbines would be visible from 0.5 mile to 5 miles within the primary “view cone” of residences and roadways. "View cone" or "cone of vision" refers to the central area that the eye can see clearly without moving and is surrounded by the peripheral vision. In distinguishing between moderate and low levels of sensitivity in the 0.5-mile to 5-mile zone, contextual factors were also considered, including the viewing conditions in the immediate foreground of the view.
- Low levels of sensitivity were assigned to areas 5 miles or more from the closest turbine, where a wind power project would be a distant and a relatively minor element in the overall landscape.

Related Policies and Studies

Under the Kittitas County Comprehensive Plan (Kittitas County 2002a), the project area is designated as Rural, while under the County's Zoning Code (Kittitas County 1991, as amended by Kittitas County 2002b), the project area is zoned Agriculture-20 and Forest and Range. No specific scenic or visual resource policies are contained in the Comprehensive Plan that would affect the proposed project.

Kittitas County prepared a scenic route corridor plan that includes SR 10. SR 10 is south of the project site along the Yakima River. A planning report for this corridor, titled the *Swift Water Corridor Vision Plan* (Kittitas County 1997), documents its scenic and cultural character and recommends road improvements and development of roadway amenities and interpretive installations. The report does not contain specific recommendations for visual impacts.

The Federal Highway Administration designated the 100-mile segment of I-90 beginning at the Seattle waterfront and extending east to Thorp as a National Scenic Byway in 1998. This highway segment is also a part of the Mountains-to-Sound Greenway. The Greenway, which consists of the corridor along I-90 from downtown Seattle to Thorp, is conceived of as a scenic, historic, and recreation corridor intended to function as a scenic gateway to the Seattle metropolitan area and a pathway to nature for the metropolitan area’s population.

In addition, US 97 in this area is a state-designated Scenic and Recreational Highway. Typically, this designation means that a scenic corridor management plan would be prepared to provide policy-level guidance in the local adoption of comprehensive plan policies, zoning, and other land use regulation. There is no scenic corridor management plan for US 97 and, therefore, no regulatory control of aesthetic impacts within the US 97 corridor. However, the scenic highway designation implicitly carries an additional level of care and scrutiny in the review of potential aesthetic impacts.

3.9.2 Affected Environment

Visual resources are the natural and built features open to view in the landscape. The combination of land, water, and vegetation patterns represent the natural landscape features that define an area's visual character while built features such as buildings, roads, and other structures reflect human or cultural modifications to the landscape. These natural and built landscape features or visual resources contribute to the public's experience and appreciation of the environment.

Regional and Local Landscape Setting

<u>Geography</u>

The KVWPP would be sited on ridges located along the northern edge of the Kittitas Valley, approximately 10 miles to the north and west of the City of Ellensburg. These ridges slope southward toward the valley from Table Mountain, a 6,359-foot-high peak that is part of the Wenatchee Mountain Range to the north. The ridges in the project area range in elevation from 2,160 to 3,445 feet and lie in the area defined by Swauk Creek on the west and Green Canyon on the east. The tops of the ridges have a gentle southward slope incised by steep canyons.

The project area has an open, windswept appearance. Most of the ridgetops on which the project facilities would be located are dry, rocky grasslands used for grazing. Trees and shrubs are found mostly along streams in the canyons. One exception is the forest of predominantly ponderosa pine in the higher elevation areas at the project's northern boundary.

<u>Built Environment</u>

US 97, a north-south route of regional importance, generally bisects the project area. The most visually prominent built features in the project area, in addition to US 97, are the arrays of electrical transmission lines in the Bonneville and PSE transmission corridors that cross the project area in an east-west direction. Although many portions of the project area are uninhabited, there are several clusters of rural residences on large parcels, most notably along the US 97 corridor just south of the project site, on ridges east of US 97, and along Bettas Road.

Some of the rural residences in and around the project area are accessible by private roads that branch off US 97. For example, Elk Springs Road is a private dirt road that extends along the top of the ridge where turbine string I is proposed. It is gated at US 97 and is accessible only to property owners with a key. Elk Springs Road is used to access residences and recreational properties located at dispersed locations along the ridge and on the forested slopes that lie north of proposed turbine strings G and H in an area referred to as "Section 35." Cricklewood Lane extends from US 97 into the canyon between the ridges where turbine strings I and J are proposed. Cricklewood Lane is not gated in the area from US 97 to the Bonneville transmission line corridor, but north of this area access is restricted by a locked gate.

Project Site Scenic Quality Assessment

To assess the scenic quality of the landscapes potentially affected by the proposed project, the analyses of views toward the project site from selected viewpoints includes an overall rating of the scenic quality prevailing in the existing views. Scenic quality ratings were developed based on observations in the field, photographs of the affected area, methods for assessment of visual quality, and research on public perceptions of the environment and scenic beauty ratings of landscape scenes. The final assessment of scenic quality was made based on professional judgment that took a broad spectrum of factors into consideration, including:

- Natural features, including topography, watercourses, rock outcrops, and natural vegetation;
- The positive and negative effects of human alterations and built structures on visual quality; and
- Visual composition, including an assessment of the vividness, intactness, and unity of patterns in the landscape, defined as follows:
  - Vividness refers to the memorability of the visual impression received by the viewer from contrasting landscape elements as they combine to form a striking and distinctive visual pattern.
  - Intactness is the integrity of visual order in the natural and human landscape, and the extent to which the landscape is free from visual encroachment.
  - Unity is the degree to which the visual resources of the landscape join together to form a coherent and harmonious visual pattern.

Each viewpoint was assigned a final rating based on the rating scale summarized in Table 3.9-1. This rating scale incorporates landscape assessment concepts developed by the U.S. Forest Service and the U.S. Department of Transportation.

Table 3.9-1: Landscape Scenic Quality Scale

Rating	Explanation
Outstanding Visual Quality	A rating reserved for landscapes with exceptionally high visual quality. These landscapes are significant nationally or regionally. They usually contain exceptional natural or cultural features that contribute to this rating. They are what we think of as “picture postcard” landscapes. People are attracted to these landscapes to view them.
High Visual Quality	Landscapes that have high quality scenic value. This may be due to cultural or natural features contained in the landscape or to the arrangement of spaces contained in the landscape that causes the landscape to be visually interesting or a particularly comfortable place for people. These landscapes have high levels of vividness, unity, and intactness.
Moderately High Visual Quality	Landscapes that have above average scenic value but are not of high scenic value. The scenic value of these landscapes may be due to human or natural features contained within the landscape, to the arrangement of spaces in the landscape, or to the two-dimensional attributes of the landscape. Levels of vividness, unity, and intactness are moderate to high.
Moderate Visual Quality	Landscapes that are common or typical landscapes with average scenic value. They usually lack significant human or natural features. Their scenic value primarily results from the arrangement of spaces contained in the landscape and the two-dimensional visual attributes of the landscape. Levels of vividness, unity, and intactness are average.

Table 3.9-1: Continued

Rating	Explanation
Moderately Low Visual Quality	Landscapes that have below average scenic value but not low scenic value. They may contain visually discordant human alterations, but these features do not dominate the landscape. They often lack spaces that people perceive as inviting and provide little interest in terms of two-dimensional visual attributes of the landscape.
Low Visual Quality	Landscapes that have below average scenic value. They may contain visually discordant human alterations, and often provide little interest in terms of two-dimensional visual attributes of the landscape. Levels of vividness, unity, and intactness are below average.

Source: Buhyoff et al. 1994; Federal Highway Administration 1988; and U.S. Forest Service 1995.

Viewpoints

To analyze the project's effects on visual resources, viewpoints were selected to characterize the aesthetics character of the project area. The existing views from these viewpoints are described below and illustrated with photographs. Most of the viewpoints are at publicly accessible locations where the most people would view the project. Individual viewpoints were chosen as being the most representative views for the different roads, population areas, and recreation areas where views of the wind turbines would occur. Figures 3.9-1 and 3.9-2 show the locations of these viewpoints from outside and within the project area, respectively.

US 97 Corridor: Viewpoints 1 through 3

Landscape Description and Scenic Quality

US 97 divides the project area and is an important route between Ellensburg and Wenatchee. On an average day, 2,800 vehicles travel the segment of US 97 between Ellensburg and SR 970.

US 97 borders the Dry Creek wash as it passes through the flat and open upper extent of the Kittitas Valley. (Figure 3.9-3 shows the existing view from Viewpoint 1 at Ellensburg Ranches Road, looking north.) Along the stretch of highway approaching the project area from the south, northbound travelers are able to see the grass- and shrub-steppe-covered lower slopes of the ridges that define the valley's northern edge, as well as the forest-covered upper ridge areas. As travelers approach within a mile or less of the project area, the landscape consists of open shrub-steppe lands with dispersed rural residences that are generally highly visible because of the openness of the surrounding landscape. The most visually prominent features in this area are the lattice steel transmission towers on the Bonneville transmission corridor that crosses US 97 and the adjoining ridges along the southern edge of the project area. Along the segment of US 97 that extends from a point several miles south of the project area to the edge of the project area at the Bonneville transmission corridor, the existing visual quality can be generally be classified as moderately low.

As US 97 enters the project area, the corridor along Dry Creek becomes a well-defined valley through the ridges. The highway passes though this valley and up a long, steep slope to a crest at approximately 1,700 feet in elevation where it passes over one of the ridges. At the crest is a privately owned gravel pit and gravel storage area on the west side of the road. In this area, views for northbound travelers to the east are constrained by steep road cuts. (Figure 3.9-4 shows the existing view from Viewpoint 2 at US 97 north of the gravel pit, looking north.) The visual quality in this area is moderate, although farther north along US 97, a more rugged, forested, and visually intact landscape comes into view. In this area, the visual quality is moderately high to high.

Although the landscape in this area consists primarily of open shrub-steppe lands, there are clusters of ponderosa pine and other trees at scattered locations along the edge of Dry Creek. This area is crossed by a single PSE powerline carried on wood H-frame towers. The existing visual quality in the area along US 97 extending from the Bonneville transmission corridor to the road's crest on the side of the ridge ranges from moderately low to moderate.

Near the intersection with the north end of Bettas Road, this ridge becomes the primary element in the cone of vision for roadway viewers. (Figure 3.9-5 shows the existing view from Viewpoint 3 at US 97 at the north end of Bettas Road, looking south.) South of the intersection with Bettas Road along the base of the ridge, views to the east and to the ridgetop become more constrained. The view to the southwest ridgetop however is more open. Along this segment of the highway, the most salient developed features in the southbound view are the road and road cuts, the Bonneville transmission lines, and the gravel facility at the top of the ridge. Along this segment of US 97, the visual quality of southbound views ranges from moderately high in Hidden Valley to moderate in the area farther to the south.

After US 97 crosses over the crest near the gravel facility, views for southbound travelers open up to reveal a panorama to the southwest and then to the south across the ridges and the Kittitas Valley toward Manastash Ridge and other hills and mountains 20 miles or more in the distance. Views toward the ridges to the east where many of the turbines would be located are constrained to some degree by the road cuts. However views toward the ridgetop to the west are more open and only partially screened by clusters of trees. Farther south along US 97, the proposed turbines would be out of the southbound traveler's cone of vision. The project's substations and O&M facility become prominently visible in the canyon area at the base of the slope. In this area, the landscape consists primarily of open shrub-steppe land, and the transmission towers in the PSE and Bonneville transmission corridors become prominent elements of the landscape. Along this segment of US 97, southbound views from the highway range from moderate to moderately high on the upper slopes to moderately low in the areas on the lower slopes where the many transmission lines are a dominant element of the view.

South of the Bonneville transmission lines at the southern end of the project area, some residences are dispersed along the highway corridor. Some of this development lies along Sagebrush Road and Ellensburg Ranches Road, private roads that serve a large-lot subdivision on the slopes to the west of the highway. In this area, there are over 30 lots, of which approximately half have been developed with residences. In general, views toward the project site from residences along both sides of the US 97 corridor have visual quality levels that range from moderately low to moderate.

Figure 3.9-1

Figure 3.9-2

Figure 3.9-3

Figure 3.9-4

Figure 3.9-5

Visual Sensitivity

For the section of US 97 extending from the intersection with the north end of Nacho Road to a point slightly north of the intersection with the north end of Bettas Road, the highway lies within 0.5 mile of the closest proposed wind turbine. In this area the sensitivity of viewers is rated high. Along the portions of the highway to the north and south of this road segment where travelers are in the zone between 0.5 and 2 miles from the closest turbine, the traveler sensitivity is considered to be moderate. For the most part, the sensitivity of the views from the rural residences in the US 97 corridor in the area south of the Bonneville transmission corridor can be considered moderate because most of these residences are 0.5 mile or more from the closest proposed turbine. The exceptions are several residences at the northern end of Sagebrush Road that lie less than 0.5 mile from proposed turbines E4 and E5. Because of their proximity to these proposed turbines, the visual sensitivity is high.

<u>Ridges East of US 97: Viewpoint 4</u>

Landscape Description and Scenic Quality

This viewing area encompasses the terrain east of US 97 and consists of long, north-south-trending ridges separated by narrow canyons. Most of this area is open in character and covered in grass and shrub-steppe vegetation, although the slopes at the northern end of the ridges are covered with ponderosa pine and other conifers. The most visually prominent developed features in this area are the transmission towers in the Bonneville transmission corridor that runs across the southern ends of the ridges, and the PSE and Bonneville transmission lines that run through the project farther to the north. The lands in this area are predominantly used for grazing. However, the area also contains a number of scattered rural residences. Cricklewood Lane provides access to some of these residences. Although Cricklewood Lane is a private road, it is not gated in the area from US 97 to the Bonneville transmission line corridor. North of this area, a locked gate restricts access.

Approximately 35 residences and recreational properties are accessible by Elk Springs Road, a private road that is gated at US 97. Several residences are in dispersed locations along the ridge, with the largest single concentration in Township 20 North, Range 17 East, Section 35. This section has been divided into 32 lots ranging from 10 to 60 acres in size. Approximately 20 of these parcels have some kind of structure or a trailer on them. (Figure 3.9-6 shows the existing view from Viewpoint 4 at one of the residences in Section 35 on Elk Springs Road, looking south toward the project area.) The visual quality of the views in this area range from moderately low at the base of the ridges, moderate along the ridgetops, and moderately high to high in locations in Section 35 from which panoramic views to the south are available (see Figure 3.9-6).

Visual Sensitivity

Because portions of Cricklewood Lane and most of Elk Springs Road are in areas with open views that lie within 0.5 mile or less of proposed turbines, the views from these roads are considered sensitive. Because these are private, dead-end roads whose primary function is to provide access to abutting properties, the number of road users affected are assumed to be relatively small. Given the restricted access to these road segments and the small number of viewers, the sensitivity to visual effects is classified as low.

For the 11 residences located along Cricklewood Lane and the lower and middle sections of Elk Springs Road that are within 0.5 mile of the proposed turbines and which would have unobstructed views of them, the sensitivity of views is high. Field studies, aerial reconnaissance, and maps and photographs indicate that in Section 35 heavy tree cover provides partial to full screening of many of the views toward the area where the turbines would be located. Given this tree screening, it appears that there are five existing residences from which the proposed turbines would be potentially visible. Three of these residences lie within 0.5 mile of the proposed turbines, and views from these residences would be considered to have a high sensitivity. Because the other two residences in Section 35 from which the turbines would be potentially visible lie more than 0.5 mile from the closest proposed turbine, the visual sensitivity of views from those properties is considered to be moderate.

Bettas Road: Viewpoint 5

Landscape Description and Scenic Quality

The Bettas Road corridor extends west from the site of the proposed O&M facility and then north to the intersection with US 97. This area is shrub-steppe landscape. After passing over the crest of the ridge, Bettas Road descends into Horse Canyon, a small valley with a rural character. At the southern end of the valley, there is a cluster of five rural residences on ranchette parcels. Farther north along the road, two dwellings are associated with larger ranch properties. (Figure 3.9-7 shows the existing view from Viewpoint 5 in the northern portion of Bettas Road, looking north.) Except for Bettas Road and an existing Bonneville transmission line, this portion of the Bettas Road corridor is undeveloped. In the middle ground of the view, US 97 travels up the slope at the base of the ridge visible to the east. Along this portion of Bettas Road, the visual quality is moderately high, reflecting vivid topographic and vegetative conditions.

Visual Sensitivity

The sensitivity of views on Bettas Road is moderate. Although from most portions of the road turbines would be visible within 0.5 mile, the number of travelers affected is very low. The 2001 average daily traffic on Bettas Road was only 26 vehicles. Some views of the closest turbines would be constrained by the steep slopes along Bettas Road. All of the residences along the Bettas Road corridor are within 0.5 mile, or about 0.5 mile from the closest proposed turbine. From most of the residences, the visual sensitivity is high, but from several that are oriented toward views down the valley to the southwest rather than to views toward the ridgelines to the east and north, the sensitivity is moderate.

Figure 3.9-6

Figure 3.9-7

SR 10 Corridor: Viewpoint 6

Landscape Description and Scenic Quality

The project area is visible from SR 10. The section of SR 10 between Ellensburg and Cle Elum is a state-designated Scenic and Recreational Highway. The *Swift Water Corridor Vision Plan* (Kittitas County 1997) identifies measures to develop roadway improvements and amenities that would enhance the road's scenic qualities. Average daily traffic on SR 10 is 1,200 vehicles per day.

With the exception of several dispersed ranch dwellings and clusters of rural residences, the landscape consists of open grasslands and areas of riparian forest. A distinctive cultural element in this area is an old flume structure at the base of the bluffs just to the east of the road. Farther to the northwest, where the highway is at a higher elevation along the side of the bluff defining the river canyon, there is no development, and the landscape is characterized by rock outcrops, clusters of trees and shrubs, and views of the canyon. (Figure 3.9-8 shows the existing view from Viewpoint 6 at SR 10 between Morrison Canyon and Swauk Creek, looking east.) Along this segment of the highway corridor, the visual quality of views toward the project site ranges from moderate to moderately high.

Visual Sensitivity

The sensitivity of views from the highway to the project is high because several short segments of SR 10 are within 0.5 mile of the closest proposed turbine, the highway carries a moderately high level of traffic, and the road is a designated scenic and recreational highway.

The ridges where turbines are proposed are visible from residences along this portion of SR 10. The visual sensitivity of views from these properties is moderate because these residences are typically not in the foreground view and most are not oriented toward the ridgetops.

Most of the recreational use of the Yakima River along SR 10 is fishing, although the number of people who fish is apparently low because of poor river access. The sensitivity of views toward the project site from the recreational use areas is low to moderate because:

- The number of recreational users is relatively low;
- Most of the Yakima River is a mile or more from the closest proposed turbine; and
- Many views toward the project site are constrained by steep bluffs and trees along the river.

John Wayne Trail: Viewpoint 7

Landscape Description and Scenic Quality

The John Wayne Trail is a hiking, biking, and equestrian trail that has been developed in the Iron Horse State Park. The park was created on the former right-of-way of the Milwaukee Road Railroad. The John Wayne Trail extends 109 miles from North Bend to the Columbia River. In the project area, the trail has a wide gravel surface and is adjacent to a powerline on wood poles.

From most areas of the trail, the ridges on which the project would be developed are visible at a distance ranging from 1 to 5 miles. (Figure 3.9-9 shows the existing view from Viewpoint 7 on the John Wayne Trail at Taneum Road, looking north.) From most areas along the trail, the visual quality of views toward the project site would be rated moderately high.

Visual Sensitivity

Washington State Parks reports that in 2001, the portion of the John Wayne Trail extending from North Bend to Thorp had 163,532 visitors, the segment from Thorp east to Vantage had 21,079 visitors, and that most visits took place during the summer season. Trail use levels for the Thorp area are likely to be lower than the trail section near Snoqualmie Pass. The visual sensitivity of the trail is lower because it has a wide gravel surface and is adjacent to powerlines. The trail's visual sensitivity, level of use, and the distance to proposed wind turbines give this viewpoint a low sensitivity to visual impacts.

Thorp: Viewpoint 8

Landscape Description and Scenic Quality

Figure 3.9-10 shows the existing view from Viewpoint 8 at Thorp Highway, looking north. The ridges on which the project is proposed are 3 miles farther to the north and form the backdrop of the view. The visual quality of the view toward the project site is moderate, reflecting moderate levels of vividness, unity, and intactness.

Visual Sensitivity

This viewpoint would qualify as low in visual sensitivity for travelers because:

- Traffic levels in this area are fairly moderate;
- The distance to the nearest wind turbines is approximately 3 miles; and
- The project area does not lie within the primary cone of vision of travelers.

Approximately 118 residences are in and near Thorp. Other structures and trees screen views of the ridgeline from many Thorp residences, although some have views of the ridgeline. However, because these ridgelines are distant, the sensitivity is moderate.

Figure 3.9-8

Figure 3.9-9

Figure 3.9-10

I-90: Viewpoint 9

Landscape Description and Scenic Quality

I-90 is about 2.5 miles south of the project site. The Federal Highway Administration designated the 100-mile segment of I-90 beginning at the Seattle waterfront and extending east to Thorp as a National Scenic Byway in 1998. Traffic on I-90 in this area averages 21,000 vehicles per day. From some areas along I-90, topography and trees in the foreground screen views toward the ridges on which the project would be developed. In many areas, however, the ridges are clearly visible in views across an open valley landscape. The views toward the project area from I-90 are at a right angle to the road and do not fall within the primary cone of vision of drivers.

Figure 3.9-11 shows the existing view from Viewpoint 9 at I-90 and Springwood Ranch, looking northeast. The view is approximately 2.5 miles from the closest proposed turbine location. In this area, the visual quality of views toward the project site is high, reflecting the high vividness attributable to the presence of the peaks of the Stuart Range in the far background of the view, and the view's relatively high levels of unity and intactness.

Visual Sensitivity

The sensitivity of views from this viewpoint is moderate. Although I-90 carries a high volume of traffic and is a designated National Scenic Byway, views toward the project area are not within the primary cone of vision of drivers, and appear in the far middle ground of the view.

Lower Green Canyon Road: Viewpoint 10

Landscape Description and Scenic Quality

Figure 3.9-12 shows the existing view from Viewpoint 10 along Lower Green Canyon Road, looking northwest. It represents views in the portion of the Kittitas Valley northwest of Ellensburg, where the project area is visible across the flat valley on the hills that frame the northwestern edge of the valley. In the upper valley, viewing distances to the project site range from 2 to more than 8 miles. From Viewpoint 10, the project site is approximately 5 miles in the distance. The upper valley is highly rural in character, and the landscape consists of large farms and ranches and some dispersed small-parcel, non-farm residences. In general, views from this area toward the project site have moderately high to high visual quality.

Visual Sensitivity

The sensitivity of this viewpoint to the effects of the proposed project is moderate. Although there are relatively large numbers of residential and roadway viewers in this area, the distance to the proposed turbines reduces the level of sensitivity.

National Forest Lands: Viewpoint 11

Landscape Description and Scenic Quality

In the project area, the Wenatchee National Forest includes the slopes of Table Mountain to the north and east of the project site. Table Mountain is a popular place for winter sports, hiking, camping, picnicking, and other recreational activities. Lion Rock, an area on Table Mountain that has notable panoramic views, would not have views of the project because of intervening trees and topography.

The National Forest lands closest to the project site are in Section 25, northeast of the large lot residential subdivision in Section 35 at the upper end of Elk Springs Road. This portion of the National Forest is about 1 mile from the closest proposed turbine. Because most of the land in Section 25 slopes into the canyon along First Creek, the project area is potentially visible only from an area of ridge along the southern edge of the forest. At this location, the visibility is reduced by dense forest to the south. The primary access from the valley into the Table Mountain area is via Reecer Creek Road, which becomes National Forest Primary Route 35 at the forest boundary in Section 33. Route 35 traverses Table Mountain in a series of switchbacks with broad views of the Kittitas Valley. (Figure 3.9-13 shows the existing view from Viewpoint 11 at Forest Service Road 35, looking southeast). In general, views from this area would have moderately high to high visual quality.

Visual Sensitivity

Visual sensitivity from this viewpoint would be moderately high because:

- From the road, views are frequent and generally open, with the project site visible in middle ground and foreground areas 3.25 to 6.5 miles to the southwest;
- The turbines would be seen against a backdrop of rural grassland and distant mountains in which there is currently little evidence of human development; and
- Even though much of the recreation in the Wenatchee National Forest occurs farther inside the National Forest boundaries, Forest Route 35 offers numerous opportunities for visitors to view the surrounding valley, whether they are in their vehicles, or stopped at one of the many pullouts on the road.

Scenic Views of Regional Importance: The Stuart Range

The Stuart Range consists of a series of high snow-covered peaks in the Alpine Lakes Wilderness, approximately 20 miles northwest of the project area. The highest of these peaks is Mount Stuart, with an elevation of 9,416 feet. The elevations of the other major peaks in the range vary from 8,000 to 9,000 feet. The Stuart Range, a highly noticeable and memorable feature, is the most regionally unique feature in the project area landscape.

The Stuart Range is most visible from portions of the Kittitas Valley such as the view from I-90 at Springwood Ranch (Viewpoint 9, Figure 3.9-11) and the view from Lower Green Canyon Road (Viewpoint 10, Figure 3.9-12). The visual prominence of the Stuart Range in these views creates a high level of vividness and overall visual quality.

Figure 3.9-11

Figure 3.9-12

Figure 3.9-13

In the areas closer to the foothills, the peaks in the Stuarts are less visible, and in many places, they are not visible at all. For example, in the community of Thorp located a little over a mile south of the base of the foothills, only the tops of the peaks in the Stuart Range can be seen (Viewpoint 8, Figure 3.9-10). In areas at the base of the foothills, like those along US 97 in the immediate project vicinity, the Stuart Range is not visible at all.

Light and Glare

The primary source of light at the proposed project site and in the immediate project vicinity is from vehicle headlights on nearby roadways. Rural residential developments in the project area also contribute to the ambient light environment and, to a small extent, glare from window glass.

3.9.3 Impacts of Proposed Action

This analysis examines potential direct aesthetics and light and glare impacts during the construction, operations and maintenance, and decommissioning phases of the proposed KVWPP. Indirect impacts are not anticipated because the project is not expected to substantially induce regional growth to the extent that would result in significant changes to the offsite visual landscape.

For the proposed project, the primary concern is the potential aesthetic and light and glare impacts of the proposed wind turbines. Other project elements such as the O&M facility and substations, 19 miles of new gravel access roads, and additional power lines are discussed only where there is a likelihood that visual impacts would occur.

Figure 2-2 in Chapter 2 illustrates the typical dimensions of the three project scenarios. Comparing these three scenarios requires consideration of the visual scale of the wind turbines in the setting and the number of wind turbines a given setting could absorb without appearing to be cluttered. Constructing fewer but larger wind turbines (i.e., the lower end scenario) would mean less potential for visual clutter yet would result in much larger scale elements in the landscape. Conversely, installing more but smaller wind turbines (i.e., the upper end scenario) has the potential to visually overload the landscape. There is little that can be done to mitigate the visual impact of a wind turbine. Being available to the wind means being in the open and highly visible.

In all three scenarios, it is the ability of the landscape in question to accommodate both the size and density of the wind turbines that would determine the resulting visual impacts. Because of the potential variability in impact levels from different viewing locations, a table illustrating the comparative level of visual impacts under the three project scenarios has not been prepared. However, in the following analysis, the potential visual impact for all three project scenarios is described and evaluated from one viewing location.

Construction Impacts

Aesthetics

Onsite activities that would be required during project construction are described in Chapter 2. During construction, large earth-moving equipment, trucks, cranes, and other heavy equipment would be highly visible from nearby areas. At some times, small, localized clouds of dust created by road building and other grading activities may be visible at the site. Because of construction-related grading activities, areas of exposed soil and fresh gravel that contrast with the colors of the surrounding undisturbed landscape would be visible. In close-up views, particularly those seen by travelers on the segment of US 97 that passes through the project site and those seen from the closest residences, the visual changes associated with the construction activities would be highly visible and would have a moderate to high visual impact. From more distant locations, the visual effects would be relatively minor and would have little or no impact on the quality of views.

Light and Glare

During turbine erection, some days would require double shifts to allow for construction in low wind conditions. Therefore, some construction activities may occur during evening (dusk) or nighttime hours, and lighting may be needed. The effects of construction lighting would be temporary, lasting only during the specific activity period (for turbine erection, estimated at six months).

Operations and Maintenance Impacts

Aesthetics

The project has the potential to create high levels of visual impact at several locations. Not every potential view receptor in the project area has been documented. Selected viewpoints are representative of a variety and range of views in the project area. For example, some commentors during the EIS scoping process requested that visual impacts be described for the area along Reecer Creek Road, east of the project area. The existing and simulated views of the project from Reecer Creek Road are illustrated in Figures 3.14-3 and 3.14-4, respectively, in Section 3.14, Cumulative Impacts. The photos used for the simulations show the worst-case seasonal conditions for visual contrast between the wind turbines and the primarily green and brown landscape backdrop. The period with the least visual contrast is anticipated to occur when there is snow cover and gray skies.

This section rates potential levels of visual impacts from key project viewpoints through the use of simulations of the built project under the middle scenario. The following figures present the same images used in Section 3.9.2, Affected Environment, to rate the existing levels of visual quality and visual sensitivity, with wind turbines "placed" (simulated) in the image at the proposed size and location.

Viewpoint 1: US 97 at Ellensburg Ranches Road Looking North

From Viewpoint 1, turbines from strings I and J would be visible on the ridgetops at distances of 0.8 to 3 or more miles. Three photosimulations from Viewpoint 1 were prepared to illustrate the three project scenarios. Figures 3.9-14, 3.9-15, and 3.9-16 show the simulated views from Viewpoint 1 on US 97 at Ellensburg Ranches Road, looking north, for the lower, middle, and upper scenarios, respectively. This analysis shows that the visual impact would be slightly higher under the upper end scenario (moderate) (Figure 3.9-16) than for the lower end scenario (low) (Figure 3.9-14). At the distance depicted in the photo, the visual clutter of more turbines has more impact than the considerable scale of the larger turbines. Also, about half the turbines would be less noticeable where there is less contrast with the hillside background. The remaining half, however, would be silhouetted against the sky, increasing their visual impact. The presence of the turbines would reduce the scene's degree of intactness by introducing a large number of highly visible engineered vertical elements.

The potential visual impact from Viewpoint 1 would range from low to moderate under the lower end and upper end scenarios, respectively.

Viewpoint 2: US 97 North of Gravel Pit Looking North

From Viewpoint 2, nine turbines in turbine string G would be visible on top of the ridge at distances ranging from 0.4 to 1 mile. (Figures 3.9-17 and 3.9-18 show the simulated view from Viewpoint 2 at US 97 north of the gravel pit, looking north, with gray and brown turbines, respectively.) Because the turbines would be seen against the sky at relatively close range, they would be highly visible in this view. These turbines would be new and visually dominant features in a landscape setting that currently has a high degree of visual unity; they would reduce the unity to a degree that would substantially alter the scene's existing character.

The potential visual impact from Viewpoint 2 with gray turbines would be moderate to high.

Comparing Figure 3.9-17 with Figure 3.9-18 indicates that although the brown color reduces visual contrast in views where the turbines are seen against a landscape backdrop, it accentuates the visibility of the turbines in views where they are seen against the sky. Because the turbines are most frequently seen against the sky, particularly in close-range views where visual concerns are the greatest, the gray finish is recommended as the better choice for minimizing aesthetic impacts (see Section 3.9.5, Mitigation Measures).

The potential visual impact from Viewpoint 2 with brown turbines would be moderately high to high.

Viewpoint 3: US 97 at Northern End of Bettas Road Looking South

Ten turbines in turbine string G would be prominently visible from Viewpoint 3 in the driver's cone of vision along the east side of the US 97. (Figure 3.9-19 shows the simulated view from Viewpoint 3 on US 97 at the northern end of Bettas Road, looking south.) These turbines would be located on ridgetops at distances ranging from 0.5 to 1 mile from this viewpoint. Because the turbines would be seen against the sky at relatively close range, they would be highly visible in this view and would reduce the visual unity to a degree that would substantially alter the scene's existing character.

The potential visual impact from Viewpoint 3 would be moderate.

Viewpoint 4: Ridges East of US 97

Approximately 40 turbines would be visible from Viewpoint 4 looking south from a residence in Section 35 at the upper end of Elk Springs Road. (Figure 3.9-20 shows the simulated view from Viewpoint 4 at a residence in Section 35 on Elk Springs Road, looking south.) Three strings of turbines would be visible in the middle ground, and two additional strings would be visible in the far middle ground. Because of the elevated viewing position, these turbines would be seen against the ground surface backdrop. The contrast between the light color of the turbines and the darker color of the ground would create a moderate visual contrast, increasing the visibility of the turbines. Because of the elevated position of this viewpoint and its distance from the turbines, the turbines' apparent scale would be consistent with that of other features in the setting. The presence of the turbines would likely have a moderate effect on the vividness of this view, but would reduce its overall sense of unity and intactness.

The potential visual impact from Viewpoint 4 would be moderate to high.

Viewpoint 5: Bettas Road

Ten turbines in turbine string G would be prominently visible in the driver's cone of vision along the east side of Bettas Road. (Figure 3.9-21 shows the simulated view from Viewpoint 5 in the northern portion of Bettas Road, looking north.) These turbines would be located in the ridgetops at distances ranging from 0.5 to 1 mile from this viewpoint. Because the turbines would be seen against the sky at relatively close range, they would be highly visible and would reduce the visual unity to a degree that would substantially alter the scene's existing character. The wind turbines would be arrayed uniformly along the ridgeline and would not necessarily create a substantial change in the setting's moderate visual quality.

The potential visual impact from Viewpoint 5 would be moderate.

Viewpoint 6: SR 10 Corridor

Fourteen turbines in turbine strings B and C would be visible on the ridgeline located 1.5 miles or more from Viewpoint 6 along SR 10 between Morrison Canyon and Swauk Creek. (Figure 3.9-22 shows the simulated view from Viewpoint 6 on SR 10 between Morrison Canyon and Swauk Creek, looking east.) The turbines would be seen against the sky. The presence of the long line of turbines may create a slight increase in the vividness of this view, may have a small adverse effect on the view's unity, and would have a more substantial effect on the view's intactness.

The potential visual impact from Viewpoint 6 would be moderate.

Figure 3.9-14

Figure 3.9-15

Figure 3.9-16

Figure 3.9-17

Figure 3.9-18

Figure 3.9-19

Figure 3.9-20

Figure 3.9-21

Figure 3.9-22

Viewpoint 7: John Wayne Trail

Over 30 turbines in turbine strings A, B, and C and from strings on ridges farther to the north would be visible on the ridgelines located 2 miles and farther from Viewpoint 7 looking north along the Iron Horse/John Wayne Trail at Taneum Road. (Figure 3.9-23 shows the simulated view from Viewpoint 7 on the John Wayne Trail at Taneum Road, looking north.) The closer turbines would be seen against the sky. The more distant turbines would be seen against the slopes of distant hills, and under some lighting conditions, would contrast with the backdrop, increasing the visual impact. The visible turbines would have little effect on this view's vividness, but would reduce its unity and intactness to a slightly greater extent.

The potential visual impact from Viewpoint 7 would be low.

Viewpoint 8: Thorp

Over 20 turbines in turbine strings A, B, and C and from strings on ridges farther to the north would be visible on the ridgelines located 3 miles and farther from Viewpoint 8 looking north from the Thorp Highway in the center of the community of Thorp. (Figure 3.9-24 shows the simulated view from Viewpoint 8 on Thorp Highway, looking north.) Most of the turbines would be seen against the sky. However, at this distance, they would have a relatively low visual impact. Some of the turbines would be seen in front of the Stuart Range. However, because of their relatively small size at this viewing distance, they would not likely detract from views toward the Stuarts. The visible turbines would have little effect on this view's vividness, unity, and intactness.

The potential visual impact from Viewpoint 8 would be low.

Viewpoint 9: I-90

Two simulations, one with gray turbines and the other with light brown turbines, are provided for comparison from Viewpoint 9 along I-90 looking northeast at Springwood Ranch. (Figures 3.9-25 and 3.9-26 show simulated views from Viewpoint 9 on I-90 at Springwood Ranch, looking northeast, with gray and brown turbines, respectively.) At this distance, the brown turbines have less contrast with the hilly background. However, as shown from Viewpoint 2 (Figure 3.9-18), the brown turbines have greater contrast with the sky when viewed at a closer distance. In addition, the brown color would have a significantly greater contrast when snow is on the ground.

Over 20 turbines in turbine strings A, B, C, and E and from strings on ridges farther to the north and east would be visible on the ridgelines located 2.5 miles and farther from this viewpoint. Some of the turbines would be seen against the sky although the more distant turbines would be seen against the hillsides and under some lighting conditions would contrast with their backdrop, thereby increasing their visual impact. The visible turbines would have a minor effect on the vividness of this view but would decrease the apparent unity and intactness.

The potential visual impact from Viewpoint 9, using gray turbines, would be low. The potential visual impact from Viewpoint 9, using brown turbines, would be moderately low.

Viewpoint 10: Lower Green Canyon Road

Almost all of the project's turbines would be visible on the ridgelines in the background of Viewpoint 10, 5 miles or more from Lower Green Canyon Road. (Figure 3.9-27 shows the simulated view from Viewpoint 10 along Lower Green Canyon Road, looking northwest.) Most of the turbines would be seen against the slopes of the ridges and more distant hills and under some lighting conditions would contrast with the background. At a distance of 5 miles or more, however, this contrast would have little effect on the overall visual impact. Consequently, because the prominence of the turbines in the view would be low, the turbines would have a minor effect on the vividness, unity, and intactness.

The potential visual impact from this viewpoint would be low.

Viewpoint 11: National Forest Lands

Viewpoint 11 illustrates views of the project area from the southern portion of the Wenatchee National Forest on Forest Route 35. (Figure 3.9-28 shows the simulated view for the middle scenario from Viewpoint 11 on Forest Service Road 35, looking southeast.) As this road switches back and forth up the west slope of Table Mountain, the project site becomes increasingly visible. Because of the steep slopes, increasing elevation, and many pullouts on the forest access road, the project site is frequently visible against the broad rural landscape of the valley below. In the plateau areas to the north where recreation areas are located, trees generally screen views to the southwest toward the project site, making the project less visible to recreational visitors.

Much of the project would be seen from Reecer Creek Road and areas of the National Forest used for recreation. Given the moderately high to high scenic quality of this view, the impacts of the project on recreational users of forestlands would be moderately high.

<u>Scenic Views of Regional Importance – The Stuart Range</u>

Because the Stuart Range is northwest of the project site, the areas from which the project and the Stuart Range have the potential to be seen in the same view are in the region to the southeast of the project's proposed turbine strings. Review of mapped data and the simulations prepared for this project shows that the Thorp vicinity would be the most likely area for turbines to appear in the line of sight of views toward the Stuart Range (Figure 3.9-24). In views from areas farther to the west, such as the John Wayne Trail at Taneum Road (Figure 3.9-23), the Stuart Range would either not be visible at all or not in the line of sight of the turbines.

There is a potential for the wind turbines to appear in the line of sight of the Stuart Range in views from residences on the tops of the ridges southwest of the turbines. Some of the residences along Sagebrush Road and Ellensburg Ranches Road west of US 97 could have turbines in the line of sight toward the peak of Mount Stuart.

Figure 3.9-23

Figure 3.9-24

Figure 3.9-25

Figure 3.9-26

Figure 3.9-27

Figure 3.9-28

Most of the residential properties east of US 97 are north of the proposed turbine strings. Therefore, the turbines would not obstruct views of the Stuart Range from these parcels.

<u>Light and Glare</u>

Light

To comply with the FAA's aircraft safety lighting requirements, the project turbines would be marked with lights that flash white (at 20,000 candela) during the day and red (at 2,000 candela) at night. These lights are designed to concentrate the beam in the horizontal plane, thus minimizing light diffusion down to the ground and up to the sky. The FAA has already concluded that the project would not interfere with aviation operations (FAA 2002). After reviewing final project plans, the FAA would determine the exact number of turbines that would require lights. Typically, FAA requires warning lights on the first and last turbines of each string and every 1,000 to 1,400 feet on the turbines in between. Aside from aircraft warning lights, the turbines would not be illuminated at night. This potential impact would be greatest under the upper end scenario, which would require the largest number of turbines.

Based on experience at the Stateline and Nine Canyon Wind projects in Washington, the white flashing (daytime) lights would be visible but not intrusive to viewers in the areas surrounding the project and are thus unlikely to create a high visual impact.

The flashing red lights would be a new visual element into the project area's nighttime landscape. At present, the project site and surrounding area are relatively dark at night. The major sources of light in the area are outdoor lights at the residential properties and headlights on the surrounding roads. The flashing red lights would be most noticeable within 1 mile of the project and are likely to have an adverse effect on views from residential properties in these areas.

Shadow-flicker caused by wind turbines is defined as alternating changes in light intensity as the moving blade casts shadows on the ground and objects (including windows at residences). Section 3.4, Health and Safety, examines the potential effects of shadow-flicker for residents near the proposed project and recommends measures for minimizing these effects.

Other project facilities that would require outdoor lighting at night for operational safety and security include the proposed O&M facility and substations. These facilities would create sources of light in areas where there is no nighttime lighting other than vehicle headlights and would contribute to the overall increase of nighttime illumination in the project area. This impact would be the same under all three project scenarios.

Glare

The proposed project facilities, including turbines, substation equipment, aboveground electrical collection system, and O&M facility have the potential to be constructed of materials that could create a new source of glare in the project area. The degree of impact would depend on the specific type of materials used but would likely be greatest under the upper end scenario.

Potential glare impacts would be minimized through proposed mitigation (see Section 3.9.5, Mitigation Measures).

Decommissioning Impacts

Decommissioning would consist of removing above ground equipment such as turbine and meteorological towers and their associated foundations to a depth of 3 feet below ground. Wind turbine foundations below 3 feet would remain. The ground surface would be regraded to natural contours and revegetated to a natural condition.

For several years after decommissioning, site disturbance would be visible upon close examination. The visual impacts of those aboveground elements that are not removed would remain. During the decommissioning process, similar impacts to those experienced during construction would occur but to a lesser extent because less construction material would be removed than was delivered to the wind turbine sites.

3.9.4 Impacts of No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated and the visual impacts described in this section would not occur. The No Action Alternative assumes that future development would comply with existing zoning requirements for the project area that is zoned Agriculture-20 and Forest and Range. According to the County's Zoning Code, the Agriculture-20 zone is primarily intended for farming, ranching, and rural residences. Permitted uses in the Forest and Range zone include logging, miming, quarrying, and agricultural practices as well as residential uses (Kittitas County 1991).

The visual character of the project area would remain rural assuming that land uses would continue to follow recent trends and that no area-wide rezoning would occur in the near future. However, even under current zoning, the rural character could slowly become more urban if large parcels are subdivided and residences are constructed on smaller lots.

The demand for electrical power in the region would increase and some other energy production facility would likely be constructed elsewhere in the region. The visual impacts of another facility are not predictable and would range from incompatible to acceptable depending on the type and location of the facility.

3.9.5 Mitigation Measures

Mitigation of aesthetic and light and glare impacts related to wind power projects could include a combination of methods. The goal of mitigation is to avoid, reduce, and compensate for impacts to the maximum extent practical. The most fundamental mitigation method is to completely avoid the impacts at a given location by either not constructing the project or constructing it at a different location. This option is discussed in Section 3.9.4, No Action Alternative.

In current literature on the subject, a number of commonly accepted aesthetic and light and glare impacts are associated with wind power projects. Many of these impacts may be reduced if recommended planning and design methods are followed. The Applicant is proposing some of these impact-reduction methods, as summarized below.

Mitigation Measures Proposed by the Applicant

- During the construction period, active dust suppression would be implemented to minimize the creation of dust clouds.
- When construction is complete, areas disturbed during the construction process would be restored to natural conditions.
- The wind turbine towers, nacelles, and rotors used would be uniform in design throughout the project.
- The turbines would have neutral gray finish to minimize contrast with the sky backdrop. Because the turbines are most frequently seen against the sky, particularly in close-range views where visual concerns are the greatest, the gray finish is the most effective choice for minimizing project aesthetic impacts.
- A low-reflectivity finish would be used for all surfaces of the turbines to minimize the reflections that can call attention to structures in a landscape setting.
- Because of the prevailing wind conditions and the high level of reliability of the equipment being used, the rotors would be turning approximately 80-85% of the time, minimizing the amount of time that turbines would appear to be not operating.
- The small cabinets containing pad-mounted equipment that would be located at the base of each turbine would have an earthtone finish to help them blend into the surrounding ground plane.
- The only exterior lighting on the turbines would be the aviation warning lighting required by the FAA. The warning lighting would be the minimum required intensity to meet the current FAA standards.
- Most of the project's electrical collection system would be buried.
- The 1.2-mile aboveground segment of the electrical collection system would include wood poles, low-reflectivity conductors, and non-reflective insulators. The aboveground segment would be located along two sets of existing overhead high voltage transmission.
- To the extent feasible, existing road alignments would be used to provide access to the turbines, minimizing the amount of additional surface disturbance required. Access road widths would be restricted to 20 feet in the middle and upper scenarios. The roads would have a gravel surface and would have grades of not more than 15% to reduce unsightly soil erosion.
- The O&M facility would have a low-reflectivity earthtone finish to reduce visual contrast with the surrounding landscape.
- The colors of the asphalt and gravel used for circulation and parking areas at the O&M facility would be selected to minimize contrast with the site's soil colors.
- Outdoor night lighting at the O&M facility and substations would be the minimum necessary for safety and security. All lights would be shielded to reduce offsite light trespass.
- All substation equipment would have a low-reflectivity neutral gray finish to reduce visual impact.
- All insulators in the substations and on takeoff towers would be non-reflective and non-refractive.

- The control buildings located at each substation would have a low-reflectivity earthtone finish.
- The chain-link fences surrounding the substations would have a non-reflective, dark finish to reduce their contrast with the surroundings.
- In the areas surrounding the O&M facility and substations, naturalistic groupings of indigenous trees and shrubs would be established to provide partial screening and to help visually integrate the facilities into the landscape.
- An information kiosk and public viewing area would be constructed near the proposed O&M facility off Bettas Road. Signs would be provided to direct tourists to this viewing area (see Chapter 2). There is evidence from viewer survey results that people who have an understanding of the technology and characteristics of wind energy facilities are less likely to find views of turbines in the landscape objectionable.

Additional Recommended Mitigation Measures

During EIS scoping, concerns were raised about the project's aesthetic impacts. It was suggested that the County impose scenic setbacks from US 97 to protect the project area's viewshed. Kittitas County would make decisions regarding scenic setbacks in the project area.

Other commentors requested that the project compensate for lost sleep or loss of enjoyment of property caused by the proposed turbine lighting. Specific types of mitigation include methods to mitigate for light pollution at residences that do not have window coverings and methods to shield or somehow create a visual barrier between the tower lights and nearby residences. However, as noted below, attempts to screen or buffer views of the wind turbines should be carefully examined because a failed attempt to screen the turbines could have a greater negative impact than no attempt at all.

Additional measures or modifications that could further reduce the aesthetic and light and glare impacts of the project are recommended below. Some of the potential mitigation measures are published recommendations in current literature about wind power project aesthetic impacts (e.g., Pasqualetti et al. 2001). See Section 3.4, Health and Safety, for a discussion of recommended measures to minimize the effects of shadow-flicker during project operations.

- Architectural compatibility with the region’s agricultural building types would unify the O&M facility and potentially the substation with the surrounding landscape. For example, if the O&M facility looked like a barn and the parking area was hidden behind it, travelers on US 97 would be less likely to view the structure as atypical for the area.
- For wind turbines that would be viewed uphill within a 1-mile distance, planting natural-looking groups of native conifers should be explored as a means to reduce the overall impact. However, any attempt to screen or buffer views of the wind turbines should be carefully examined because the aesthetic impact of a failed attempt to screen the turbines could have more impact than no attempt at all. Any attempt to camouflage or paint in a decorative way would make the turbines more noticeable and incongruous. The wind turbines should not be painted to match sky or ground surface colors because the sky and surface colors are constantly changing. For paint colors other than white or light gray, the degree of contrast

between the turbines and sky or ground surface could range from very low to very high depending on conditions such as snow or seasonal vegetative cover.

- The wind turbines should not be installed on a foundation that is raised above natural (existing) grades. The grasses and other plants used in post-construction restoration efforts should continue to the base of the tower so that the tower is visually connected to the earth.
- All wind turbines should be the same design, height, and color, and their blades should rotate in the same direction. The nacelles should have only one small logo visible on the two longest sides. Cellular dish-type antennas should not be attached. Narrow antennas could likely be added to the wind turbines with minimal aesthetic impact.
- The towers should be constructed to house the transformer and any control panels within the base of the tower to avoid visual clutter.
- To compensate for visual impacts, the Applicant should acquire conservation easements on land in important foreground views of the wind turbines so that no further development occurs in these areas until after decommissioning. This approach would conserve natural areas so that the visual contrast between the wind turbine and the land maintains its order and purity.

3.9.6 Significant Unavoidable Adverse Impacts

For many viewers, the presence of the wind turbines represents a significant unavoidable adverse impact because it significantly alters the appearance of the rural landscape over a large area of the Kittitas Valley. The constant flashing of lights on the tops of turbines would similarly be considered a significant unavoidable adverse impact. The degree to which impacts are adverse depends on the viewer's location and sensitivity and the impact on view quality. In the final analysis, it is the comparative number of viewers most affected by the project that determines the overall impact. A project that significantly affects a small number of viewers may be offset by the fact that it may have a relatively low impact on a large number of viewers.

3.10 TRANSPORTATION

This section describes the existing transportation network serving the proposed KVWPP in Kittitas County near the City of Ellensburg. It also evaluates potential traffic volume and level-of-service impacts on the local transportation system, and identifies mitigation measures to limit those impacts. The analysis in this section is primarily based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Section 5.2). Where additional information has been used to evaluate the potential impacts associated with the proposal, that information has been referenced.

Existing state transportation plans and local comprehensive plans were reviewed to identify planned roadway improvements. Vehicle trip generation for the KVWPP was based on the Institute of Transportation Engineers (ITE) *Trip Generation Manual, An Informational Report* (1997). Level-of-service (LOS) analyses were conducted consistent with methods presented in the *Highway Capacity Manual* (Transportation Research Board 2000).

3.10.1 Affected Environment

The project site is located in rural Kittitas County between the cities of Cle Elum and Ellensburg. The study area defined for this transportation analysis is bounded by SR 970 on the north, I-90 on the south and west, and US 97 on the east. The study area also includes roads maintained by Kittitas County, including Bettas Road and Hayward Road, as well as private roads. Most of the public roads in the region are paved county roads, with a few state routes traversing the area. The remaining public road system is composed of county roads that have bituminous pavement, gravel, or unimproved dirt. Figure 3.10-1 illustrates the principal transportation routes that would serve the site.

Existing Roadway Network

The Applicant has identified the most logical route to/from the Seattle area for the transport of materials that would be used during construction of the KVWPP. This route to the project site includes I-90, US 97, Bettas Road, and Hayward Road. In addition, several private roads provide access to private property in and around the project area, such as Elk Springs Road and Cricklewood Lane.

<u>Interstate 90</u>

I-90 is the major east-west freeway across the state of Washington. Near Cle Elum, I-90 has four lanes: two eastbound and two westbound. Each travel lane is 12 feet wide. Six-foot-wide paved shoulders exist on both sides of the highway. The posted speed limit is 70 mph. The Washington State Department of Transportation (WSDOT) maintains I-90.

Two truck weigh stations (one eastbound and one westbound) are located on I-90 approximately one-half mile west of the Bullfrog Road interchange at Cle Elum. Washington State Patrol operates both facilities, while WSDOT maintains access to and from the sites. In addition to the truck weighing function, the westbound weigh station is used for checking and placing snow chains on trucks before they cross Snoqualmie Pass during winter months.

US 97

US 97 (north of I-90) is a two-lane, north-south roadway with 4- to 8-foot-wide asphalt shoulders between I-90 and SR 970. Its posted speed limit ranges from 40 to 65 mph. According to the WSDOT road classification system, the majority of US 97 within the project area is classified as a rural-principal arterial. The section of US 97 immediately north of I-90 at Ellensburg is classified as an urban-principal arterial (WSDOT 2003a). The section of US 97 south of Bettas Road passes through rolling terrain that causes trucks to slow down frequently. US 97 provides access to and across Blewett Pass in the north.

Kittitas County Roads

Kittitas County roads that would be used to access the KVWPP site include Bettas Road and Hayward Road, which branches off Bettas Road. These roads provide local access only. Bettas Road is a two-lane, north-south paved roadway that has posted speed limits of 35 mph and branches off US 97 approximately 10 miles north of the I-90 interchange. Hayward Road is a two-lane, north-south gravel road that branches off Bettas Road to the south. The southern portion of Hayward Road (approximate 3,000-foot segment between the North Branch Canal and SR 10) is unimproved and not accessible to emergency vehicles. Parking is not permitted along any of these roadways, with the exception of emergency parking.

Private Roads

Some of the rural residences in and around the project area are accessed by private roads that branch off US 97. Because these are private, dead-end roads whose primary function is to provide access to abutting properties, the number of road users and corresponding volume of traffic are assumed to be relatively small.

Elk Springs Road is a private road that extends along the top of the ridge where turbine string H is proposed. It is gated at US 97 and accessible only to property owners with a key. Elk Springs Road is used to access approximately 35 residences and recreational properties at dispersed locations along the ridge and on the forested slopes that lie north of proposed turbine strings G and H in an area referred to as “Section 35.” According to the Applicant, approximately five of the parcels in Section 35 have residences that are occupied on a full-time basis. Six of the parcels are used only on weekends, and nine are used occasionally (more than a few times a year, but less frequently than most weekends). The rest are used infrequently (a few times a year) (Sagebrush Power Partners LLC 2003a, Section 5.1.4.3.2).

Cricklewood Lane extends from US 97 into the canyon between the ridges where turbine strings I and J are proposed. Cricklewood Lane is not gated in the area from US 97 to the Bonneville transmission line corridor, but north of this area access is restricted by a locked gate. There are 11 residences along Cricklewood Lane.

Figure 3.10-1:

Traffic Patterns and Volumes

Table 3.10-1 shows the average daily traffic (ADT) volumes on roadways in the project area between 1997 and 2001. Volumes for 2001 are shown in Figure 3.10-1. These volumes are based on available traffic data from WSDOT. US 97 volumes vary from a predominantly urban setting near I-90 to a more rural setting in the vicinity of Bettas Road. Therefore, traffic was analyzed in two different sections where data were available from WSDOT. The first 2-mile section is immediately north of I-90 (referred to as US 97, north of I-90). The second 2-mile section is south of Bettas Road (referred to as US 97, south of Bettas Road).

Table 3.10-1: Average Daily Traffic Volumes and Estimated Percentage of Trucks

Roadway	1997 ADT	1998 ADT	1999 ADT	2000 ADT	2001 ADT	Estimated % Trucks
I-90 (west of US 97)	22,000	23,000	23,000[1]	22,000[1]	22,000	20
US 97 (north of I-90)[2]	2,500	2,600	2,800	2,800	2,800	N/A
US 97 (south of Bettas Rd.)	2,000	2,100	2,200	2,200	2,200	26
Bettas Road	N/A	N/A	43	36	26	N/A
Hayward Road	N/A	N/A	N/A	29	24[3]	N/A

Sources: WSDOT 2000, 2001; Spurlock, pers. comm., 2002.
N/A = Not available.
1 1999 and 2000 ADT for I-90 estimated.
2 The traffic count for this portion of US 97 was taken at MP 134.18; the road is classified as urban in this location (WSDOT 2003a).
3 2001 ADT for Hayward Road is estimated.

Roadway Limitations

The Kittitas County road network would provide the primary public routes for construction of the KVWPP. All new road construction in the county must be done in accordance with the current edition of WSDOT's *Standard Specifications for Road & Bridge Construction*. Kittitas County road standards state the minimum requirements for road construction in the county. According to RCW 46.44.041, the maximum legal load on state highways is 105,500 pounds. Kittitas County has adopted the state's schedules of permits and fees for overweight vehicles as set forth in RCW 46.44 for all county roads (Kittitas County 1997b).

On I-90, the route most likely to be used by construction vehicles, the Cle Elum River bridge at milepost (MP) 80.79 has a height restriction of 16 feet 6 inches in the center lane and 14 feet 8 inches to 15 feet in the westbound outside lane. In addition, there is a vertical height restriction on I-90 at Exit 62 approximately 8 miles east of Snoqualmie Pass. Loads over the legal height (14 feet) must exit at the eastbound ramp and reenter via the eastbound on-ramp (WSDOT 2003a).

Existing Roadway Levels-of-Service

LOS is a qualitative measure describing operational conditions in a traffic stream, and motorists' or passengers' perceptions of those conditions. It generally describes traffic conditions in terms of speed and travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. There are six LOS classifications, each given a letter designation from A to F. LOS A represents the best operating conditions and LOS F represents the worst.

Kittitas County's LOS standards are contained in its Comprehensive Plan. Transportation GPO No. 4.26 addresses the issue of LOS. GPO 4.26 states, "Kittitas County shall utilize the HCM (Highway Capacity Manual) methodology to measure the effectiveness of the arterial system at arterial intersections by evaluating all arterial/arterial intersections (including state highways) to identify existing service levels and by developing a transportation model to evaluate the impacts of future land use alternatives on arterial or arterial intersections. Intersections that fall below level of service C in rural areas and D in urban areas shall be considered deficient" (Kittitas County 2002a).

Table 3.10-2 summarizes the existing roadway traffic conditions in the project vicinity and includes existing roadway classification, number of lanes, daily volume, design capacity, peak-hour volume, and LOS.

LOS was determined on the basis of the most current Highway Capacity Manual (Transportation Research Board 2000). Daily volumes (ADT) were used to analyze traffic conditions and determine the LOS along roadway segments. Intersection analyses were not performed because peak-hour turning movement counts were not collected. The daily volumes shown in Table 3.10-2 represent the estimated 2001 ADTs in both directions of travel. Available daily volumes were obtained from WSDOT and Kittitas County. These were used to estimate missing volumes and peak-hour volumes, which were assumed to be 10% of the daily volumes.

Table 3.10-2: 2001 Conditions of Affected Roadways

Roadway	Classification	No. of Lanes	Average Daily Volume	Hourly Design Capacity[1]	PM Peak-Hour Volume[2]	PM Peak-Hour LOS
I-90 (west of US 97)	Rural-Interstate	4	22,000	6,020	2,200	B
US 97 (north of I-90)	Urban-Principal Arterial	2	2,800	2,800	280	C
US 97 (south of Bettas Rd.)	Rural-Principal Arterial	2	2,200	2,800	220	C
Bettas Road	County Road	2	26	2,800	3	A
Hayward Road	County Road	2	24	2,800	3	A

Source: Sagebrush Power Partners LLC 2003a.

1 Maximum number of vehicles per hour in both directions for LOS E.

2 Peak-hour volumes estimated at 10% of ADT.

To determine the LOS for selected roadways in the study area, daily traffic capacity was determined by estimating capacities obtained from the Highway Capacity Manual. Daily traffic volumes were compared to these capacities to determine volume-to-capacity ratios. These ratios were used to calculate the existing LOS. The LOS definitions are presented in Appendix C. Included are definitions for freeways, urban streets, and two-lane rural highways. The freeway and two-lane rural highway LOS definitions are most applicable to the KVWPP.

The existing LOS for roadways surrounding the project site is LOS C or better, which represents generally smooth traffic conditions. Under these conditions, individual users feel unrestricted by the presence of others in the traffic stream.

Accident Rates

Accidents are generally expressed in terms of accident rate, where accident occurrence is indexed to the amount of traffic using a given roadway. For roadway segments, accident rates are computed as the number of accidents per million vehicle-miles (MVM) of travel. Table 3.10-3 shows an estimated number of accidents for selected roadways in the project area based on 1996 (the most recent year for which accident data are available) average daily traffic volumes and multi-year accident rates.

Table 3.10-3: Accident Rates and Numbers, 1996 and 2001

Roadway	Milepost	Length (mile)	Accident Rate (accidents/MVM)[1]	1996		2001	
				ADT	No. of Accidents	ADT	No. of Accidents[2]
I-90	106.06	3.28	0.80	20,000	26	22,000	29
US 97	135.38	14.31	0.60	2,250	9	2,800	11

Source: WSDOT 1996
1 1996 Multi-year accident rate. Rate is based on 1994-1996 data.
2 Estimated, based on 1996 accident rate.

The 1996 accident data indicate an average statewide accident rate of 1.48 accidents per MVM for the type of roadway corresponding to the rural portion of US 97 (rural-principal arterial). The average statewide accident rate is higher than the accident rate of these roads (0.60 accidents per MVM for US 97). Similarly, the statewide average accident rate for a rural interstate roadway is 0.86, which is higher than the accident rate for I-90 (0.80 accidents per MVM). WSDOT records indicate that two accidents have occurred at the intersection of US 97 and Bettas Road at MP 144.73 (a "T" intersection) in the last seven years (WSDOT 2003b).

Future Plans and Projects

Kittitas County Department of Public Works staff stated that there are currently no construction projects planned for county roads in the project area. WSDOT indicated that the following projects may affect transportation and/or operation of the proposed project (WSDOT 2003b):

- US 97: Ellensburg to Virden paving project (MP 137 at SR 10 - MP 149 at SR 970). Scheduled for spring of 2004. This project is within the boundaries of the KVWPP.
- I-90: Gold Creek to Easton Hill paving project (MP 55-MP 67). Scheduled for spring of 2004.

The paving project on I-90 between MP 55 and MP 67 is within the four-lane section of the interstate. Traffic control for this paving project would include lane closures restricting traffic to single-lane movements eastbound and westbound. The paving is expected to occur only during daylight hours. Project-related heavy vehicles could potentially use these routes while they are under construction. See Section 3.14, Cumulative Impacts, for a discussion of potential cumulative traffic impacts from these and other projects.

Local Comprehensive Transportation Plans

There are currently no plans for major improvements to the transportation system in Kittitas County.

Pedestrian/Bicycle Facilities

Within Kittitas County, I-90 and US 97 are identified for bicycle use on the Washington Bicycle Map. Kittitas County Code 12.10 states that all roadway improvements shall include pedestrian access as part of the design unless otherwise approved by the County. There are currently no planned roadway improvements and no planned pedestrian or bicycle facilities on the roadways near the project site.

Public Transportation

Kittitas County is primarily a rural county where the need for public transportation in or near its towns is not a high priority. The cities of Cle Elum and Ellensburg in the project vicinity currently do not have public transit systems. However, there is an accessible/special needs transportation program provided by the Kittitas County Action Council for citizens. Greyhound bus service is the primary form of public transit between cities such as Cle Elum and Ellensburg.

Air Traffic

No regional or municipal airports are in the project vicinity. The closest airport is near Ellensburg, approximately 12 miles to the southeast. The Ellensburg airport does not have scheduled air service and is limited to private and charter plane service. Small planes may use private runways at ranches or farms in the project area; however, the frequency of this type of use is unknown. The closest private landing strip in the project vicinity is a little over 1 mile due east of proposed turbine string J and west of Green Canyon Road.

Rail Traffic

Burlington Northern operates an active main line between Auburn and the Tri-Cities over Stampede Pass. The main line passes through Ellensburg. Portions of the line were inactive until 1996, when the pass portion reopened to freight traffic. Approximately 4 to 10 trains traverse the route daily.

Waterborne Traffic

Over 100 miles southeast of the project site, the Ports of Pasco, Benton, and Kennewick are located on the Columbia River. Grain is the major commodity using barge transportation on this stretch of the river.

3.10.2 Impacts of Proposed Action

This section evaluates potential transportation impacts that could result from the proposed project. It summarizes vehicle trip generation associated with construction and operation of the KVWPP. Potential impacts on traffic volumes are evaluated for key roadways that would provide primary access to the project site. LOS analyses were conducted for 2004 (construction, operation, and maintenance impacts) and 2030 (operations and maintenance impacts).

Direct impacts would occur if predicted traffic levels exceed applicable LOS standards. Other types of direct transportation impacts include the potential for the project to exceed legal roadway load and weight limits, accident or navigational hazards (for both motorists and aviators), and degradation of roadway conditions. For the proposed project, the primary concern is the potential transportation-related impacts attributable to vehicle trips (both trucks and automobiles). These trips would be associated with construction, operations and maintenance, and decommissioning of the various project elements, including the wind turbines and meteorological towers, existing and new gravel access roads, additional power lines, and the proposed O&M facility and substations. Potential aviation hazards would be specifically associated with the proposed turbine and meteorological towers. Indirect impacts are not anticipated because the project is not expected to substantially induce regional growth to the extent that would result in significant changes to offsite traffic. Table 3.10-4 summarizes potential transportation impacts under the three project scenarios.

Table 3.10-4: Summary of Potential Transportation Impacts

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Construction Impacts			
Construction trips	658 daily trips	622 daily trips	630 daily trips
Parking requirements	Same as middle scenario	Approx. 2 acres	Same as middle scenario
Hazardous materials transport	Same as middle scenario	Diesel fuel and gasoline required for mobile construction equipment	Same as middle scenario
Roadway limitations	Greater than middle scenario because of larger number of trucks	Trucks could exceed legal load and weight limits	Greater than middle scenario because of larger number of trucks
Roadway navigation hazards	Greater than middle scenario because of larger number of trucks	Increased risk of accidents	Greater than middle scenario because of larger number of trucks
Aviation hazards	Same as middle scenario	FAA determined no hazard to air navigation from construction equipment	Same as middle scenario
Operations and Maintenance Impacts			
Operational trips	Same as middle scenario	28 daily trips	40 daily trips
Parking requirements	Same as middle scenario	Up to approx. 20 spaces	Up to approx. 25 spaces
Hazardous materials transport	Same as middle scenario	No adverse effect	Same as middle scenario
Road limitations	Same as middle scenario	No effect anticipated	Same as middle scenario

Table 3.10-4: Continued

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Operations and Maintenance Impacts cont.			
Road navigation hazards	Same as middle scenario	Potential for accidents at US 97/Bettas Road	Possibly greater risk because of slightly larger project-generated trips
Aviation hazards	Additional notice to FAA required due to different turbine configuration	FAA determined no hazard to air navigation from turbine towers	Additional notice to FAA required because of different turbine configuration
Road maintenance and public access requirements	26 miles (95 acres) of roadway footprint to maintain	26 miles (67 acres) of roadway footprint to maintain	Same as middle scenario
Tourism-induced traffic	Unknown	Unknown	Unknown
Decommissioning Impacts			
	Similar to those described for construction. However, assuming that roadways would remain in place, the resulting workforce and corresponding vehicle trips would be smaller.	Similar to those described for construction. However, assuming that roadways would remain in place, the resulting workforce and corresponding vehicle trips would be smaller.	Similar to those described for construction. However, assuming that roadways would remain in place, the resulting workforce and corresponding vehicle trips would be smaller.

Source: Sagebrush Power Partners LLC 2003a, c, f.

Construction Impacts

Traffic

Project construction would take approximately one year. It is anticipated that most of the employees would travel to the site from within a 75-mile radius.

The roadway network discussed above would be the primary roadways used by construction vehicles traveling to and from the project site. US 97, the primary access route to the site, would likely receive the greatest impact from construction vehicles and workers. It is anticipated that the majority of the construction workforce traffic would originate in Ellensburg and Yakima. Even if the majority of employees came from outside Kittitas and Yakima counties (as is assumed in the socioeconomic analysis), these workers would probably temporarily relocate to the project vicinity, and therefore would travel on the same roads as local residents. Employees coming from Ellensburg would travel north on US 97 to the junction with Bettas Road, where workers would disperse to the various construction locations at the project site. Employees from Yakima would most likely travel north on I-82, then west on I-90 to US 97, and continue northbound on US 97 to Bettas Road. These are the shortest and most direct routes from the major urban areas within a 75-mile radius.

The wind turbines, towers, transformers, and other large equipment would be transported to the site using a semi-truck and lowboy transporter designed for heavy loads (i.e., multiple axles). The trucks would deliver the equipment to the project site. During the peak construction month, there would be an onsite workforce of about 160 workers. The average workforce over the entire construction period would be about 75 workers.

Estimated construction vehicle trips generated under the three project scenarios are presented in Table 3.10-5.

Table 3.10-5: Construction Trip Generation

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Employee Traffic			
Daily trips[1]	320	320	320
PM peak-hour trips	160	160	160
Light Duty Delivery Trucks			
Daily trips	40	40	40
PM peak-hour trips	20	20	20
Heavy Duty Truck Trips[2]			
Total truck trips	26,730	23,633	24,238
Daily truck trips[3]	298	262	270
PM peak-hour trips	149	131	135
Total Construction Trips			
Daily trips	658	622	630
PM peak-hour trips	329	311	315

Source: Sagebrush Power Partners LLC 2003a, f.

1 Assumes no worker carpooling.

2 Assumes offsite import of gravel from a location(s) south of the immediate project area.

3 Assumes 180 workdays over a nine-month construction period at 20 workdays per month.

During the peak construction period, employees would generate approximately 320 daily trips, 160 of which would occur during the evening peak hour. (The trip estimate does not include any reduction from carpooling.) In addition to worker traffic, there would be an estimated 20 light duty delivery trucks during the peak of the construction period, resulting in 40 daily trips. Therefore, the total number of vehicles during the construction peak would be 180 (160 vehicles for worker traffic and 20 vehicles for light duty delivery). This number would be the same under all three project scenarios.

Construction-related traffic would consist of deliveries of project equipment and construction materials (such as concrete and steel) by truck. Truck deliveries are anticipated to occur between 8 a.m. and 4:30 p.m. on weekdays. These truck deliveries would include:

- Major equipment (e.g., tower sections, nacelles, blades);
- Gravel for site access roads, O&M facility area, and substation;
- Water trucks to wet the road during compaction and for dust control;
- Construction equipment delivery and pickup;
- Concrete and reinforcing steel;
- Mechanical equipment;
- Electrical equipment and material (transformers, cable, etc.);
- Miscellaneous steel, roofing, and siding;
- Construction consumables; and
- Contractor mobilization and demobilization.

For purposes of estimating trip generation, the most conservative scenario assumes construction of 82 wind turbines (the lower end scenario). The reason for this assumption is that for wind turbines larger than 1.5 MW in size, more gravel trucks would be required to construct 34-foot-wide roads to allow for the safe passage of larger cranes. Under this scenario, approximately 26,700 heavy duty truck deliveries are expected during the construction period. (This assumes that gravel for site construction must be brought to the project from an offsite source in or around Ellensburg or from another location(s) south of the project area.) Assuming 180 work days (nine months at 20 workdays per month), this would result in an average of 149 trucks per day or 298 daily truck trips. Although the construction period is expected to last for approximately one year, a nine-month (180-day) construction schedule was assumed for purposes of evaluating the most conservative construction traffic scenario.

Table 3.10-6 summarizes future 2004 PM peak-hour traffic and LOS during the construction period for the lower end scenario (the scenario that would involve the greatest number of trips). The projected number of construction trips was assigned to each roadway shown in Table 3.10-4. Because these trips would be distributed onto multiple roadways during project construction (i.e., 149 heavy duty truck trips would typically not occur along Bettas Road during a PM peak-hour period), Table 3.10-4 provides worst-case estimates of LOS on any given roadway.

Table 3.10-6: Total PM Peak Hour and LOS Construction Impacts (Lower End Scenario)

Roadway	No. of Lanes	2004 Base ADT	2004 PM Peak[1]	Employee Truck Traffic	Construction Truck Traffic		Total PM Peak	LOS
					Light Duty	Heavy Duty		
I-90 (west of US 97)	4	22,660	1,283	0	20	149	1,452	B
US 97 (north of I-90)	2	2,884	297	160	20	149	626	D
US 97 (south of Bettas Rd.)	2	2,266	233	160	20	149	562	C
Bettas Road	2	27	3	160	20	149	332	B
Hayward Road	2	25	3	160	20	149	332	B

Source: Sagebrush Power Partners LLC 2003a, f.
[1] Directional volumes.

The construction LOS during the PM peak hour with employee traffic and delivery traffic would be LOS D on US 97 north of I-90. The first segment of US 97 immediately north of I-90 (between MP 134.00 and 134.87) is classified as an urban-principal arterial, whereas the portion north of MP 134.87 is classified as a rural-principal arterial. According to WSDOT, the portion of US 97 north of I-90 most likely to experience LOS D conditions would be expected at or around the four-way stop of US 97 and Dolarway Road in the City of Ellensburg at MP 134.14 (Holmstrom, pers. comm., 2003). Therefore, for the urban portion of US 97 north of I-90 the project's construction-generated traffic would not exceed the county standard of LOS D for urban areas. Construction traffic impacts would be mitigated with appropriate traffic-control procedures approved by WSDOT, as presented in Section 3.10.4.

Parking

During construction, parking would be located at the O&M facility and along the site access roads. The O&M facility would also serve as a construction staging area. Parking along turbine string roads would be primarily for those employees working on foundations, electrical infrastructure, and turbines. Vehicles would park in areas that are already temporarily or permanently disturbed for other construction purposes. No additional ground disturbance would occur solely for parking needs.

It is anticipated that roughly half of all employee vehicles would be parked at the O&M facility and the other half would be dispersed across the various turbine strings. Assuming a peak workforce of 160 people, the worst-case scenario (assuming no carpooling) would require approximately 2 acres for parking. This parking area requirement would be the same under the three project scenarios.

Hazardous Materials Transport

Diesel fuel and gasoline are the only potentially hazardous materials that would be used in significant quantities during project construction (approximately 25,000 gallons under each project scenario). The EPC contractor would use fuel trucks to refill construction vehicles and equipment onsite. The fuel trucks would be properly licensed and would incorporate features in equipment and operation such as automatic shut-off devices to prevent accidental spills. Measures to prevent and contain accidental spills resulting from fuel transportation are discussed in Section 3.4, Health and Safety.

Roadway Limitations

The movement and transport of wind turbine components along state highways is necessary because there is no source for these components close to the project. The required materials and equipment must be shipped into the region from a larger metropolitan area such as Seattle. The wind turbine blades are manufactured as single units and cannot be divided. The proposed route for these superloads is along I-90 and US 97, both of which are state-maintained highways.

Some of the trucks that would deliver construction equipment and materials to the project site would have a gross vehicle weight of up to 105,500 pounds. This would exceed the WSDOT legal load limit. Trucks in excess of legal load limits could degrade the condition of existing roadways. This potential impact would be greatest for the lower end scenario because it would require the greatest number of heavy duty truck trips.

RCW 46.44.090 allows special permits to be issued for vehicles exceeding the state's maximum size, weight, and load limits. Because KVWPP construction vehicles may exceed this weight limit, a special permit in accordance with RCW 46.44.090 would be required. For example, WSDOT allows superloads with a special superload permit. A superload is a vehicle or combination with a nondivisible load having a gross weight exceeding 200,000 pounds and/or a total width or height exceeding 16 feet. A permit for these superloads must be submitted in writing, along with an explanation of why the move or transport is necessary, why the load cannot be divided into smaller loads, and a proposed route that is known to be adequate to accommodate this superload.

The Cle Elum River bridge is height-restricted only in the westbound direction. Therefore, this bridge would not restrict loaded trucks carrying oversize equipment traveling eastbound on I-90 to the project site.

Roadway Navigation Hazards

WSDOT staff visited the project site in the spring of 2003. On the basis of that visit, WSDOT gave preliminary approval to two project access points at private approaches on the east side of US 97: one adjacent to Elk Springs Road at MP 144.56 and one at MP 145.9. The access point at MP 144.56 would be temporary and removed after construction. WSDOT recommended access at MP 145.9 after reviewing project plans and visiting the project site. The access point at MP 145.9 has good sight distance and a widened shoulder that would aid in delivery of oversized equipment and construction materials (WSDOT 2003b). A third access point off US 97 would be at MP 144.73 at the intersection of US 97 and Bettas Road. The sight distance at the public road intersection with Bettas Road and at the private access connections exceeds the minimum sight distance requirements set forth in the WSDOT Design Manual, Chapter 9 (WSDOT 2003c).

Construction vehicles would not use private roadways used by residents who live in or visit the project area, such as Elk Springs Road and Cricklewood Lane. However, given the potential volume of truck trips generated during construction, the additional vehicular and construction traffic attributable to the project could temporarily increase the risk of accidents in the project area. The risk of accidents would be greatest along routes where construction vehicles would share the roadway with other vehicles, such as along Bettas Road or US 97. A Transportation Management Plan would be submitted to EFSEC for review and approval before construction, and that plan would include measures to minimize impacts of construction-related traffic (see Section 3.10.4, Mitigation Measures).

The Cle Elum and Ellensburg School Districts indicate that their buses use US 97 and some stop on the route where shoulders are provided. Given that construction-related traffic is not anticipated to increase total truck volume along the highways by more than 15% over the current level and this increase would be for a short period, it is not expected to cause problems for school bus service in the area.

Aviation Hazards

Temporary construction equipment such as cranes and derricks that may be used during construction of the proposed towers could pose a hazard to aviation safety during the construction period. The FAA has reviewed and approved use of proposed construction equipment at the site and has issued "Determinations of No Hazard to Air Navigation" for the project. FAA permits are discussed in further detail below.

Operations and Maintenance Impacts

Traffic

The project would operate continuously (24 hours per day, 7 days per week) using an automated system. It would employ an estimated 14 to 20 full-time workers, depending on the selected project scenario. The operations crew would normally work 8-hour days Monday through Friday, with one person working half days on the weekends. The maximum number of vehicle trips associated with workers commuting to and from the O&M facility on paved state and county roads would be 40 during a 24-hour period under the upper end scenario. Traffic between the O&M facility and the individual turbines on the new and upgraded private gravel roads would be minimal during operations. This source of traffic would consist of weekly or less frequent trips to turbines for maintenance and repair (Sagebrush Power Partners LLC 2003a, Section 3.2.4).

Future traffic volumes and LOS on public roads during the operations and maintenance phase of the project were estimated for two buildout years: 2004 (start of operations) and 2030. Future year 2030 volumes were estimated using a 2% growth factor. This growth factor is considered reasonable because of the area's rural nature and is based on growth factors developed for other projects in Kittitas County.

Table 3.10-7 presents estimated current and future traffic volumes and LOS during the operations and maintenance phase of the project. As shown in Table 3.10-7, all roadways would operate at LOS C or better during evening peak conditions. According to the Applicant, the LOS of unsignalized intersections in the area would probably continue to operate at acceptable levels in the future.

Table 3.10-7: Existing and Future Daily Peak-Hour Traffic Volumes and LOS with and without Project (Upper End Scenario)

	2001 Existing PM Peak		2004 PM Peak without Project		2004 PM Peak with Project		2030 PM Peak without Project (Horizon Year)		2030 PM Peak with Project (Horizon Year)	
	Traffic	LOS	Traffic	LOS	Traffic	LOS	Traffic	LOS	Traffic	LOS
I-90[1] (west of US 97)	1,210	B	1,283	B	1,303	B	1,912	C	1,932	C
US 97 (north of I-90)	280	C	297	C	317	C	442	C	462	C
US 97 (south Bettas Road)	220	C	233	C	253	C	348	C	368	C
Bettas Road	3	A	3	A	23	A	5	A	25	A
Hayward Road	3	A	3	A	23	A	4	A	24	A

1 Directional volumes

The total projected number of operations and maintenance trips were assigned to each roadway shown in Table 3.10-7. Because these trips would be distributed onto multiple roadways during project operations, Table 3.10-7 provides conservative estimates of LOS.

Parking

During the operational phase, employees would park at the O&M facility parking lot. With an anticipated operations workforce of 20 people, plus occasional visitor and delivery vehicles, no more than 25 vehicles are expected to be parked at the facility at any one time under the upper end scenario. A visitor kiosk is also planned at the O&M facility, which would provide tourists a safe place to view and learn about the wind turbines. Parking requirements for this visitor kiosk would be accommodated by parking spaces at the O&M facility. However, as described below under Tourism-Induced Traffic, the number of vehicle trips, both buses and private cars, that would be associated with the KVWPP as a tourist attraction is unknown. Therefore, the proposed O&M facility parking lot may not be sufficient to accommodate future parking needs of both project employees and potential tourists. Mitigation measures for this potential impact are recommended in Section 3.10.4.

Hazardous Materials Transport

No substantial quantities of industrial materials would be brought onto or removed from the project site during project operations. The only materials that would be brought onto the site would be those related to maintenance and/or replacement of project facilities (e.g., nacelle or turbine components, electrical equipment). Hazardous materials transported to the site include minimal amounts of lubricating oils, hydraulic fluids, and mineral oil (see Section 3.5, Energy and Natural Resources). The largest quantities of hazardous materials used during project operations would occur under the upper end scenario because of the larger number of turbines. Waste fluids would need to be changed infrequently (generally less than once per year and sometimes only once every five years), and therefore would not result in a safety risk associated with hazardous materials transport.

Roadway Limitations

Vehicles used during operations and maintenance of the proposed project would primarily be from employees commuting to and from the site and are not expected to exceed state or county legal roadway load limits. Therefore, these trips would not contribute to degradation of roadway conditions.

Road Navigation Hazards

During the EIS scoping process, concerns were raised about the project's effects on the ability of motorists traveling northbound on US 97 to turn left onto Bettas Road. This intersection would be the entry to the proposed O&M facility as well as to a public viewing area. According to WSDOT, the intersection has good sight distance on US 97, but does not have turn lanes (WSDOT 2003b). Projected traffic volumes during project operations could result in increases in the number of accidents at this intersection. This potential impact would be greatest under the upper end scenario because it would involve the greatest number of trips.

Another concern raised during the scoping period is the safety risk to motorists of ice from the turbine blades falling onto nearby public and private roadways during winter months. Measures to reduce this risk are addressed in Section 3.4, Health and Safety.

Aviation Hazards

The FAA must be notified of construction or alteration of a structure that may affect the National Airspace System (NAS) as required under 14 CFR part 77. A Notice of Proposed Construction or Alteration Form (FAA Form 7460-1) must be completed. Any temporary or permanent structure, including all appurtenances, that exceeds an overall height of 200 feet above ground should be marked and/or lighted. FAA recommendations on marking and/or lighting structures can vary depending on terrain features, weather patterns, geographic location, and in the case of wind turbines, the number of structures and overall layout of design (FAA 2000).

The FAA has reviewed plans for the proposed project (under the middle scenario) to determine if it has the potential to interfere with local air traffic operations and issued "Determinations of No Hazard to Air Navigation" (numbers 2002-ANM-1017-OE through 2002-ANM-1206-OE) on August 21, 2002. The FAA issued separate no hazard determinations for each proposed wind power and meteorological tower using two types of determinations: one type concluded that the tower would not require lighting, the second type concluded that it did. A copy of each type of no hazard determination (for proposed turbines G1 and G2) is included in Appendix C (Transportation).

The FAA determinations were based on the number, sizes, and dimensions of turbines proposed for the middle scenario (i.e., 1.5-MW turbines). According to the FAA permits, "any future construction or alteration, including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA." Because the lower and upper end scenarios would operate using different numbers and sizes of equipment, the FAA would be notified of these changes (see Section 3.10.4, Mitigation Measures).

Road Maintenance and Public Access

The Applicant would construct a road system on the project site, with site access roads from the turbine locations to US 97, Bettas Road, or Hayward Road. The Applicant would be responsible for maintenance of turbine string access roads, access ways, and other roads built to construct and operate the project.

The only multipurpose rights-of-way (ROWs) envisioned for the project involves a 1-mile section of the existing Bonneville ROW between Hayward Road and the proposed Bonneville substation and turbine string E (see Figure 2-1). This ROW is currently a dirt road and is not heavily used by Bonneville. The Applicant's plans for upgrading this ROW are discussed in Section 3.10.4, Mitigation Measures.

During the EIS scoping process, members of the public requested that the EIS describe future uses of project maintenance roads and whether they could be used as residential access routes through leased property, as well as address the project's impacts on roads currently closed for the winter. According to the Applicant, turbine maintenance roads would be available for the use of the fee owners of the affected parcels. The Applicant would also provide a master key to local emergency responders to allow access to all project maintenance roads (Sagebrush Power Partners LLC 2003c).

The northern potion of Hayward Road is the only public road that the Applicant proposes to use for project construction and operations that is currently closed for the winter. The Applicant has proposed measures to upgrade and maintain this roadway through all phases of the project (see Section 3.10.4, Mitigation Measures). Potential upgrades to the southern portion of Hayward Road are being discussed in negotiations with Kittitas County Fire District No. 1 (see Section 3.13, Public Services and Utilities, for further discussion).

There would be no public access to project facilities on privately owned land during construction, operations and maintenance, or decommissioning of the project. Any access provisions for project facilities located on land owned by Washington DNR would be arranged in coordination with DNR, in conjunction with the Applicant's land lease, and according to agency guidelines. Appropriate measures to protect public safety would be incorporated in any access provisions for DNR lands in the project site.

Tourism-Induced Traffic

During the EIS scoping process, members of the public requested that the traffic impacts associated with tourism generated by project operations be addressed as part of the EIS analysis. Tourists who visit the project area could affect local traffic patterns and road safety. The Kittitas County Department of Public Works specifically requested that the EIS address the impacts of tourism on Bettas and Hayward roads.

As is occurring in southeast Washington at the wind turbine development near Walla Walla, visits to the project area by tourists can be expected. Examples of potential environmental effects attributable to increased tourism include degradation of the level-of-service on project area roadways such as US 97 and Bettas Road from increased automobile and bus trips and increased demand for parking at the O&M facility/public viewing area. However, the number of vehicle trips, both buses and private cars, that would be associated with the KVWPP as a tourist attraction is unknown. Similarly, it is unknown to what extent visitors attracted to the project area would represent new tourists that otherwise would not have visited the area. Therefore, without specific data, the environmental effects of tourism are considered an issue of uncertainty that has yet to be resolved. The Applicant proposes to construct an information kiosk and public viewing area near the proposed O&M facility off Bettas Road (see Section 3.10.4, Mitigation Measures). This kiosk would minimize potential tourist-generated traffic impacts on state and county roads.

Decommissioning Impacts

Impacts from decommissioning activities would be similar to those for construction. However, assuming that the roadways would remain in place, heavy vehicle trips would primarily consist of trucks carrying wind turbines and transformers and the resulting workforce and vehicle trips would be smaller. Mitigation at the time of decommissioning would be implemented and would likely be similar to that recommended for construction.

3.10.3 Impacts of No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated, and the environmental impacts described in this section would not occur. The No Action Alternative assumes that future development would comply with existing zoning requirements for the project area, which is zoned Agriculture-20 and Forest and Range.

Background growth projections (without the project) are based on past county and state growth and take into account any known large capital projects. A 2% growth factor was assumed in establishing impacts on future background levels of traffic.

Local policies are intended to maintain public road service at or above an accepted level of service determined by the county. Roadways that would experience heavy truck traffic can be assessed on an individual basis by the county during the project. All of the roadways in the study boundaries currently provide LOS C or better.

Table 3.10-8 describes the existing and future daily peak-hour traffic volumes and LOSs without any project traffic impacts. It is estimated that during the peak hour in 2004, all roadways in the project vicinity would function at LOS C or better without the project.

Table 3.10-8: Existing, Future Daily, and Peak-Hour Traffic Volumes and LOS without Project

Roadway	No. of Lanes	Daily		Estimated Directional Peak Hour without Project			
		2001	2004	2001	LOS	2004	LOS
I-90 (west of US 97)	4	22,000	22,660	1,210	B	1,283	B
US 97 (north of I-90)	2	2,800	2,884	280	C	297	C
US 97 (south of Bettas Rd.)	2	2,200	2,266	220	C	233	C
Bettas Road	2	26	27	3	A	3	A
Hayward Road	2	24	25	3	A	3	A

Source: WSDOT 2001; City of Cle Elum 2001

If the proposed project is not constructed, it is likely that the region's need for power would be addressed by developing a gas-fired combustion turbine. Because constructing and operating a gas-fired combustion turbine is a predictable consequence of not building the project, it is considered a predictable outcome of the No Action Alternative (Bonneville et al. 2002). Constructing a power generation facility other than the proposed project could have transportation impacts. The intensity and significance of transportation impacts would depend on the site-specific design and location of the generation facility.

3.10.4 Mitigation Measures

Mitigation Measures Proposed by the Applicant

Construction Traffic Control

The following mitigation measures are proposed to reduce the impact of project construction on roadway traffic in the region:

- The Applicant would prepare a Transportation Management Plan (TMP) that would be reviewed and approved by WSDOT and Kittitas County. The TMP would direct and obligate the contractor to implement procedures that would minimize traffic impacts;
- The TMP would include coordination between project-related construction traffic and WSDOT planned construction projects;
- Any oversize or overweight vehicles would comply with applicable state and county requirements, as permitted by WSDOT and Kittitas County.
- The Applicant would provide notice to landowners when construction takes place to help minimize access disruptions;
- The Applicant would provide proper road signs and warnings of "Equipment on Road," "Truck Access," or "Road Crossings";
- When slow or oversized wide loads are in transit to and from the site, advance signs and traffic diversion equipment would be used to improve traffic safety. Pilot cars would be used as WSDOT codes dictate depending on load size and weight. Permits would be obtained for these oversized or overweight vehicles as required by WSDOT and Kittitas County;
- The Applicant would construct necessary site access roads and entrance driveways that would be able to service truck movements of legal weight;
- The Applicant would encourage carpooling for the construction workforce to reduce traffic volume;
- In consultation with Kittitas County, the Applicant would provide detour plans and warning signs in advance of any traffic disturbances;
- The Applicant would employ flaggers as necessary to direct traffic when large equipment is exiting or entering public roads to minimize risk of accidents;
- One travel lane would be maintained at all times.

Hazardous Materials Transport

- Transportation of hazardous materials would be conducted in a manner that protects human health and the environment and is in accordance with applicable federal and WSDOT requirements.

Access Road Construction

- The access road from US 97 would be constructed with slopes and culverts designed according to WSDOT and Washington State access management standards under Title 468 WAC and Chapter 47.50 RCW. Access from county roads (Bettas or Hayward) would also be constructed with the appropriate slopes and culverts in accordance with Kittitas County standards.

Roadway Maintenance

- The Applicant proposes to upgrade the northern portion of Hayward Road prior to construction to allow passage of heavy equipment and trucks and to restore this portion of Hayward Road to a condition equal to or better than its present condition after construction is completed.
- The Applicant would consult with the Kittitas County Department of Public Works to determine the specific requirements for any improvement and restoration to Hayward Road (and any other county roads used by the project).
- The Applicant proposes to take responsibility for ongoing maintenance to the northern portion of Hayward Road that is necessitated by the project's operation. Assuming the County chooses to keep Hayward Road closed for the winter, the Applicant would coordinate with the County to keep non-project vehicles off this road during the closure period.
- The Applicant plans to submit an Application for Proposed Use of ROW to Bonneville for joint use of the 1-mile section of ROW between Hayward Road and the proposed Bonneville substation and turbine string E. With Bonneville approval, the Applicant proposes to upgrade this section of ROW from dirt to gravel surface and would assume responsibility for maintenance of this section of ROW.

Tourism-Induced Traffic

- The Applicant proposes to construct an information kiosk and public viewing area near the proposed O&M facility off Bettas Road. Signs would be provided to direct tourists to this site (see Section 2.2.3, Facilities). This measure would minimize tourist-generated traffic impacts on county roadways.

Additional Recommended Mitigation Measures

Construction Traffic Control

- The Applicant should consult and coordinate with WSDOT and Kittitas County to identify additional temporary measures that could be implemented to improve LOS along US 97 north during the construction period.

Parking

To ensure that adequate parking is provided to accommodate both project employees at the O&M facility and tourists attracted to the project area, the following mitigation measure is recommended:

- The Applicant should monitor the volume of tourists visiting the proposed viewing area to determine if overflow parking is required. If additional parking is needed, the Applicant could identify and create an adjacent overflow parking area. The specific location of an overflow parking area should be sited so that tourist traffic does not conflict with employee access into and out of the O&M facility and no additional environmental impacts are caused.

Traffic Safety

In the absence of projected increased traffic volumes at the intersection of US 97 and Bettas Road, WSDOT recommends the following mitigation measure to improve traffic safety at this intersection during project operations (WSDOT 2003b):

- WSDOT would monitor the incidence of traffic accidents at the intersection of US 97 and Bettas Road. If, within a five-year time period, WSDOT determines that channelization improvements at the intersection of US 97/Bettas Road are necessary to reduce accidents caused by additional turning traffic, the Applicant should be responsible for all costs associated with the safety improvement. The safety improvement would be limited to a northbound left-turn lane, a southbound right-turn lane, or both. The time period for monitoring would begin at the time of development approval.

Aviation Safety

To ensure that the project would not create hazards to aviation under any of the project scenarios, the following mitigation measure is recommended:

- If the Applicant's final proposal differs from the proposal submitted to, reviewed, and approved by the FAA in terms of number, siting, or size of proposed turbines, the Applicant should notify the FAA of these changes and secure any additional "Determinations of No Hazard to Air Navigation," as warranted.

3.10.5 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts are associated with the transportation element of the proposed project. The Applicant has proposed several mitigation measures to minimize traffic impacts along all project area roadways.

3.11 AIR QUALITY

This section describes existing air quality conditions in the KVWPP area. It also identifies potential impacts and mitigation measures designed to mitigate (limit) those impacts. The analysis in this section is primarily based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Section 3.2). Where additional information has been used to evaluate the potential impacts associated with the proposal, that information has been referenced.

3.11.1 Regulatory Framework

Existing federal and state air quality regulations were reviewed for the preparation of this section. Both the federal government (through the Environmental Protection Agency [EPA]) and the state government (through Ecology) have established ambient air quality standards and emission limits for sources of regulated air emissions. EPA has established National Ambient Air Quality Standards (NAAQS) for criteria pollutants, including carbon monoxide (CO), particulate matter less than 10 micrometers in size (PM_{10}) and 2.5 micrometers in size ($PM_{2.5}$), ozone, sulfur dioxide, lead, and nitrogen dioxide. NAAQS are air pollution concentration levels against which all areas of the country are evaluated. If an area meets the standards, it is in "attainment" and if it does not, it is considered a "nonattainment area."

New stationary sources of air emissions in nonattainment areas must undergo more rigorous permitting than equivalently sized sources in attainment areas in an effort to bring the nonattainment area back into compliance with the air quality standards. Through the Department of Ecology, the state of Washington has established rules for permitting new sources in both attainment and nonattainment areas of the state, and additional requirements may be imposed by local air authorities. EFSEC issues authorizations for air emissions for sources under its jurisdiction. In general, if potential emissions from stationary sources exceed certain thresholds, approval from the appropriate permitting authority is required before beginning construction. The two most common permits associated with industrial activity emitting regulated air pollutants are Notice of Construction (NOC) approvals and Prevention of Significant Deterioration (PSD) permits. The proposed project would not be required to go through this type of permitting process because wind turbines have no regulated air emissions during operation.

Mobile sources (such as construction equipment and maintenance pickups) are regulated separately under the federal Clean Air Act, including vehicle inspection and maintenance programs, and are not included when determining if a source must go through permitting.

According to WAC 173-400-300, fugitive air emissions are emissions that "do not and which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening." These emissions include fugitive dust from unpaved roads, construction sites, and tilled land. Fugitive emissions are considered in determining the level of air permitting required only for a certain subset of sources, not including wind power projects. However, pursuant to WAC 173-400-040(8)(a) "The owner or operator of a source of fugitive dust shall take reasonable precautions to prevent fugitive dust from becoming airborne and shall maintain and operate the source to minimize emissions."

Construction emissions are not included in permitting of stationary sources. Only emissions from operations are considered in the new source review program.

Notice of Construction/New Source Review

WAC Chapters 463-39 and 173-400 establish the requirements for review and issuance of NOC approvals for new sources of air emissions under EFSEC jurisdiction. A NOC is not required for the proposed project because there would be no permanent sources of regulated air emissions. No backup generation or spinning reserves would be required as part of the proposed project. The only air emissions associated with this project are from construction vehicles and equipment, and from operations and maintenance vehicles, which would comply with all applicable state and federal emissions standards and are not subject to air emissions permit requirements.

Prevention of Significant Deterioration

PSD regulations apply to proposed new or modified sources located in an attainment area that have the potential to emit criteria pollutants in excess of predetermined *de minimus* values (40 CFR Part 51). For new generation facilities, these values are 100 tons per year of criteria pollutants for 28 specific source categories, or 250 tons per year for sources not included in the 28 categories. For the proposed project, a PSD permit would not be required; the generation of electricity with wind turbines does not produce air emissions because no fuel is being burned to produce energy.

3.11.2 Affected Environment

Climate

The proposed project is located in a semi-arid region of south central Washington, at the western edge of the Columbia Basin that includes the Ellensburg Valley, the central plains area in the Columbia Basin. This large province occurs within the rain shadow of the Cascade mountain range, and is characterized by semi-arid conditions, as well as a large range of annual temperatures indicative of a continental climate. Annual precipitation ranges from 7 inches in the drier localities along the southern slopes to 15 inches in the vicinity of the Blue Mountains.

The project site has a strong wind energy resource, which is primarily thermal driven. When warm air rises over the desert-like areas east of Ellensburg, cooler air in the Cascades west of Cle Elum, near Snoqualmie Pass, is drawn through the Kittitas Valley.

Figure 3.11-1 shows a wind energy rose for the project site, generated using data from a 100-foot test tower that was in operation from 1992 to 1994. The table at the bottom of the figure lists the mean speeds for all 16 directions. The wind rose shows that the prevailing winds blow from the west through north-northwesterly directions. The highest wind speeds are from the west and west-northwest direction and generally occur in the spring through summer months (Sagebrush Power Partners LLC 2003c).

Figure 3.11-1

Existing Air Quality

Existing land uses in the project area consist primarily of grazing, rangeland, and low-density residential development. Therefore, sources of existing air pollutants in the project area are limited to vehicle emissions. Kittitas County is classified as an attainment area for all criteria pollutants. This means that ambient air quality in the study area meets the National and Washington Ambient Air Quality Standards (NAAQS/WAAQS).

Ecology has established air pollution monitoring stations throughout the state. No operating air quality monitoring stations for CO or ozone are located in Kittitas County. PM_{10} is monitored in Ellensburg, the largest urban area in Kittitas County, which is approximately 10 miles southeast of the project site. PM_{10} levels monitored in Ellensburg in 2002 reached a maximum concentration of 77 micrograms per cubic meter ($\mu g/m^3$) on January 23, 2002. This maximum 2002 concentration was below the NAAQS/WAAQS for PM_{10} of 150 $\mu g/m^3$ (Rossow, pers. comm., 2003). However, because of the localized nature of particulate matter, concentrations measured at this location may not be representative of the project site.

3.11.3 Impacts of Proposed Action

This section describes potential direct impacts related to air quality for the KVWPP. Direct impacts would occur if air quality approached or exceeded the NAAQS/WAAQS for a pollutant during project construction or operation. These types of direct impacts could be associated with construction, operations and maintenance, or decommissioning of any of the proposed project elements, including the wind turbines and meteorological towers, 19 miles of new gravel access roads, additional power lines, O&M facility, and substations. Indirect impacts in the immediate vicinity are not anticipated because the project is not expected to substantially induce regional growth to the extent that would result in significant changes to offsite air quality. Regional indirect impacts associated with the avoidance of air emissions in the power generation process are discussed below under "Indirect Operations and Maintenance Impacts." Table 3.11-1 summarizes potential air pollutant sources under the three project scenarios. As described in further detail below, air emissions are associated with fugitive dust from construction activities, or with exhaust emissions from motor vehicles.

Table 3.11-1: Summary of Potential Air Quality Impacts

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Construction Impacts			
Equipment and vehicle exhaust emissions	Construction equipment requirements same as middle scenario.	See EIS Table 2-4 for list of construction equipment.	Construction equipment requirements same as middle scenario.
	Up to 658 daily construction trips if gravel is imported from offsite; up to 450 daily trips if no gravel import is required.	Up to 622 daily construction trips if gravel is imported from offsite; up to 462 daily trips if no gravel import is required.	Up to 630 daily construction trips if gravel is imported from offsite; up to 470 daily trips if no gravel import is required.
Fugitive dust emissions	231 total acres disturbed	311 total acres disturbed	371 total acres disturbed
Odors	Limited and negligible	Limited and negligible	Limited and negligible

Table 3.11-1: Continued

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Operations and Maintenance Impacts			
Fugitive dust and exhaust emissions	Up to 28 daily trips	Up to 28 daily trips	Up to 40 daily trips
Odors	None	None	None
Regulated air pollutants	Same as middle scenario	None; avoidance of regulated criteria pollutants in the NAAQS/WAAQS	Same as middle scenario
Greenhouse gas emissions	Same as middle scenario	Indirect avoidance of greenhouse gas emissions from other sources of power generation that would have otherwise been built or operated to produce an equivalent amount of energy	Same as middle scenario
Decommissioning Impacts			
	Similar to those described for construction, however access roads may be left in place so impacts could be lower	Similar to those described for construction, however access roads may be left in place so impacts could be lower	Similar to those described for construction, however access roads may be left in place so impacts could be lower

Source: Sagebrush Power Partners LLC 2003a, f.

Construction Impacts

The primary type of air pollution generated during project construction would be emissions from vehicle and equipment exhaust, and fugitive dust particles from travel on paved and unpaved surfaces. The fugitive dust particles occur when disturbed soils become airborne.

Exhaust Emissions

Heavy trucks and construction equipment powered by gasoline and diesel engines would generate CO, hydrocarbons, nitrogen oxides (NOx), and particulate matter in exhaust emissions. These emissions would be temporary and limited to the immediate area surrounding the construction site. Exhaust emissions would be generated from the following equipment sources used to construct the project:

- Diesel construction equipment used for project site preparation, grading, excavation, and construction;
- Water trucks used to control construction dust emissions;
- Diesel trucks used to deliver equipment, concrete, fuel, and construction supplies to the construction site;
- Diesel cranes used to erect the wind turbines;

- Pickup trucks and diesel trucks used to transport workers and materials around the construction site and from vehicles (cars or trucks) used by workers to commute to the construction site; and
- Diesel-powered welding machines, electric generators, air compressors, etc.

Table 2-4 in Chapter 2 of this EIS shows the estimated type and number of construction equipment that would be used during each phase of construction and the estimated duration (in months) of that particular phase, including site preparation and road construction, turbine foundation construction, and wind turbine assembly and erection. Project construction would generally require approximately the same type, number, and duration of equipment regardless of whether 82 units of large size turbines (lower end scenario) or 150 units of small wind turbines (upper end scenario) are built (Sagebrush Power Partners LLC 2003f). The reason for this is that, even though the lower end scenario would involve constructing larger turbines, there would be fewer of them to erect. However, the specific number of heavy duty truck trips associated with transporting materials to the project site would vary by project scenario, primarily due to differences in the required number of turbine components (e.g., tower sections, hubs, blades, etc.). (See Section 3.10, Transportation, for a detailed discussion of truck trips requirements.)

One of the variables to consider in estimating construction-related air quality impacts from equipment and vehicle exhaust is the amount and source of gravel required to create gravel-compacted road surfaces. The Applicant proposes to secure gravel from local offsite quarries, resulting in heavy truck transportation of the materials to the project site. The daily number of heavy truck trips required to transport gravel to the project site would range from 262 daily trips under the middle scenario to 298 daily trips under the lower end scenario. (Under the lower end scenario, more gravel trucks would be required to support the construction of wider roads to allow for safe passage of larger construction cranes.) Total daily construction trips (employee vehicles and trucks hauling materials) would range from 622 trips under the middle scenario to 658 under the lower end scenario. If gravel is imported from the existing permitted quarry just north of turbine F-1, the number of daily construction trips could be reduced to a range from 450 under the lower end scenario to 470 under the upper end scenario. (The upper end scenario would require a larger number of heavy-duty trucks to transport more turbine components to the project site.) Regardless of the source of the imported gravel, these trips would generate diesel and other exhaust during project construction. However, such short-term emissions from construction sites are exempt from air emission permitting requirements.

Fugitive Dust Emissions

Fugitive dust would be generated by construction-related traffic traveling on paved and unpaved surfaces. If not properly mitigated, fugitive dust could also escape from uncovered trucks carrying materials to the project site. The magnitude of this impact would depend on the number of vehicles operated during construction, and the distance over which transportation occurs. For example, as described above, construction activities would require substantial amounts of gravel to create gravel-compacted road surfaces, resulting in a large number of daily construction trips. The number of truck trips could be reduced if a closer source of gravel was selected.

Disturbing the land for project construction would also cause fugitive dust emissions. Fugitive dust emissions would be associated with land clearing, ground excavation, and cut-and-fill operations. Construction emissions would be greatest during the earthwork phase because most emissions are associated with the movement of dirt on a development site. Fugitive dust emissions would vary from day to day, depending on level of activity, specific operations, and weather conditions (especially precipitation). Depending on which scenario would be constructed, the lower end scenario (up to 82 wind turbines) would have less land disturbed (231 acres) and in turn less fugitive dust emissions than the upper end scenario (up to 150 wind turbines, 371 acres land disturbed). Types of construction activities that could create fugitive dust include road construction and improvements, work area clearing, and blasting foundations and trenches for wind turbines. Although short-term emissions from construction sites are exempt from air quality permitting requirements, the Applicant proposes mitigation measures to minimize fugitive dust impacts (see Section 3.11.5).

Odors

Construction of the proposed project would produce limited odors associated with exhaust from diesel equipment and vehicles but would not result in adverse effects.

Direct Operations and Maintenance Impacts

Emissions Sources

During project operations, travel on the new and upgraded private gravel access roads would generate limited amounts of fugitive dust and CO, hydrocarbon, NOx, and particulate matter emissions. This traffic is expected to consist of weekly or less frequent trips to turbines in service vehicles for maintenance and repair activities (Sagebrush Power Partners LLC 2003a, Section 3.2.4). This impact would be expected to be greatest under the upper end scenario because it would consist of the largest number of turbines (150) that would require maintenance. The number of vehicle trips associated with workers commuting to and from the O&M facility on paved state and county roads would range from 28 daily trips under the lower end and middle scenarios to 40 daily trips under the upper end scenario. Therefore, it is unlikely that the resulting dust would generate a significant air quality impact in excess of the NAAQS/WAAQS.

Odors

Operation of the wind turbines and other project facilities would create no odors because no combustion is involved and no odor-producing materials are used in the operations.

Regulated Air Pollutants

The proposed project would not generate regulated air pollutants. The generation of electricity through wind would avoid emissions of criteria pollutants regulated in the NAAQS/WAAQS from other sources of power that would have otherwise been built or operated to produce an equivalent amount of electricity. For example, an estimated amount of CO_2 emissions resulting from the operation of a 60-aMW combustion turbine facility would be more than 2,000,000 tons per year. Similarly, nitrogen dioxide emissions would be more than 30 tons per year, and carbon monoxide emissions would be more than 50 tons per year (see Section 3.11.4, No Action Alternative, for further discussion).

Indirect Operations and Maintenance Impacts

Global warming is a worldwide problem caused by the combined greenhouse gas emissions throughout the planet. The issue of how emissions from human activities might affect global climate has been the subject of extensive international research over the past several decades. There is now a broad consensus among atmospheric scientists that emissions generated by humans are causing a rise in global temperatures, although there is still uncertainty about the magnitude of future impacts and the best approach to mitigate the impacts. Two sets of key research documents have recently been published.

The United Nations Intergovernmental Panel on Climate Change (IPCC) published its most recent set of five-year progress reports summarizing worldwide research on global warming (IPCC 2001). These reports indicated that some level of global warming related to human activity is likely to occur and there is a significant possibility of severe environmental impacts.

President Bush requested the National Academy of Sciences to provide a brief comprehensive review of the IPCC reports (National Academy of Sciences 2001). The review panel included atmospheric scientists with a range of opinions on future global warming. The National Academy of Sciences review was written in lay terms and focused on addressing several fundamental issues. The panel concurred with most of the findings by the IPCC.

Many air pollutants compose greenhouse gases, each of which exhibits a different chemical tendency to affect global warming. The principal greenhouse gases are carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), tropospheric ozone (O_3), and chlorofluorocarbons (CFCs). Carbon dioxide emitted from an industrial facility persists in the atmosphere for more than 100 years before it is eventually metabolized by plants or absorbed into the oceans (IPCC 2001). During that 100-year lifetime, a parcel of emissions generated anywhere on the planet would disperse throughout the world and affect climate change everywhere. Thus, climate change in Washington would be affected as much by emissions from facilities in China, for example, as by emissions from a local project in Washington State.

Among America’s current energy sources, coal, the largest source of CO_2, the leading greenhouse gas, is used to generate more than half of all the electricity (52%) in the United States. Other sources of electricity are natural gas (16%), oil (3%), nuclear (20%), and hydropower (7%) (AWEA 2002). Table 3.11-2 lists the CO_2 emission factors for typical fossil-fueled generating stations operating today.

Table 3.11-2: Typical CO_2 Emission Factors for Electrical Generating Stations

Generating Station Fuel Type	CO_2 Emission Factor in pound per kilowatt-hour (lbs CO_2 per kW-hr)
Natural gas fuel, conventional gas-fired boiler	1.2
Fuel oil, conventional oil-fired boiler	1.9
Coal, conventional coal-fired boiler	2.1
Other solid fuel generating stations	2.95
Nationwide average for electric utility generating stations (1998)	1.35

Source: Ecology 1999

The proposed wind power project would produce energy while generating only limited amounts of localized non-regulated air emissions, namely from construction activities and vehicular and truck exhaust. However, the specific process of generating electricity with wind turbines does not produce air emissions because no fuel is burned to produce energy. Since fossil fuels are not consumed with the proposed project, greenhouse gas emissions incident to the extraction and transportation of coal, oil, or gas are also avoided.

Although operation of the proposed wind turbines themselves would not produce emissions, the project could still contribute to the generation of greenhouse gas emissions taking into consideration its "total fuel cycle," which includes the processes of manufacturing and transporting project parts and equipment, as well as constructing the project. For example, fabrication and transport of the parts used to construct the project such as the wind turbine towers, generators, and nacelle, which typically occurs in other regions of the country or abroad in Europe, would generate CO_2 emissions. Some believe that the fabrication and transport process in itself could contribute to the global problem of greenhouse gas emissions and result in adverse climate effects. However, according to the American Wind Energy Association, several studies have found that even when the total fuel cycle of a wind power project is considered, CO_2 emissions are on the order of 1% of coal or 2% of natural gas per unit of electricity generated (AWEA 2002).

The actual effect on global warming caused solely by emissions from the KVWPP, either from fabrication, transport, construction, or operations, is unknown. However, the project would likely displace emissions from other sources of power generation such as coal or natural gas-fired power plants that would have otherwise been built or operated to produce an equivalent amount of electricity. As mentioned above under "Regulated Air Pollutants" and discussed further in Section 3.11.4, No Action Alternative, operation of a 60-aMW combustion turbine facility (equivalent energy generated by the proposed wind power project) would generate more than 2,000,000 tons per year of CO_2 emissions. Similarly, nitrogen dioxide emissions would be more than 30 tons per year, and carbon monoxide emissions would be more than 50 tons per year.

Decommissioning Impacts

Potential air quality impacts during project decommissioning would be similar to those described for construction. However, access roads may be left in place so impacts could be lower. Standard mitigation measures implemented to minimize potential impact from construction activities would also be applied to decommissioning activities when necessary.

3.11.4 Impacts of No Action Alternative

Under the No Action Alternative, the project would not be built and the project area would remain in the same condition as it is presently. Temporary dust from construction and operation activities would not occur. However, this does not preclude the development of other projects allowed under current land use zoning from being developed at the project site. The specific type, nature, and extent of future developments at the project site are unknown, and would depend primarily on county growth trends.

Regional electricity needs would either not be filled, leading to long-term shortages, or would be filled through the development and operation of other power generation sources. The most likely alternative to wind generation would be electricity production using combined-cycle combustion turbines fueled by natural gas. Typical environmental impacts associated with combustion of fossil fuels include regulated air pollutant emissions and greenhouse gas emissions.

Table 2-9 in Chapter 2 of this EIS presents estimated annual emissions for a 60-aMW natural gas-fired combined cycle combustion turbine facility from all stages of operation, including onshore gas extraction, transportation, and generation. As shown in Table 2-7, CO_2 emissions were estimated at more than 234,000 tons/year, nitrogen dioxide emissions were estimated at more than 365 tons/year, and carbon monoxide emissions were estimated at more than 130 tons/year (Bonneville and U.S. Department of Energy 1993). However, these emissions estimates were based on 1993 data. Correcting for technology improvements in emissions control over the past decade, project emissions from a 60-aMW natural gas-fired combustion turbine would be expected to be lower, as described below.

The *Stateline Wind Project Environmental Impact Statement* (Walla Walla County 2000), reviewed permits of two facilities currently in operation in the Boardman, Oregon, area: the Portland General Electric Coyote Springs plant, and the Hermiston Generating plant. At the time of that analysis (2000), each of these plants operated two gas-fired turbines of approximately 250 MW each. Using EPA's standard emission factor document *Compilation of Air Pollutant Emission Factors,* Fifth Edition (EPA 2000b), CO_2 emissions were estimated at 120,000 pounds per million cubic feet of gas burned. Using this emission factor, the information in the operating permit for each facility, and adjusting the data to be consistent with a 60-MW plant, CO_2 emissions resulting from the operation of a 60-MW combustion turbine facility would be more than 2,000,000 tons per year. Similarly, nitrogen dioxide emissions would be more than 30 tons per year, and carbon monoxide emissions would be more than 50 tons per year.

3.11.5 Mitigation Measures

Construction of the proposed project would create fugitive dust emissions from construction-related traffic and additional wind-blown dust because of ground disturbance. The proposed project would require mitigation measures to comply with Ecology's regulations to control dust during construction (WAC 173-400-040).

The proposed project would implement a dust control program to minimize any potential disturbance from construction-related dust and to avoid creating a local nuisance or significant environmental impacts. The specific details of the dust control program would depend largely on the timing of construction, which is itself dependent on the date when the project is permitted. For example, a more aggressive dust control effort would be required if major civil construction work occurs in the late dry summer as opposed to early spring (Sagebrush Power Partners LLC 2003g).

Dust suppression would be accomplished through application of either water or a water-based, environmentally safe dust palliative such as lignin, in accordance with the Proposed Dust Abatement Policy developed by Kittitas County Public Works Department. (This draft policy has not been formally adopted by the Board of County Commissioners.) The use of a dust palliative such as lignin (a non-toxic, non-hazardous compound derived from trees) would result in the use of substantially less water for dust suppression (see Section 3.3, Water Resources) and therefore less traffic from water trucks to the construction site. The EPC contractor in consultation with local authorities would make the final decision regarding dust suppression techniques.

The Applicant proposes the following mitigation measures for construction-related air emissions and dust:

- All vehicles used during construction would comply with applicable federal and state air quality and vehicle emission regulations;
- Operational measures such as limiting engine idling time and shutting down equipment when not in use would be implemented;
- Active dust suppression would be implemented on unpaved construction access roads, parking areas and staging areas, using water-based dust suppression materials in compliance with state and local regulations;
- Traffic speeds on unpaved access roads would be kept to 25 mph to minimize generation of dust;
- Carpooling among construction workers would be encouraged to minimize construction-related traffic and associated emissions;
- Disturbed areas would be replanted or graveled to reduce wind-blown dust; and
- Erosion control measures would be implemented to limit deposition of silt to roadways.

No mitigation is proposed for project operations because there would be no regulated air or odor emissions.

3.11.6 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts on air quality are identified. Air quality impacts from the project include low levels of combustion pollutants and dust from vehicles during project construction, operation and maintenance, and decommissioning. Operation of the proposed wind turbine project would not emit air pollutants into the atmosphere except from operational vehicle exhaust. Without substantial emissions from wind turbines operations, it is anticipated that there would be no observable changes in ambient air quality levels locally or within the United States.

3.12 NOISE

This section describes existing noise conditions in the KVWPP area and surrounding area. It also identifies potential impacts and mitigation measures designed to limit those impacts. The analysis in this section is primarily based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Section 4.1.1). Where additional information has been used to evaluate the potential impacts associated with the proposal, that information has been referenced.

3.12.1 Affected Environment

Fundamentals of Acoustics

Sound travels through the air as waves of air pressure fluctuations caused by vibration. Because energy contained in a sound wave is spread over an increasing area as it travels away from the source, loudness decreases with distance. Noise is defined as unwanted sound. There are several ways to measure noise, depending on the source of the noise, the receiver, and the reason for the noise measurement.

A decibel (dB) is the unit used to describe the amplitude of sound. Noise levels are stated in terms of decibels on the A-weighted scale (dBA). This scale reflects the response of the human ear by filtering out some of the noise in the low- and high-frequency ranges that the ear does not detect well. The A-weighted scale is used in most noise ordinances and standards. The equivalent sound pressure level (L_{eq}) is defined as the average noise level for a stated period of time (such as hourly).

The dBA scale is logarithmic. Therefore, individual dBA ratings for different sources cannot be added directly to calculate the sound level for combined sources. For example, two sources, each producing 50 dBA will, when added logarithmically, produce a combined noise level of 53 dBA.

Noise Standards

There are two kinds of noise standards—absolute and relative. An absolute standard is a noise level that should not be exceeded, while a relative standard specifies the permissible increase in noise levels above background noise levels. The Washington State noise regulations specify absolute standards.

Section 173-60 of the WAC provides the applicable noise standards for Washington State, including Kittitas County. Kittitas County has not adopted independent state-approved noise standards pursuant to WAC 173-60-110. WAC 173-60 establishes maximum permissible environmental noise levels. These levels are based on the environmental designation for noise abatement (EDNA), which is defined as an area or zone (environment) within which maximum permissible noise levels are established. There are three EDNA designations (WAC 173-60-030), which generally correspond to residential, commercial/recreational, and industrial/agricultural uses:

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

For the purpose of this analysis, noise-sensitive areas in the project vicinity include Class A and Class C EDNA. Table 3.12-1 summarizes the maximum permissible levels applicable to noise received at noise-sensitive areas (Class A EDNA) and at industrial/agricultural areas (Class C EDNA) from an industrial facility (Class C EDNA).

Table 3.12-1: State of Washington Noise Regulations

Statistical Descriptor	Maximum Permissible Noise Levels (dBA)		
	Class A EDNA Receiver[1]		Class C EDNA Receiver [2]
	Daytime (7 a.m. – 10 p.m.)	Nighttime (10 p.m. – 7 a.m.)	Anytime
L_{eq}	60	50	70
L_{25}	65	55	75
$L_{16.7}$	70	60	80
$L_{2.5}$	75	65	85

Source: WAC 173-60

1 Term used for locations where noise may affect frequent human activities.

2 Standard applies at the property line of the receiving property.

The following are exempted from the limits presented in Table 3.12-1 (per 173-60-050 WAC):

- Construction noise (including blasting) between the hours of 7 a.m. and 10 p.m.
- Motor vehicles when regulated by 173-62 WAC (Motor Vehicle Noise Performance Standards for vehicles operated on public highways).
- Motor vehicles operated off public highways, except when such noise affects residential receivers.

Note that 173-60-50(6) WAC states, “Nothing in these exemptions is intended to preclude the Department [of Ecology] from requiring installation of the best available noise abatement technology consistent with economic feasibility.”

There are no state or Kittitas County regulatory limits for allowable increases above background noise levels caused by industrial projects. However, with regard to increases in A-weighted noise levels, listed below are definitions of how noise can be perceived (Kryter 1970).

- Except in carefully controlled laboratory experiments, the human ear cannot perceive a change of 1 dBA.
- Outside the laboratory, a 3-dBA change is considered a just-perceivable difference.

- A change in level of at least 5 dBA is required before any noticeable change in community response can be expected.
- A 10-dBA change is subjectively heard as approximately a doubling in loudness and would likely cause an adverse community response.

Noise Study Methodology

The study area for the KVWPP noise impact analysis included all areas where residents have the potential to hear construction or operational noise from the project.

The effects of noise on people fall into three general categories:

- Subjective effects of annoyance, nuisance, and dissatisfaction;
- Interference with such activities as speech, sleep, and learning; and
- Physiological effects such as startling and hearing loss.

In most cases, environmental noise produces effects in the first two categories only. However, workers in industrial plants may experience noise effects in the third category. There is no completely satisfactory way to measure the subjective effects of noise, or to measure the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard is primarily a result of the wide variation in individual thresholds of annoyance and adjustment to noise. Thus, an important way of determining a person's subjective reaction to a new noise is by comparing it with the existing or ambient environment to which that person has adapted. In general, the more the level or the tonal (frequency) variations of a noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise will be, as judged by the exposed individual (California Energy Commission [CEC] 2001a).

Table 3.12-2: Sound Pressure Levels of Representative Sounds and Noises

Source	Decibels	Description
Large rocket engine (nearby)	180	
Jet takeoff (nearby)	150	
Pneumatic riveter	130	
Jet takeoff (60 meters)	120	Pain threshold
Construction noise (3 meters)	110	
Subway train	100	
Heavy truck (15 meters), and Niagara Falls	90	Constant exposure endangers hearing
Average factory	80	
Busy traffic	70	
Normal conversation (1 meter)	60	
Quiet office	50	Quiet
Library	40	
Soft whisper (5 meters)	30	Very quiet
Rustling leaves	20	
Normal breathing	10	Barely audible
Hearing threshold	0	

Source: Tipler 1976

The KVWPP noise analysis was based on noise level measurements taken in the field, vendor-supplied noise data associated with the 1.5 MW wind turbines proposed for this project (under the middle scenario), and computer modeling of the turbine strings using the L_{eq} descriptor (see Operations and Maintenance Impacts, below, for further discussion of noise modeling).

Project Area Land Uses and Noise Sources

The project would be located in mostly undeveloped hilly terrain in a rural area with low population density. There are approximately 60 residential structures within 1 mile of the proposed wind turbine strings. Distances range from approximately 790 to 3,230 feet from the closest wind turbine. Figures presented in Appendix D (Noise) show the location of the proposed wind turbines, residences, and property lines. The primary source of noise in the project area is wind and vehicular traffic along US 97 that bisects the project site.

Noise Measurements and Ambient Noise Levels

Ambient (background) noise is defined as the total of all noise in a system or situation, excluding the sound source of interest (USDOT and FHWA 1980). Because the project area and general vicinity are rural and sparsely populated, background noise levels at locations distant from traveled roadways are relatively low. Ambient noise level measurements were measured at three separate locations (referred to as Locations A, B, and C) to describe the existing noise environment and to identify major noise sources in the project area (Figure 3.12-1). Reference wind speeds also were measured at the monitoring locations. Noise measurements were taken between December 1 through 14, 2002. The results of noise measurements at the three monitoring locations are described in further detail below. (See Appendix D for graphics illustrating the results of background noise measurements.)

<u>Location A</u>

Noise measurement Location A is located along Bettas Road, west of proposed turbine string F (see Figure 3.12-1). Ambient hourly L_{eq} noise levels at Location A, measured between December 1 through December 12, 2002, ranged from below 20 dBA to the upper 40s dBA, with an approximate average over the 12-day monitoring period in the mid-40s dBA. Location A followed a common trend, with noise levels decreasing at night and increasing during the day. Wind speeds at this measurement location were always below 10 mph.

<u>Location B</u>

Noise measurement Location B is located along US 97, just south of this roadway's intersection with Bettas Road (see Figure 3.12-1). Ambient hourly L_{eq} noise levels at Location B, measured between December 5 through December 14, 2002, ranged from the low 40s dBA to the mid-60s dBA, with an approximate average over the 10-day monitoring period in the mid-50s dBA. Similar to Location A, Location B followed the same common trend, with noise levels decreasing at night and increasing during the day. Wind speeds at the measurement location were always below 10 mph.

Figure 3.12-1

Location C

Noise measurement Location C is located between proposed turbine strings I and J in the eastern portion of the project area (see Figure 3.12-1). Ambient hourly L_{eq} noise levels at Location C, measured from December 1 through December 12, 2002, ranged from the low 20s dBA to the mid-40s dBA, with an approximate average over the 12-day monitoring period in the upper 30s dBA. Similar to Locations A and B, Location C followed the same common trend, with noise levels decreasing at night and increasing during the day. Wind speeds at the measurement location were not available during the monitoring period because of lack of equipment.

3.12.2 Impacts of Proposed Action

This section evaluates potential noise impacts that could result from construction and operation of the proposed project. Direct impacts would occur if noise levels exceed WAC criteria for maximum permissible noise levels for a particular receptor or land use. Indirect impacts are not anticipated because the project is not expected to substantially induce regional growth to the extent that would result in significant changes to off-site noise. Table 3.12-3 summarizes potential noise impacts under the three project scenarios.

Table 3.12-3: Summary of Potential Noise Impacts

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Construction Impacts			
Noise generated by construction equipment	Same as middle scenario	See EIS Table 2-4 for list of construction equipment	Same as middle scenario
Blasting noise/conflicts with nearby residential land use	Up to 164 blasts for foundation construction	Up to 242 blasts for foundation construction	Up to 300 blasts for foundation construction
Noise generated by construction traffic	330 PM peak-hour trips (Total of 26,730 heavy truck trips with gravel import)	311 PM peak-hour trips (Total of 23,633 heavy truck trips with gravel import)	315 PM peak-hour trips (Total of 24,238 heavy truck trips with gravel import)
Operations and Maintenance Impacts			
Noise generated by wind turbines	Within regulatory limits	Within regulatory limits	Within regulatory limits
Noise generated by high-voltage transmission lines	Within regulatory limits	Within regulatory limits	Within regulatory limits
Noise generated by traffic	Same as middle scenario	24-28 trips daily; no substantial adverse noise effect	36-40 trips daily; no substantial adverse noise effect
Vibration effects	None	None	None
Decommissioning Impacts			
	Similar in type but shorter in duration compared to those anticipated for the construction phase	Similar in type but shorter in duration compared to those anticipated for the construction phase	Similar in type but shorter in duration compared to those anticipated for the construction phase

Source: Sagebrush Power Partners LLC 2003a, c, f.

Construction Impacts

During the construction phase of the proposed project, noise from construction activities would add to the noise environment in the immediate area. Construction activities would be temporary in nature.

Construction Equipment Noise

Residences in the vicinity of the project site could be exposed to moderate to high levels of construction noise associated with grading and earthmoving activities, hauling of materials, building of structures, and construction of turbines towers. Project construction would require approximately the same type, number, and duration of equipment regardless of whether 82 units of large-size turbines (lower end scenario) or 150 units of small wind turbines (upper end scenario) are built (Sagebrush Power Partners LLC 2003f). However, the number of truck trips associated with construction would vary depending on the project scenario (see the discussion of Construction Traffic Noise, below).

WAC 173-60-050 specifically exempts construction activity noise impacts to Class A (residential) properties during daytime hours (between 7 a.m. and 10 p.m.). Construction noise limits are less restrictive because the noise is temporary. Noise generated by construction equipment is expected to vary, depending on the construction phase. Table 3.12-4 summarizes noise levels produced by construction equipment that would likely be used on the project site at various distances.

Table 3.12-4: Noise Levels from Common Construction Equipment

Construction Equipment	Noise Levels at Various Distances (dBA)			
	50 feet	1,000 feet	2,500 feet	5,000 feet
Bulldozer (250 to 700 horsepower)	88	62	54	43
Front-end loader (6 to 15 cubic yards)	88	62	54	43
Truck (200 to 400 horsepower)	86	60	52	41
Grader (13- to 16-foot blade)	85	59	51	40
Shovel (2 to 5 cubic yards)	84	58	50	39
Portable generators (50 to 200 kilowatts)	84	58	50	39
Mobile crane (11 to 20 tons)	83	57	49	38
Concrete pumps (30 to 150 cubic yards)	81	55	47	36
Tractor (3/4 to 2 cubic yards)	80	54	46	35

Source: Barnes et al. 1977.

Blasting Noise

Nearby residents could potentially be disturbed by the project's temporary construction activities, such as blasting for turbine foundations. Blasting activities are specifically exempt from the noise regulations (WAC 173-69-050). It is estimated that these activities would occur for eight weeks during the foundation excavation phase of construction. Due to rocky site conditions, it is anticipated that most wind turbine foundations would require one to two blasts (depending on which one of the three scenarios are built) each over the eight-week construction period (Sagebrush Power Partners LLC 2003a, Section 4.1.1.4.1). Blasting would take place in the daytime during the spring, summer, or fall season. This temporary noise impact would be greatest under the upper end scenario, with up to 300 blasts, because it would require constructing the largest number of wind turbines. (See Chapter 2 of this EIS for further details.) Conversely, the potential noise conflicts with nearby sensitive land uses would be the least under the lower end scenario, with as few as 82 blasts, because it would require constructing the smallest number of wind turbines.

The closest residential structure under the middle scenario is approximately 790 feet from the nearest turbine (H23) (Genson property). However, the majority of structures are located from 1,000 and 3,200 feet from the closest wind turbine (Table 3.12-5). Due to the intermittent and temporary nature of proposed construction activities and the distance of the project site from residents, noise from these activities would not substantially impair residential land uses.

<u>Construction Traffic Noise</u>

Construction vehicles traveling on local roadways and other nearby roads would temporarily increase noise levels. The number of truck trips associated with construction would vary depending on the project scenario. This potential noise impact would be greatest under the lower end scenario because it would result in the greatest number of PM peak-hour trips and total heavy-duty truck trips. For example, if gravel has to be hauled in from an offsite location other than the quarry just north of turbine F1 during project construction, the total number of heavy-duty truck trips would range from approximately 23,600 trips under the middle scenario to approximately 26,730 trips under the lower end scenario. (See Section 3.10, Transportation, for further discussion of construction-generated traffic impacts.) However, this would be temporary and is not anticipated to be an adverse impact.

Operations and Maintenance Impacts

<u>Wind Turbine Noise</u>

The proposed wind turbines could potentially operate 24 hours per day during windy periods, and not at all when winds are calmer. Although the exact turbine model to be used for the proposed project scenario has not been determined, representative values for the type of equipment being considered for the project have been used for this analysis. The selected turbines are expected to be warranted by the manufacturer not to exceed a maximum sound pressure level of 103 dBA with a wind speed of 18 mph at 33 feet from the base of the tower in accordance with the protocol established in International Electrotechnical Commission (IEC) 61400. This is approximately equivalent to a sound pressure level of 72 dBA at 50 feet from the turbine. However, a sound pressure level between 98 and 108 dBA is representative of the range of noise test data for all turbines under consideration for the proposed project (Sagebrush Power Partners LLC 2003f).

Table 3.12-5: Predicted Noise Levels in KVWPP Area

Township	Sect	Parcel Owner[1]	Distance from Structure to Turbine (feet)[2]	Nearest Turbine	Map I.D.[3]	Approx. Noise Level at Structure (dBA)[4] EDNA Class A	Distance from Property Line to Turbine (feet)	Approx. Noise Level at Property Line (dBA)[5] EDNA Class C	Nearest Turbine
T19N R17E	1	Brooke	N/A				1,207	40 - 45	H3
T19N R17E	1	L. Gerean	1,338	H1	59	40 - 45	944	45 - 50	H2
T19N R17E	1	Meyer	N/A				732	45 - 50	H1
T19N R17E	1	T. Gerean	804	H1	58	46	692	45 - 50	H1
T19N R17E	2	Burdyshaw	N/A				144	50 - 55	H6
T19N R17E	2	Burdyshaw	N/A				143	50 - 55	H6
T19N R17E	2	Mathias	N/A				601	45 - 50	H5
T19N R17E	2	S. Fossett	2,376	H4	55	35 - 40	1,063	45 - 50	H4
T19N R17E	2	Sambrano	N/A				253	50 - 55	H7
T19N R17E	3	P. Burke	N/A				180	50 - 55	G8
T19N R17E	4	David Archambeau	2,835	G12	42	40 - 45	1,902	40 - 45	G12
T19N R17E	4	James Stewart	N/A				2,856	35 - 40	F2
T19N R17E	4	Rainbow Ranch	2,519	G10	41	40 - 45	2,274	40 - 45	G10
T19N R17E	9	Anthony	1,662	F6	43	40 - 45	1,491	35 - 40	F6
T19N R17E	9	David Archambeau	N/A				193	50 - 55	F4
T19N R17E	9	Estes	N/A				1,659	40 - 45	D1
T19N R17E	9	Jackson	N/A				2,679	35 - 40	D1
T19N R17E	9	L. Schaller	N/A				2,325	40 - 45	F6
T19N R17E	9	Martin Rand	N/A				1,361	45 - 50	F11
T19N R17E	9	North	2,610	D1	150	35 - 40	2,095	35 - 40	D1
T19N R17E	9	Robertson	1,325	D1	555	42	875	40 - 45	D1
T19N R17E	9	Sean Taylor	1,132	D1	45	40 - 45	410	45 - 50	D1
T19N R17E	9	Slim Jorgensen	N/A				2,841	35 - 40	F2
T19N R17E	9	T. Gaskill	1,995	F7	44	40 - 45	1,795	40 - 45	F6
T19N R17E	9	WSDOT	N/A				1,531	40 - 45	F7
T19N R17E	9	Zeller	N/A				2,767	35 - 40	D1
T19N R17E	11	N. Andrew[6]	1,028	H13	50	49			

Source: Sagebrush Power Partners LLC 2003c, as amended by Sagebrush Power Partners LLC 2003f, h.

1 Property owners in the KVWPP area where turbines are proposed but no structure is present that have not been included in this table include: L. Tritt, Pautzke Bait Co., C. Thomas, D. and M. Green, J. Majors, Cascade Field & Stream, K. Krogstad, and Los Abuelos, Inc.

2 N/A indicates that aerial photography does not show a structure on the property.

3 See noise figures in Appendix D for corresponding Map I.D.

4 The EDNA classification for noise levels at structures is Class A. The maximum permissible daytime noise level at a Class A receptor is an Leq of 60 dBA, and the maximum permissible nighttime noise level at a Class A receptor is an Leq of 50 dBA. Approximate noise levels are presented at a predicted specific level (as opposed to a range) for those parcel owners that approach the 50 dBA nighttime noise threshold.

5 The EDNA classification for noise levels at property lines is Class C. The maximum permissible noise level (daytime or nighttime) at a Class C receptor is an Leq of 70 dBA.

6 In general, noise levels at property lines were not estimated for property owners with signed wind option agreements with the Applicant.

Table 3.12-5: Continued

Township	Sect	Parcel Owner[1]	Distance from Structure to Turbine (feet)[2]	Nearest Turbine	Map I.D.[3]	Approx. Noise Level at Structure (dBA)[4] EDNA Class A	Distance from Property Line to Turbine (feet)	Approx. Noise Level at Property Line (dBA)[5] EDNA Class C	Nearest Turbine
T19N R17E	12	Gagon	2,588	J1	75	35 - 40	141	50 - 55	J1
T19N R17E	12	Gorski	N/A				490	45 - 50	J1
T19N R17E	12	Pentz	N/A				559	50 - 55	J2
T19N R17E	12	Robert Best	N/A				1,809	40 - 45	J1
T19N R17E	13	A. Schwab	2,036	J12	215	40 - 45	483	50 - 55	J12
T19N R17E	13	E. Garrett	N/A				316	50 - 55	J11
T19N R17E	13	Gallagher	N/A				1,286	45 - 50	J5
T19N R17E	13	Gallagher/Steinman	N/A				342	50 - 55	J9
T19N R17E	13	J. Kuhn	N/A				151	50 - 55	J7
T19N R17E	13	J. Sherman	N/A				838	45 - 50	J14
T19N R17E	13	J. Vlasic	N/A				335	50 - 55	J8
T19N R17E	14	M. Genson[6]	788	H23	49	48			
T19N R17E	14	Nelson	1,290	J10	417	48	164	50 - 55	I16
T19N R17E	14	Steinman/Geisick	1,055	J15	117	46	583	45 - 50	I19
T19N R17E	17	Nature Conservancy	N/A				809	40 - 45	A1
T19N R17E	17	Swauk Valley Ranch	N/A				2,820	30 - 35	A1
T19N R17E	20	BLM	N/A				2,032	35 - 40	A2
T19N R17E	21	Holmquist	N/A				1,262	45 - 50	B7
T19N R17E	21	Swauk Valley Ranch	N/A				293	50 - 55	A3
T19N R17E	23	Barkl	2,331	E5	418	35 - 40	930	40 - 45	E5
T19N R17E	23	Bowman	N/A				1,335	40 - 45	I21
T19N R17E	23	Burt	2,530	E5	83	35 - 40	1,383	40 - 45	E5
T19N R17E	23	Burt	2,344	E5	84	35 - 40	1,383	40 - 45	E5
T19N R17E	23	Burt	2,191	E5	85	35 - 40	1,383	40 - 45	E5
T19N R17E	23	Darrow	2,269	E5	86	35 - 40	1,808	35 - 40	E5
T19N R17E	23	Engelstad	2,692	E5	94	35 - 40	1,565	40 - 45	E5
T19N R17E	23	Gordon	N/A				2,929	35 - 40	E5

Source: Sagebrush Power Partners LLC 2003c, as amended by Sagebrush Power Partners LLC 2003f, h.

1 Property owners in the KVWPP area where turbines are proposed but no structure is present that have not been included in this table include: L. Tritt, Pautzke Bait Co., C. Thomas, D. and M. Green, J. Majors, Cascade Field & Stream, K. Krogstad, and Los Abuelos, Inc.

2 N/A indicates that aerial photography does not show a structure on the property.

3 See noise figures in Appendix D for corresponding Map I.D.

4 The EDNA classification for noise levels at structures is Class A. The maximum permissible daytime noise level at a Class A receptor is an Leq of 60 dBA, and the maximum permissible nighttime noise level at a Class A receptor is an Leq of 50 dBA. Approximate noise levels are presented at a predicted specific level (as opposed to a range) for those parcel owners that approach the 50 dBA nighttime noise threshold.

5 The EDNA classification for noise levels at property lines is Class C. The maximum permissible noise level (daytime or nighttime) at a Class C receptor is an Leq of 70 dBA.

6 In general, noise levels at property lines were not estimated for property owners with signed wind option agreements with the Applicant.

Table 3.12-5: Continued

Township	Sect	Parcel Owner[1]	Distance from Structure to Turbine (feet)[2]	Nearest Turbine	Map I.D.[3]	Approx. Noise Level at Structure (dBA)[4] EDNA Class A	Distance from Property Line to Turbine (feet)	Approx. Noise Level at Property Line (dBA)[5] EDNA Class C	Nearest Turbine
T19N R17E	23	Higginbotham	2,757	E5	89	35 - 40	2,567	35 - 40	E5
T19N R17E	23	Higginbotham	2,885	E5	90	35 - 40	2,567	35 - 40	E5
T19N R17E	23	Holister	N/A				145	50 - 55	J15
T19N R17E	23	J. Campbell	N/A				362	45 - 50	E5
T19N R17E	23	Kimbler	N/A				2,809	35 - 40	J15
T19N R17E	23	M. Campbell	1,841	E5	82	40 - 45	362	45 - 50	E5
T19N R17E	23	Millett	N/A				1,006	45 - 50	E4
T19N R17E	23	Millett	N/A				1,563	40 - 45	I21
T19N R17E	23	Murphy	N/A				2,818	35 - 40	J15
T19N R17E	23	Price	1,968	J15	80	35 - 40	1,275	40 - 45	J15
T19N R17E	23	R. Wines	N/A				1,970	40 - 45	I21
T19N R17E	23	R. Wines/L. Snover	2,479	J15	81	35 - 40	855	40 - 45	I21
T19N R17E	23	Schults	2,524	E5	87	35 - 40	2,218	35 - 40	E5
T19N R17E	23	Schults	2,401	E5	88	35 - 40	2,218	35 - 40	E5
T19N R17E	23	Schults	N/A				360	45 - 50	E5
T19N R17E	23	Tate	N/A				2,685	35 - 40	E5
T19N R17E	23	Winkle	2,882	E5	93	35 - 40	2,300	35 - 40	E5
T19N R17E	23	Zellmer	1,797	E3	48	40 - 45	1,350	40 - 45	I21
T19N R17E	24	DNR	N/A				1,039	45 - 50	J15
T19N R17E	26	Clayburn	3,230	C5	100	35 - 40	2,264	35 - 40	C5
T19N R17E	26	Engelstad	N/A				2,247	35 - 40	C4
T19N R17E	26	Heistand	N/A				1,740	30 - 35	C5
T19N R17E	26	Jones	N/A				2,050	35 - 40	C4
T19N R17E	26	KRD (Canal)	N/A				926	40 - 45	C5
T19N R17E	26	Poulin	N/A				935	40 - 45	C5
T19N R17E	26	Ptaszynski	2,265	C5	101	35 - 40	1,472	35 - 40	C5
T19N R17E	26	Reilley	N/A				1,884	35 - 40	C4

Source: Sagebrush Power Partners LLC 2003c, as amended by Sagebrush Power Partners LLC 2003f, h.

1 Property owners in the KVWPP area where turbines are proposed but no structure is present that have not been included in this table include: L. Tritt, Pautzke Bait Co., C. Thomas, D. and M. Green, J. Majors, Cascade Field & Stream, K. Krogstad, and Los Abuelos, Inc.

2 N/A indicates that aerial photography does not show a structure on the property.

3 See noise figures in Appendix D for corresponding Map I.D.

4 The EDNA classification for noise levels at structures is Class A. The maximum permissible daytime noise level at a Class A receptor is an Leq of 60 dBA, and the maximum permissible nighttime noise level at a Class A receptor is an Leq of 50 dBA. Approximate noise levels are presented at a predicted specific level (as opposed to a range) for those parcel owners that approach the 50 dBA nighttime noise threshold.

5 The EDNA classification for noise levels at property lines is Class C. The maximum permissible noise level (daytime or nighttime) at a Class C receptor is an Leq of 70 dBA.

6 In general, noise levels at property lines were not estimated for property owners with signed wind option agreements with the Applicant.

Table 3.12-5: Continued

Township	Sect	Parcel Owner[1]	Distance from Structure to Turbine (feet)[2]	Nearest Turbine	Map I.D.[3]	Approx. Noise Level at Structure (dBA)[4] EDNA Class A	Distance from Property Line to Turbine (feet)	Approx. Noise Level at Property Line (dBA)[5] EDNA Class C	Nearest Turbine
T19N R17E	26	Six-Ten Investment	N/A				977	40 - 45	C5
T19N R17E	26	Tate	3,000	C5	99	35 - 40	2,685	35 - 40	E5
T19N R17E	27	Basterrechea	N/A				2,289	35 - 40	B11
T19N R17E	27	KRD (Canal)	N/A				200	50 - 55	C5 & B12
T19N R17E	27	Neuman	N/A				2,268	35 - 40	B11
T19N R17E	27	Pearson	N/A				733	40 - 45	B12
T19N R17E	28	George	N/A				2,283	35 - 40	B11
T19N R17E	28	Holmquist	N/A				1,733	40 - 45	B7
T19N R17E	28	Neuman	N/A				2,751	35 - 40	B11
T19N R17E	28	Pearson	1,976	B9	47	40 - 45	1,197	40 - 45	B9
T19N R17E	28	Pearson	1,897	B11	118	35 - 40	1,197	40 - 45	B9
T19N R17E	28	Schoeber	N/A				466	45 - 50	B7
T19N R17E	28	Tonseth	N/A				2,068	30 - 35	B8
T19N R17E	34	Buck	N/A				2,267	30 - 35	B12
T19N R17E	34	C. Wright	N/A				2,304	30 - 35	B12
T19N R17E	34	Der Yuen	N/A				1,918	35 - 40	B12
T19N R17E	34	Fonken	N/A				2,789	30 - 35	B12
T19N R17E	34	K. Smith	N/A				2,566	30 - 35	B12
T19N R17E	34	Kittitas Co Tax Deed	N/A				2,579	30 - 35	B12
T19N R17E	34	Levin	N/A				2,886	30 - 35	B12
T19N R17E	34	Pollock	N/A				1,848	35 - 40	B12
T19N R17E	34	Schober	N/A				1,728	35 - 40	B12
T19N R17E	34	WSDOT	N/A				2,206	30 - 35	B12
T19N R17E	34	Zeigler	N/A				2,623	30 - 35	B12
T19N R17E	35	Ellensburg Ranches	N/A				2,813	30 - 35	C5
T19N R17E	35	Gerald Boose	N/A				2,579	35 - 40	C5
T19N R18E	7	C. Thompson	N/A				2,769	35 - 40	J1

Source: Sagebrush Power Partners LLC 2003c, as amended by Sagebrush Power Partners LLC 2003f, h.

1 Property owners in the KVWPP area where turbines are proposed but no structure is present that have not been included in this table include: L. Tritt, Pautzke Bait Co., C. Thomas, D. and M. Green, J. Majors, Cascade Field & Stream, K. Krogstad, and Los Abuelos, Inc.

2 N/A indicates that aerial photography does not show a structure on the property.

3 See noise figures in Appendix D for corresponding Map I.D.

4 The EDNA classification for noise levels at structures is Class A. The maximum permissible daytime noise level at a Class A receptor is an Leq of 60 dBA, and the maximum permissible nighttime noise level at a Class A receptor is an Leq of 50 dBA. Approximate noise levels are presented at a predicted specific level (as opposed to a range) for those parcel owners that approach the 50 dBA nighttime noise threshold.

5 The EDNA classification for noise levels at property lines is Class C. The maximum permissible noise level (daytime or nighttime) at a Class C receptor is an Leq of 70 dBA.

6 In general, noise levels at property lines were not estimated for property owners with signed wind option agreements with the Applicant.

Table 3.12-5: Continued

Township	Sect	Parcel Owner[1]	Distance from Structure to Turbine (feet)[2]	Nearest Turbine	Map I.D.[3]	Approx. Noise Level at Structure (dBA)[4] EDNA Class A	Distance from Property Line to Turbine (feet)	Approx. Noise Level at Property Line (dBA)[5] EDNA Class C	Nearest Turbine
T19N R18E	7	Lockhart	N/A				2,925	35 - 40	J1
T19N R18E	7	Szuba	N/A				2,778	35 - 40	J1
T20N R17E	34	P. Burke	2,795	G1	151	35 - 40	546	45 - 50	G2
T20N R17E	34	P. Burke	2,592	G1	152	35 - 40	546	45 - 50	G2
T20N R17E	34	U.S. Timber	N/A				151	50 - 55	G1
T20N R17E	35	C. Mannahan	N/A				2,618	35 - 40	H1
T20N R17E	35	Hampton	N/A				2,680	35 - 40	G1
T20N R17E	35	J. Moery	2,499	H1	56	35 - 40	2,147	30 - 35	H1
T20N R17E	35	J. Wilson	3,034	G1	221	35 - 40	2,092	40 - 45	G1
T20N R17E	35	Korthanke	2,521	H1	27	35 - 40	2,239	35 - 40	H1
T20N R17E	35	M. Dickerson	N/A				2,489	35 - 40	H1
T20N R17E	35	R. Weiler	N/A				2,117	40 - 45	H1
T20N R17E	35	S. Oslund	1,115	H1	216	40 - 45	821	40 - 45	H1
T20N R17E	35	S. Oslund	N/A				1,033	45 - 50	H1
T20N R17E	35	Sandall	2,747	G1	13	35 - 40	2,089	35 - 40	G1
T20N R17E	35	Slape	N/A				2,891	35 - 40	H1
T20N R17E	35	W. Flowers	N/A				2,546	35 - 40	G1
T20N R17E	36	DNR	N/A				1,082	40 - 45	H1

Source: Sagebrush Power Partners LLC 2003c, as amended by Sagebrush Power Partners LLC 2003f, h.

1 Property owners in the KVWPP area where turbines are proposed but no structure is present that have not been included in this table include: L. Tritt, Pautzke Bait Co., C. Thomas, D. and M. Green, J. Majors, Cascade Field & Stream, K. Krogstad, and Los Abuelos, Inc.

2 N/A indicates that aerial photography does not show a structure on the property.

3 See noise figures in Appendix D for corresponding Map I.D.

4 The EDNA classification for noise levels at structures is Class A. The maximum permissible daytime noise level at a Class A receptor is an Leq of 60 dBA, and the maximum permissible nighttime noise level at a Class A receptor is an Leq of 50 dBA. Approximate noise levels are presented at a predicted specific level (as opposed to a range) for those parcel owners that approach the 50 dBA nighttime noise threshold.

5 The EDNA classification for noise levels at property lines is Class C. The maximum permissible noise level (daytime or nighttime) at a Class C receptor is an Leq of 70 dBA.

6 In general, noise levels at property lines were not estimated for property owners with signed wind option agreements with the Applicant.

Modeled Noise Levels

To collect meaningful noise data for a wind turbine project, the wind must be moving fast enough to at least engage the wind turbine blades (between 7 to 10 mph). When these windy conditions exist, they often result in significant wind noise on the microphone that adversely affects the quality of the noise data collected. Accurate noise measurements require high enough wind speeds at the turbine to generate noise and low enough wind speeds at the measurement location to avoid wind-induced microphone noise. Therefore, although background noise measurements were collected (as described above in the Affected Environment section), the project's noise impact analysis is based on manufacturers' noise emissions data available for the proposed 1.5-MW wind turbine supplied by the vendor and internationally recognized noise modeling standards. The procedures for determining sound pressure levels from wind turbines are defined in IEC 61400 Wind Turbine Generator Systems Part 11: Acoustic Noise Measurement Techniques (Reference Number: IEC 61400-11:1998[E]). The measurement technique outlines procedures to determine corrections for background noise, apparent sound pressure level, and wind speed dependence (Sagebrush Power Partners LLC 2003c).

Noise modeling was based on a turbine sound pressure level of approximately 103 dBA. In general, if the sound pressure level decreases by 5 dBA (103 down to 98 dBA) the resulting sound pressure levels at the receivers would also decrease by approximately 5 dBA. The shape of the sound pressure level contours would not change. However, their value would be adjusted downward by 5 dBA (i.e., the current 45 dBA contour would be relabeled as the 40 dBA contour). Similarly, if the turbine sound pressure level increased, the resulting sound levels and contours would be adjusted upward. A sound pressure level between 98 and 108 dBA is representative of the range of turbine noise test data for all the turbines under consideration for the proposed project (Sagebrush Power Partners LLC 2003f). Therefore, the estimated noise levels at structures and property lines in Table 3.12-5 could be +/-5 dBA, which could in turn exceed regulatory thresholds.

Middle Scenario

Daytime noise levels for residential structures (Class A EDNA) are required by 173-60 WAC not to exceed 60 dBA, while nighttime levels are not to exceed 50 dBA. Table 3.12-5 identifies properties in the project area located within 3,000 feet of a proposed turbine, the distance between structures (if any) to the closest wind turbine, the distance between property lines and the closest wind turbine, and the predicted noise level at structures and property lines with an assumed wind speed of 18 mph. Figures illustrating predicted noise contours in the project area in relation to existing structures and property lines are contained in Appendix D. As summarized in Table 3.12-5, the middle scenario is anticipated to result in noise levels ranging from 35 to 49 dBA. The results indicate that noise levels would be below the most restrictive nighttime regulation of 50 dBA. Therefore, no significant noise impacts to Class A properties are anticipated during the daytime or nighttime operations of the proposed project. However, regulatory thresholds might be exceeded if the sound pressure level for the turbine selected for construction is greater than the modeled scenario. See Section 3.12.4 for recommended mitigation measures to address this issue.

Noise levels for Class C EDNA (industrial/agricultural) are not to exceed 70 dBA at property lines. Noise levels at the property lines of Class C parcels within the project area range from a minimum of 35 dBA to a maximum of 55 dBA (see Table 3.12-5) for the middle scenario. Because the predicted noise level is below the threshold established for Class C properties by the WAC, no significant noise impacts are anticipated.

Upper and Lower End Scenarios

Section 2.2.1, Project Overview, in Chapter 2, Proposed Action and Alternatives describes the three project scenarios. Wind turbine heights could range from a low of 260 feet under the upper end scenario to a high of 410 feet under the lower end scenario. However, the height of the wind turbine has very little bearing on the noise level at the analyzed receivers or property lines. For the three project scenarios under consideration, no measurable noise difference is anticipated. Typically the distance between larger turbines (lower end scenario, up to 82 wind turbines constructed) is greater than between those of smaller turbines (upper end scenario, up to 150 wind turbines constructed). This is because the lower end scenario would have fewer turbines per string than the upper end scenario. It is anticipated that noise levels from either scenario (upper end versus lower end) would be very similar to the modeled middle scenario (see Appendix D) in which distances from a receiver to the closest wind turbine would dictate noise levels (Sagebrush Power Partners LLC 2003f).

<u>Increase in Ambient Background Noise Levels</u>

Ambient background noise levels were not measured at specific project area receptors. However, general observations can be made based on available data. As described above in the Affected Environment section, ambient background noise levels were measured over several days at three locations within the project area. Throughout the measurement period, wind speed at Location A and B measurement sites never exceeded 10 mph. Noise levels varied throughout the day and for the most part depended upon wind speeds.

Predicted noise levels during project operation at the residences closest to noise measurement Location A (owners Anthony and Gaskill) ranged between 40 to 45 dBA. This corresponds to the ambient average L_{eq} dBA measured in the mid-40s. Predicted operational noise levels at the two structures closest to noise measurement Location B (owners Zellmer and Genson) resulted in noise levels ranging between 40 to 48 dBA. These are lower than the ambient noise levels in this area with an L_{eq} average measured in the low to mid-50s dBA. Based on this comparison, the anticipated difference between the measured ambient and predicted noise levels at these receptors should not be a perceived as a noticeable increase. Location C had an average L_{eq} dBA over the 12-day monitoring period in the mid- to upper 30s. Predicted noise levels during project operations at the residences closest to this measurement location (owners Nelson and Steinman/Geisick) ranged between 46 to 48 dBA. Therefore, the anticipated difference between the measured ambient and predicted noise levels in this part of the project area could be subjectively heard as approximately a doubling in loudness and would likely cause an adverse community response.

As stated in Section 3.12.1 above, there are no state or Kittitas County regulatory limits regarding an allowable increase above background noise levels caused by industrial projects. Noise modeling results indicate that project operations would not exceed regulatory threshold levels. Furthermore, the Applicant has entered into wind option agreements with landowners on whose property wind power facilities are proposed. These agreements contain provisions for generally accepting the impacts (including noise effects) of having these turbines on their property (Taylor, pers. comm., 2003). However, lack of a regulatory standard does not preclude the possibility that changes in background noise levels could be perceived as adverse depending on the magnitude of that change and the nature of the receptor. Given the variation in the size and location of proposed turbines under the three project scenarios, distances between turbines and receptors, and effects of wind speed, perceived changes in noise levels throughout the project area would be variable, and could range from no perceived effect to an adverse effect. Given the level of concern raised by the public about the potential effects of operational noise and the variability of final turbine sizes and locations, mitigation measures are recommended below to ensure that project operations comply with applicable regulatory thresholds to protect nearby receptors from adverse noise effects.

High Voltage Transmission Line Noise

Noise associated with operation of proposed high-voltage transmission lines would be corona noise during infrequent wet or foggy weather. Corona noise is a low-frequency hum (120 hertz) and crackling caused by partial breakdown of the insulting properties of air surrounding the electric conductor of the transmission line (Bonneville and EFSEC 2002). The high-voltage transmission lines associated with the project would be short (less than 200 feet long) and connect the proposed substations to existing high-voltage overhead transmission lines (either Bonneville or PSE). Audible noise from the transmission lines would comply with the Bonneville Power Administration's limits, namely an L_{50} level of 50 dBA at the edge of the right-of-way (Perry 1982). There are no existing dwellings within the right-of-way of the transmission lines. Therefore, corona noise is not expected to pose a significant noise impact.

Traffic Noise

Project operations would generate a small amount of traffic on local area roadways as workers commute to and from the O&M facility. The primary access route to the O&M facility would be US 97. Traffic noise levels depend on volume, speed, percentage of trucks, topography, vegetation, and distance from the roadway to the receptor. For example, roadway noise levels typically decrease 3 dB over hard ground (concrete or pavement) and 4.5 dB over soft ground (grass) for every doubled distance between the source and the receptor. Vehicular noise is a combination of noises from the engine, exhaust, and tires. It is estimated that daily worker trips to and from the O&M facility would range from between 24-28 trips under the lower end and middle scenarios, to 36-40 trips under the upper end scenario (see Section 3.10, Transportation). Given the magnitude of projected operational trips, this minor increase in traffic along US 97 would not generate substantial adverse noise effects.

Traffic between the O&M facility and individual turbines along project access roads would be minimal during operations because scheduled maintenance is generally performed only every six months on each turbine. This traffic would consist largely of weekly or less frequent trips to turbines in service vehicles for maintenance and repair activities. Therefore, vehicular noise generated along access roads during routine turbine maintenance activities would be infrequent and would not result in substantial adverse noise effects.

Vibration

During the EIS scoping process, the public expressed concern about the potential for project operations to generate and transmit vibration through the ground over considerable distances. Specific concerns ranged from the potential for vibration to disturb residents and wildlife as well as potential adverse effects to local groundwater wells.

Vibration can sometimes occur in connection with combustion turbine installations. Combustion turbines are capable of producing high levels of low-frequency noise. Low-frequency noise can couple with wood frame walls and windows to cause a mild but perceptible vibration. While these sound levels are virtually inaudible, the vibration may cause an adverse reaction (Bonneville and EFSEC 2002).

The Applicant and its consulting team indicate they are not aware of any wind turbine project where ground-borne vibration from an operating wind turbine has adversely affected nearby receptors or uses (Sagebrush Power Partners LLC 2003c). An Internet search by the EIS consultant also failed to identify research, reports, or other information to substantiate this concern. Therefore, it is the independent conclusion of the EIS authors that the proposed project would not result in any significant impacts from ground-borne vibration (Reed, pers. comm., 2003).

Decommissioning Impacts

Decommissioning activities would be similar in type but shorter in duration compared to those anticipated for the construction phase. Noise generated during decommissioning activities would be conducted between 7 a.m. and 10 p.m. No blasting would be required, resulting in lower noise levels than for construction. The same mitigation measures recommended during construction could also be used during the decommissioning phase.

3.12.3 Impacts of No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated, and the environmental impacts described in this section would not occur. The No Action Alternative assumes that future development would comply with existing zoning requirements for the project area, which is zoned Agriculture-20 and Forest and Range. According to the county’s zoning code, the Agriculture-20 zone is dominated by farming, ranching, and rural lifestyles, and permitted uses include residential and agriculture and forestry practices. Permitted uses in the Forest and Range zone include logging, mining, quarrying, and agricultural practices, as well as residential uses (Kittitas County 1991).

If the proposed project is not constructed, it is likely that the region's need for power would be addressed by developing a gas-fired combustion turbine. Because constructing and operating a gas-fired combustion turbine is a predictable consequence of not building the project, it is considered a predictable outcome of the No Action Alternative (Bonneville et al. 2002). Both the construction and operational impacts of a gas-fired combustion turbine are more noise-intensive than the proposed wind generation project. Construction impacts from a conventional gas turbine plant can exceed 110 dBA at 100 feet during steam blowdown activities, and operational noise levels can exceed 80 dBA at 100 feet (CEC 2001b). The noise impacts of a gas turbine generator would depend on its location and design. In some settings, it could be considered highly incompatible with the existing environment; however, in the appropriate location, noise impacts could be minor.

3.12.4 Mitigation Measures

Mitigation Measures Proposed by the Applicant

- Substation transformers and high-voltage switching equipment would be specified or designed to comply with the 70 dBA limit at all Class C EDNA property lines and 50 dBA at all Class A EDNA structures (Sagebrush Power Partners LLC 2003c).

Additional Recommended Mitigation Measures

Construction

Although no specific receivers are identified as being adversely affected by construction noise, the following contractor practices are recommended to minimize the effects of construction noise in the project area:

- Implement work-hour controls so that noisy activities occur between 7 a.m. and 10 p.m., which would reduce the impact during sensitive nighttime hours.
- Maintain equipment in good working order and use adequate mufflers and engine enclosures to reduce equipment noise during operation.
- Turn off engines when not in use to eliminate needless engine idle noise.
- Locate stationary equipment away from receiving properties to help reduce the noise through increased distance between source and receiver.
- Coordinate construction vehicle travel to reduce the number of passes by sensitive receivers.
- Schedule noisy activities to occur at the same time since additional sources of noise generally do not add a significant amount of noise.
- In the most severe case of construction noise, use temporary noise barriers or curtains to reduce noise from stationary equipment or activities located near sensitive receivers.

Operations and Maintenance

During EIS scoping, concerns were raised about the effects of the project's operational noise on nearby residents. It was suggested that trees should be planted for property owners to buffer noise impacts. Retaining existing trees and shrubs and planting new vegetation around residences in the project area would reduce noise annoyance psychologically by removing the noise source from view. However, to actually reduce noise levels, vegetation must completely block the line of sight between the receptor and the wind turbine. In addition, the vegetative buffer must be of sufficient depth to reduce noise. For example, dense woods with a depth of 100 feet would be required to reduce noise by 5 dBA. This kind of sound reduction from intervening landscaping would be expected to occur in the forested, residential establishment northwest of the project site, referred to as "Section 35." However, on the rangeland portions of the site, planting dense landscaping of sufficient depth to reduce noise would require a change in use of adjacent agricultural and residential properties. Therefore, vegetative buffering to reduce noise is not considered to be a reasonable mitigation measure for those properties.

To ensure that noise levels in the project do not exceed regulatory thresholds during project operations, the following mitigation measure is recommended:

- Prior to construction, an acoustical analysis of the final turbine layout should be prepared for all wind turbines to be located within one mile of an existing residence prior to project construction. The analysis should be conducted using noise level data for the final turbine type, size, and layout and would demonstrate compliance with the WAC (173-60). If compliance is not demonstrated, turbines should be relocated or removed, to the extent necessary, so that the project meets applicable regulatory thresholds.

3.12.5 Significant Unavoidable Adverse Impacts

With implementation of the proposed and recommended mitigation measures outlined above, no significant unavoidable adverse impacts from noise associated with constructing, operating, or decommissioning the proposed project would be anticipated.

3.13 PUBLIC SERVICES AND UTILITIES

This section characterizes existing public safety and service agencies responsible for serving the KVWPP in Kittitas County. Affected agencies include law enforcement, fire protection, emergency medical service, and schools. This section also describes utilities that would service the KVWPP, including those related to public water supply, wastewater, solid waste, and communication services. Potential impacts on the services and utilities are discussed, and mitigation measures are identified. Stormwater drainage is discussed in Section 3.3, Water Resources. Supply of, and demand for, electricity is discussed in Section 3.5, Energy and Natural Resources.

The analysis in this section is primarily based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Section 5.3). Where additional information has been used to evaluate the potential impacts associated with the proposal, such as *the Kittitas County Comprehensive Plan and Solid Waste Management Plan*, that information has been referenced. Personal communications with state and county public service agencies that have existing or potential jurisdiction over the project site were conducted.

3.13.1 Affected Environment

This section describes existing public services and utilities in Kittitas County and potential impacts associated with construction and operation of the KVWPP. The evaluation includes law enforcement, fire protection, emergency medical services, schools, water supply, sewer, solid waste, and communication services.

Public Services

Law Enforcement

The Kittitas County Sheriff's Department and the Washington State Patrol provide law enforcement services for the entire county, except for some cities that provide their own law enforcement—Cle Elum, Roslyn (covered by Cle Elum), Kittitas, and Ellensburg. All state routes (US 97, SR 970, SR 10, SR 821, I-90, and I-82) are patrolled by the Washington State Patrol. The County Sheriff's Department serves the unincorporated areas of Kittitas County.

The law enforcement services provided by the County Sheriff include traffic control, drug enforcement, search and rescue, and civil calls. The Sheriff's office recently implemented a traffic safety program and is in the final stages of developing a proposal for a new criminal justice facility in the area. Other county law enforcement services include a K9 unit, SWAT team, marine patrol, and search and rescue. The County Sheriff has 25 deputies on patrol, three detectives, a criminal chief, and an under sheriff. All officers are state-certified, and many have additional training for drugs, search and rescue, traffic control, and accidents. The Sheriff's Department is state accredited and has recently received federal certification.

The Washington State Patrol provides traffic enforcement on state highways, and drug enforcement, Hazardous Materials Team (HAZMAT) oversight, and incident response. The

Washington State Department of Ecology in Yakima (approximately 35 miles south of Ellensburg) provides a HAZMAT response team.

Fire Protection

There are three fire districts in the general project area: Fire District No. 1 (Rural Thorp), Fire District No. 2 (Rural Ellensburg), and Fire District No. 7 (Cle Elum). The City of Ellensburg has its own fire department. DNR provides fire protection on the properties it manages. As shown in Figure 3.13-1, approximately 80% of the project site is not contained in any of the fire districts.

The only district in which wind turbines would be located is Fire District No. 1, where approximately 19 turbines are proposed. There would be 31 turbines on DNR property under the middle scenario. The remaining turbines would be outside of any fire district or DNR property (Figure 3.13-1).

Fire District No. 1 operates three staffed stations that serve approximately 43 square miles. The main station is in downtown Thorpe, approximately three miles southeast of the southern end of turbine strings B and C. Approximately 10 square miles of the project area are within Fire District No. 1's jurisdiction (approximately 19 wind towers). A 21-member volunteer fire crew and a paid part-time fire chief staff the three stations. Fire District No. 1 is equipped with one Class A engine, two reserve engines, one brush truck, one mini-pumper, one 4,500-gallon water tender, one 2,000-gallon water tender, and one rescue squad truck. Estimated fire response time to the project site is approximately 20 minutes and is currently restricted due to the unimproved condition of the southern portion of Hayward Hill Road (approximate 3,000-foot segment between the North Branch Canal and SR 10) (Evans, pers. comm., 2003).

DNR is a "wildland" fire-fighting department and is not equipped or trained for handling structural fires. DNR's Southeast Regional Office is located in north Ellensburg. The DNR work (fire) stations closest to the project site are located in Cle Elum and Ellensburg. DNR employs 11 full-time fire fighters in Kittitas County, and hires approximately 40 temporary fire fighters during the summer peak fire season. The Ellensburg and Cle Elum DNR fire stations, combined, operate with five fire engines. Five additional fire engines can be brought in from Wenatchee. The Ellensburg station also operates DNR's "helitack" program for fighting fires from the air, and is equipped with two helicopters, each with a 325-gallon water bucket and the capacity to transport up to six people. Current response times to the project site depend on a variety of factors, including wind speed. DNR currently estimates it could reach the project site by helicopter in 10-15 minutes (Monroe, pers. comm., 2003).

DNR has warning levels that indicate the level of fire danger on their property, ranging from Level One (low fire danger) to Level Five (extreme fire danger). Warning levels are assigned on a daily basis. At Level Five, total shutdown is expected in DNR's entire zone of control, including industrial activity. In 2002, fire danger levels in the project area were in the Level Three-Low to Level Three-High range, with approximately one week designated as Level Four. In 2001, fire danger levels in the project area reached Level Five (Monroe, pers. comm., 2003).

Figure 3.13-1

Fires that occur most frequently in the project area are wildland fires (grass, brush, and timber), vehicle fires, and structural fires. District fire departments also receive calls for boating (e.g., District No. 1 responds to fires on the Yakima River) and hunting accidents; emergency medical situations such as heart attacks; recreational mishaps; propane spills and fires; and assistance to the State Patrol for HAZMAT. The majority of fires are caused by people, with only a few naturally occurring fires (i.e., lightning) (Taylor, pers. comm., 2002).

All fire districts have emergency medical equipment and extraction equipment for auto accidents. Most fire districts have minimal services (equipment and personnel) for search and rescue. All districts have bimonthly or monthly training meetings. None of the rural fire districts have received special training for fires that might occur in the nacelles of wind turbines. Fire District No. 2 has Basic Life Support (BLS) services. Fire District No. 1 is working towards a BLS (Evans, pers. comm., 2002). All rural county fire districts have mutual aid agreements with neighboring districts and with the City of Ellensburg's fire department. District No. 1 and District No. 7 have contracts with specific landowners. District No. 2 does not have landowner contracts.

Emergency Medical Services

The City of Ellensburg fire department provides emergency medical services (EMS) for the entire county and bills patrons for services received that may include treating falls, burns, fractures, lacerations, and heart attacks. Ambulances are located at Ellensburg, and the towns of Kittitas and Cle Elum. Also, Cascade Search and Rescue is located in Ellensburg. Emergency calls are dispatched through the Sheriff's office to the fire districts, which provide search and rescue support.

Kittitas County Community Hospital in Ellensburg serves the entire county. There are 50 licensed beds, but only 36 are set up to be used, and those beds are not used to capacity. The hospital provides Level-Four trauma service, with a limited number of specialists available. Patients with head injuries, severe burns, or trauma are transported to facilities such as Harbor View Medical Center in Seattle. Victims of less severe accidents may be transported to Yakima for hospitalization and treatment. There is a heliport on the roof of the hospital, and a helicopter is available for emergency response (Jensen, pers. comm., 2002).

Schools

School districts in the general project vicinity include District 400 (Thorpe), District 401 (Ellensburg), District 403 (Kittitas), and District 404 (Cle Elum/Roslyn). School bus routes use federal, state, and county roads for student transportation to the schools. Table 3.13-1 summarizes the facilities and enrollment for the 12 schools in the project vicinity.

Table 3.13-1: School District Student Population in the KVWPP Area, 2002-2003 School Year

District	School Name	Street Address	Grade Levels	2002-2003 Enrollment
Thorp (400)[1]	Thorp School District	10831 North Thorp Highway, Thorp	K-12	185
Ellensburg (401)	Lincoln Elementary School	200 South Sampson St. Ellensburg	K-5	416
	Mount Stuart Elementary School	705 West 15th Avenue Ellensburg	K-5	399
	Valley View Elementary School	1508 East Third Avenue Ellensburg	K-5	451
	Morgan Middle School	400 East 1st Avenue Ellensburg	6-8	690
	Ellensburg High School	1300 East 3rd Avenue Ellensburg	9-12	887
Kittitas (403)	Kittitas Elementary School	North Pierce Street Kittitas	K-5	258
	Kittitas High School	North Pierce Street Kittitas	6-12	282
Cle Elum-Roslyn (404)	Cle Elum Roslyn Elementary School	2696 SR 903	K-5	418
	Walter Strom Middle School	2694 SR 903 Cle Elum	6-8	237
	Cle Elum-Roslyn High School	2692 SR 903 Cle Elum	9-12	309

Sources: GreatSchools Inc. 2003

1 Klein, pers. comm., 2003; Thorp School District enrollment data as of September 2002.

The Thorp School District has a capacity of approximately 225 students, and currently is below maximum capacity (Klein, pers. comm., 2003). The Ellensburg School District currently is at capacity, and is using portable classrooms at its three elementary schools and high school. At this time, any potential increases in enrollment would have to be accommodated through increased class sizes (Torset, pers. comm., 2003). The Kittitas School District currently also is at capacity. However, a recently passed bond to build a new middle school-high school, anticipated to be constructed and operational by the Fall of 2004, would result in increased enrollment capacity for approximately 100 additional elementary school students (Harding, pers. comm., 2003). The Cle Elum-Roslyn School District has a total capacity of 962 students and currently is at capacity (Cle Elum-Roslyn School District 2001).

Utilities

Water Supply and Wastewater

Water supply in the project area is provided by wells. Wastewater services are provided by septic tanks.

Solid Waste

Waste Management has the franchise for solid waste collection service in Kittitas County. Two transfer stations, one in the upper county (Cle Elum) and one in the lower county (Ellensburg) provide solid waste collection services in the project area. A new Cle Elum transfer station, located between Cle Elum and Roslyn, opened in the spring of 2003; this station currently receives less than 150 tons per day but has a capacity for 300 tons/day. The Ellensburg transfer station currently receives approximately 150 tons per day and has a capacity of between 250 and 300 tons per day (Bach, pers. comm., 2002). Waste Management operates the transfer stations. There are drop boxes for recycling at both transfer stations, but mixed paper recycling is not offered (Bach, pers. comm., 2002). Moderate-risk wastes, such as oil and antifreeze, are accepted at each transfer station and recycled on a periodic basis (Kittitas County 1997c).

The county's only municipal landfill is the Ryegrass Landfill, a 640-acre parcel located in the lower county, approximately 18 miles east of Ellensburg. The Ryegrass facility is currently closed to all solid waste except construction and demolition debris (CDL). Because the Ryegrass Landfill cannot accept Kittitas County's municipal solid waste, garbage is transferred from the county transfer stations to the Greater Wenatchee Regional Landfill, a privately owned and operated facility located in East Wenatchee in Douglas County. In 1999, the volume of solid waste disposed of at the Greater Wenatchee Regional Landfill was 459,519 cubic yards. Waste Management of Greater Wenatchee estimates the facility has a projected capacity of 6,433,266 cubic yards, or approximately 14 years (Douglas County Solid Waste Program Office 2002).

CDL is currently disposed on a separately permitted 15-acre parcel located adjacent to the Ryegrass Landfill. The Ryegrass Construction and Demolition Debris Landfill, operated by Kittitas County, accepts inert materials including asphalt, construction debris, fencing, roofing material, concrete, and brick (Sagebrush Power Partners LLC 2003c). Licensed contractors with loads over one ton haul their CDL directly to the Ryegrass facilities. County and city residents with less than one ton of CDL waste bring their demolition debris directly to the transfer station. From there, the CDL is hauled to the permitted CDL site for disposal (Kittitas County 1997c).

Communication Services

The Ellensburg Telephone Company supplies telephone services in the project area. It is a multi-service organization that supplies local telephone service to approximately 1,149 square miles of the county as well as pager and alarm services (Kittitas County 2002a). Cellular phone service is available from a variety of providers. DSL internet service is provided by Ellensburg Telephone in its service territory and Inland Internet in Cle Elum, Roslyn, and Ronald.

Charter Communications in Ellensburg, R&R Cable Company in Roslyn, and TCI Cable Company in Cle Elum provide cable television services. Broadcast television stations are UHF channels and are transmitted from facilities located south and east of Ellensburg. Reception quality varies greatly based on local topography and distance from the transmitters. Radio transmission reception quality varies throughout Kittitas County.

3.13.2 Impacts of Proposed Action

This section evaluates potential direct (construction, operations, and decommissioning) impacts on identified public service agencies and utilities from the proposed action. The discussion of direct impacts to public services and utilities focuses primarily on the service providers' ability to accommodate increased demand. These types of direct impacts are primarily generated by the total number of construction and operations workers employed at the project site and therefore are not specifically associated with or attributable to specific project elements such as the wind turbines and meteorological towers, existing and new gravel access roads, additional power lines, and the proposed O&M facility and substations. Direct impacts associated with or attributable to specific project elements are discussed, where applicable. For example, the potential for the project to directly interfere with local area communication systems, including television, cell phone, and radio service, is addressed under Operations and Maintenance Impacts; this potential impact is primarily associated with the proposed turbines. Indirect impacts are not anticipated because the project is not expected to substantially induce regional growth to an extent that would result in significant increases in the demand for public services or utilities.

Construction Impacts

Table 3.13-2 summarizes potential construction impacts to public services and utilities under the three project scenarios.

Table 3.13-2: Summary of Potential Construction Impacts: Public Services

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Public Services			
Law Enforcement			
Increased demand for police protection services (e.g., traffic violations, accidents)	Same as middle scenario	Total 253 employees; maximum 160 employees during peak construction month	Same as middle scenario
Fire Protection and Emergency Medical Services			
Increased fire risk/demand for fire protection services	231 total acres disturbed	311 acres disturbed	371 total acres disturbed
Increased demand for emergency medical services	Same as middle scenario	Total 253 employees; maximum 160 employees during peak construction month	Same as middle scenario
Schools			
Increased demand for school services	Same as middle scenario	Total 253 employees; maximum 160 employees during peak construction month	Same as middle scenario
Utilities			
Water and Wastewater			
Increased demand for water	2.6 to 6.4 million gallons of water for dust control	2 to 5 million gallons of water for dust control	Same as middle scenario
Increased demand for sewage treatment	Same as middle scenario	Sanitary waste discharged to portable toilets; 253 total employees	Same as middle scenario
Solid Waste			
Increased demand for solid waste disposal services	Same as middle scenario	Volume of CDL wastes <100 tons	Same as middle scenario

Sources: Sagebrush Power Partners LLC 2003a, c.

Public Services

Law Enforcement

Construction activities associated with the project would increase traffic volume on roadways surrounding the project site, as a result of both commuting construction workers and the transportation of materials. This increased volume would likely occur in mid-summer to fall when vacationers use the roadways. It is possible that the number of accidents and calls for service along major roadways (e.g., US 97, SR 10, and I-90) would increase for approximately six months, after which most of the onsite work would be done.

The demand for traffic enforcement activities would peak when construction employment peaks at approximately 160 employees for approximately one month. Out-of-area workers are not expected to move their families into the project area because each craft would be completed within three and one-half months or less. They would likely either commute (from the Seattle area or Yakima area) or stay in temporary housing for the period of time needed to complete their tasks. As described in Section 3.7, Socioeconomics, this analysis assumes that as many as

112 non-local workers could be employed at the project site during the peak construction month (this includes potential out-of-state workers) and would likely stay in temporary housing.

There likely would be additional calls for response during the construction phase, primarily because of increased traffic and accident potential. Other law enforcement concerns during construction include construction site security against theft and vandalism. This impact would be similar under the three different project scenarios because the level of construction employment is expected to be the same. However, because the construction period is short (approximately one year), the increased service calls are not anticipated to be sufficient in number to require additional law enforcement staff resources in the project area. See Section 3.10, Transportation, for further discussion of traffic safety hazards.

Fire Protection

The project site is generally arid rangeland with a predominant groundcover of grasses and sagebrush. Given the site conditions, project construction could temporarily increase the risk of fire at the project site and in the broader project area. The highest expected fire risks are grass fires during the hot, dry summer season. This risk would be greatest for the upper end scenario, which would result in the most ground disturbance (371 acres).

Fire District No. 1's ability to provide adequate fire protection services during construction would be restricted by the unimproved condition of the southern portion of Hayward Hill Road. Fire District No. 1 is in the process of negotiating with the Applicant to determine the extent of improvements required to this roadway to ensure adequate fire protection to the project site (Evans, pers. comm. 2003).

Another concern raised by Fire District No. 1 is its ability to provide adequate training and equipment to provide emergency rescue services to project personnel working on the wind towers (Evans, pers. comm. 2003). A similar concern was raised by the County Fire Marshall with respect to the Ellensburg Fire Department, the local emergency service provider, because they are not trained in high angle rescue or in removing persons from high areas (Kittitas County 2003). However, implementation of emergency preparedness measures proposed by the Applicant would reduce potential impacts to rescue personnel during an emergency situation (see Section 3.13.4, Mitigation Measures).

DNR would continue to implement fire protection services to the project site. DNR does not anticipate substantial effects on staffing levels during project construction. However, depending on the specific fire warning level in effect, DNR may impose restrictions on particular construction activities, such as welding and blasting activities, to reduce potential fire risks during project construction (Robinson, pers. comm. 2003).

The County Fire Marshall has raised the concern that the demand for fire protection services would occur before project tax revenues are realized. This could result in a temporary negative fiscal impact to the fire districts (Kittitas County 2003), but would be addressed through implementation of mitigation measures proposed by the Applicant (see Section 3.13.4, Mitigation Measures).

Emergency Medical Services

During project construction, the local demand for emergency medical services could increase slightly due to construction accidents that could occur at the project site or project vicinity. Project construction workers would be exposed to hazards caused by equipment failure, natural disaster, or human mistake that would require the services of local emergency response units to provide initial treatment and transportation to a local medical facility and the services of emergency rooms in the receiving facility. The specific level of demand for EMS response is unknown, but it would likely be similar under the three potential project scenarios.

With adequate safety measures in place, and considering the moderate size of the construction workforce (which would temporarily reach a peak of 160 workers under all three project scenarios) it is expected that project construction would generate few serious injury accidents requiring EMS response. Furthermore, the local hospital has capacity for additional patients and there are several ambulances available to service the project site.

It is expected that up to 112 construction workers would temporarily migrate to the local labor market from either outside the immediate region (i.e., Kittitas and Yakima counties) or from out of state. However, because the duration of their stay in the project area would be short (approximately four months), it is not likely that these temporary workers would create a significant increase in demand for emergency medical services during project construction.

Schools

The 112 non-local construction workers who would temporarily work on the project are only expected to work on a short-term basis, and not relocate their families to the area. The anticipated maximum duration of employment for each craft is three to three and one-half months. Therefore, there would be no significant impacts to school facilities expected during the construction phase of the project.

Utilities

Water Supply

Approximately 2 to 5 million gallons of water would be consumed for dust suppression and other construction purposes under the middle and upper end scenarios, while an estimated 2.6 to 6.4 millions gallons of water would be required under the lower end scenario due to a larger roadway footprint. The construction contractor would supply water used during construction. Water would be delivered to the project site via water trucks and obtained from a local source with a valid water right. This impact would be greatest under the lower end scenario because it would result in the largest temporary increase in water demand. However, this impact would not be significant under any of the three project scenarios due to the temporary nature of the impact and the availability of adequate water supplies.

Wastewater

No significant impacts to community wastewater disposal systems are anticipated because the project would not be connected to a sewer system during construction. The amount of wastewater generated during project construction would be similar under the three potential project scenarios because the expected number of employees would be the same. Sanitary wastes would be collected in “portable toilets” during construction. Disposal of sanitary wastes would be managed through a contract with a portable toilet waste vendor. The contractor would incorporate applicable state capacity requirements based on the construction worker population on the project site at any given time. Collected wastes would be managed and disposed of by the contracted vendor.

Solid Waste

During construction, the primary solid waste generated would be CDL such as scrap metal, cable, wire, wood pallets, plastic packaging materials, and cardboard. The total CDL volume is estimated to be 30 dumpsters weighing approximately 3 tons each on average under all three project scenarios. This results in an estimated total of less than 100 tons of CDL (Sagebrush Power Partners LLC 2003c).

The Ryegrass CDL landfill operated by Kittitas County would accept inert materials including asphalt, construction debris, fencing, roofing material, concrete, and brick. It is estimated that the landfill has approximately 10 years of remaining available capacity. There is adequate capacity in the Ryegrass Landfill to accommodate the anticipated amount of CDL generated under all three project scenarios (Johnson, pers. comm., 2003).

Normal waste would be accumulated onsite in drop boxes until it was hauled to the Ellensburg transfer station by either the EPC contractor or a local solid waste collection service provider such as Waste Management, which has the franchise for solid waste collection service in Kittitas County. Garbage would be transferred from the transfer station in Ellensburg to the Greater Wenatchee Regional Landfill located in East Wenatchee. The maximum number of construction workers anticipated to be present in the project area during the peak construction month would be approximately 160 under the three project scenarios. Given the temporary nature and duration of construction activities, garbage generated by construction workers in the project area would not have a significant impact on the capacity of the Greater Wenatchee Regional Landfill.

Most of the construction waste would be recyclable, other than the film plastic packaging material and food-related waste generated by the construction workforce. The construction contractor would develop specific recycling program details. It is anticipated that the only materials produced during project construction that would not be accepted at the Ryegrass Landfill are cardboard and food-related wastes (Sagebrush Power Partners LLC 2003c).

Operations and Maintenance Impacts

Table 3.13-3 summarizes potential operations and maintenance impacts to public services and utilities under the three project scenarios.

Table 3.13-3: Summary of Potential Operations and Maintenance, and Decommissioning Impacts: Public Services

	82 Turbines/3 MW (Lower End Scenario)	121 Turbines/1.5 MW (Middle Scenario)	150 Turbines/1.3 MW (Upper End Scenario)
Public Services			
Operations and Maintenance Impacts			
Law Enforcement			
Increased demand for police protection services	Same as middle scenario	12-14 workers (6-7 new to project area)	18-20 workers (9-10 new to project area)
Fire Protection and Emergency Medical Services			
Increased fire risk/demand for fire protection services	82 turbines; 118 acres total disturbed	121 turbines; 93 acres total disturbed	150 turbines; 94.9 acres total disturbed
Increased demand for emergency medical services	Same as middle scenario	12-14 workers (6-7 new to project area)	18-20 workers (9-10 new to project area)
Schools			
Increased demand for school services	Same as middle scenario	6-7 new permanent employees with families in project area	9-10 new permanent employees with families in project area
Decommissioning Impacts			
	Similar to those described for construction in Table 3.13-2	Similar to those described for construction in Table 3.13-2	Similar to those described for construction in Table 3.13-2
Utilities			
Operations and Maintenance Impacts			
Water and Wastewater			
Increased demand for water	Same as middle scenario	<1,000 gallons daily at O&M facility	Same as middle scenario
Increased demand for sewage treatment	Same as middle scenario	Wastewater discharged to onsite septic tank; 12-14 workers	Wastewater discharged to onsite septic tank; 18-20 workers
Solid Waste			
Increased demand for solid waste disposal services	Same as middle scenario	Approximately 0.0645 tons daily of solid waste	Approximately 0.0692 tons daily of solid waste
Communication Services			
Disruption of communication services	Same as middle scenario	Potential interference to television, cell phone, and radio reception	Same as middle scenario
Decommissioning Impacts			
	Similar to those described for construction in Table 3.13-2	Similar to those described for construction in Table 3.13-2	Similar to those described for construction in Table 3.13-2

Sources: Sagebrush Power Partners LLC 2003a, c.

Public Services

Law Enforcement

Project operation would not have a significant effect on local long-term demands for law enforcement services. The operating workforce is anticipated to be between 12 to 20 workers, which would have a minimal effect on traffic safety in the project vicinity. This impact would be greatest under the upper end scenario because it would employ the largest number of workers. Because onsite security measures would be incorporated into the project facility and operations plans, no additional staff and equipment resources to maintain local law enforcement and protection services are anticipated (see Section 3.13.4, Mitigation Measures).

Fire Protection

Impacts from fire, either from turbine nacelles due to mechanical failures (which are rare) or wildland fire at the project site, could increase or be more difficult to control unless provisions are made for fire fighters to have easy access to the project property. For mechanical fires, this impact would be greatest under the upper end scenario, which would operate the largest number of turbines (150). However, for wildland fires, this impact would be greatest under the lower end scenario, which would disturb the greatest amount of land (118 acres). Risk of fire during project operations would be minimized through implementation of project design features and fire prevention programs, as described in Section 3.13.4, Mitigation Measures.

Once the project is in operation and the property tax assessment for the project has been formally added to the Kittitas County tax rolls, the KVWPP would generate annual property tax revenues and local fire districts would receive a share of these revenues (see Section 3.7, Socioeconomics). However, there could be a lag between the completion of project construction and receipt of property tax revenues from this new facility. Therefore, there may be an initial period of project operation during which there are no new tax revenues to offset resources needed to meet increased demand for fire services. The Applicant proposes mitigation measures to minimize this potential impact (see Section 3.13.4).

Emergency Medical Services

Project operation would not have significant impacts on emergency medical service providers. The operations workforce for the project would be relatively small (12 to 20 workers). Furthermore, the project's O&M group and third-party constructors would receive regular emergency response and safety training to ensure that effective and safe action is taken to reduce and limit the impact of any emergency at the project site. In addition, the local labor market is expected to provide approximately half of the operations workers needed by the project. Therefore, project operation would create minimal population increases to the local area, and would generate only a minor increase in demand for emergency medical services.

Schools

Of the 12 to 20 workers required for project operations, approximately half are expected to be from the local area. Therefore, it is expected that the local area would experience a minimal population increase of between 6 (under the lower end and middle scenarios) and 10 (under the upper end scenario) new families. It is not known where the new permanent residents associated with the project would reside. School districts that serve the population centers of Ellensburg and Cle Elum-Roslyn currently are at capacity, whereas the school districts that serve the more rural areas of Thorp and Kittitas have the existing or projected capacity to absorb additional enrollment growth associated with families moving into the area for project operation. Because enrollment capacity is available in the region, no operational impact to local schools is expected.

Utilities

Water Supply

No significant impacts to water supply are anticipated because the project would not be connected to a public water utility, and would have its own source of water. A new water well would be installed to provide water at the O&M facility for bathroom and kitchen use and for general maintenance purposes. Water consumption is expected to be less than 1,000 gallons per day under all three project scenarios.

Wastewater

No significant operational impacts on wastewater services are anticipated. Wastewater from project operation would be treated in an onsite septic system installed at the O&M facility pursuant to the requirements of the Kittitas County Environmental Health Department. The volume of wastewater generated would be nominal under the three project scenarios, but would be greatest under the upper end scenario due to the larger workforce. Solids that are collected in the septic system would occasionally be pumped out of the collection tank and hauled offsite for disposal at an authorized wastewater treatment facility.

Discharges to the septic system would be typical of an ordinary office facility (domestic sewage, dishwashing liquid, hand soap). There would be no industrial discharges. Hydraulic and lubricating fluids as well as anti-freeze would be managed and contained so that they would not discharge to the septic system. Trace amounts of oils or greases may enter the shop floor drain but would be captured by a grease trap installed between the floor drain and the septic tank to prevent such materials from entering the septic system.

Solid Waste

Solid waste generated by project operations would consist of typical office wastes (e.g., paper, cardboard, and food waste). The operations workforce under the three project scenarios is estimated to be between 12 and 20 employees. Assuming a solid waste generation factor of 9.2 pounds per employee per day, the estimated maximum daily amount of solid waste generated during project operations would be approximately 129 pounds (0.0645 tons) under the lower end and middle scenarios. Under the upper end scenario, the maximum daily amount of solid waste generated would be 184 pounds (0.092 tons) (California Integrated Waste Management Board 2003). This waste would be stored in a dumpster until it is collected for removal. There is sufficient existing capacity at the local transfer stations to accommodate this amount of increased waste under project operations.

Lubricating oils and hydraulic fluids used in the individual wind turbine generators would need to be replenished or replaced periodically. The Applicant estimates these fluids would be replaced no more frequently than once per year and sometimes once every five years. The required amount of fluids would be similar under the three potential project scenarios (see Section 3.5, Energy and Natural Resources). Fluids would be removed in small, typically 5-gallon containers, and transferred via truck to the O&M facility for temporary storage (typically less than one per month) before being collected by a licensed transporter for recycling or disposal in accordance with applicable federal, state, and local regulations.

Communication Services

<u>Microwave Communication Pathways</u>. The Applicant commissioned a study of the potential for turbines to obstruct telecommunications facilities in the project area. Based on a turbine blade radius of approximately 130 feet, the study concluded that 12 proposed turbines could potentially obstruct five existing microwave paths in the project area. As a result of this study, 10 turbines were removed from the project layout and the remaining 2 were relocated. After making these adjustments to the site plan, the data were verified and the study concluded that the proposed turbine locations would not obstruct or interfere with existing microwave telecommunications facilities in the project area.

Under the lower end scenario, 82 turbines, each with a 150-foot blade radius, would be constructed. Under the upper end scenario, 150 turbines, each with a 100-foot blade radius, would be constructed. It is not known how the location and dimension of turbines under the lower or upper end scenarios would affect microwave paths in the project area. However, the Applicant plans to undertake final field measurement test surveys of communication microwave paths prior to construction. The results of these surveys may require that some turbine locations be adjusted slightly to avoid telecommunication interference (see Section 3.13.4, Mitigation Measures).

<u>Television Reception</u>. Based on the location of existing television transmitters in relation to project turbines, impacts to televisions that rely on standard antennas are not expected in Kittitas County population centers such as Ellensburg, Cle Elum, Roslyn, Kittitas, Thorp, and Vantage. However, it is possible that the project could affect television reception in a small, sparsely populated area immediately northwest of the project site. This area, known as Swauk Prairie, is a recessed valley bounded by Lauderdale Junction and the Teanaway River. The current quality of television reception in the Swauk Prairie area has been surveyed in a preliminary fashion and found to be highly variable.

Corona-caused television interference is the result of electrical discharges caused by a breakdown in air around conductors. It occurs only at very high voltages and usually in damp weather conditions. The existing high-voltage transmission lines that traverse the project site or the proposed high-voltage substation may produce this type of interference. Other potential forms of television interference generated during turbine operations are signal reflection (ghosting) and signal blocking caused by the relative locations of the turbine structures and the receiving antenna with respect to the incoming television signal. Television systems that operate at higher frequencies, such as satellite receivers, are not affected by corona-generated television interference. However, because they are line-of-sight systems, physical interference from the turbine towers or blades is a possibility. Mitigation measures for this potential impact are discussed in Section 3.13.4. Cable television systems are unaffected by corona or the physical placement of the towers or blades of the machines.

Cell Phone Interference. The project's potential to interfere with or degrade cell phone service has been raised as an issue of concern by the public. The Applicant indicates that there is no documented evidence that wind turbines or towers interfere with cellular phone service or coverage. Maintenance personnel at wind power projects routinely use both cell phones and two-way radios when they are out among the turbines for communicating with other staff on and offsite. In areas of the United States with very large numbers of turbines and high densities of turbines, such as Altamont, Tehachapi, and Palm Springs in California, no problems have been reported with cell phone service. Furthermore, in Germany and elsewhere, cell phone antennae are being installed on the same towers as wind turbine generators (Sagebrush Power Partners LLC 2003c).

Degradation of existing cell phone service in the area resulting from the project is unlikely. However, the location of the cell phone user relative to the existing cell phone antennae and project turbines could possibly affect the quality of service at specific receiving locations. Cell phone reception is not affected by line-of-sight disruptions, but cell phone signals are not all-encompassing. Therefore, the relative position of the user, antenna, and intervening objects (such as the proposed turbine towers) could affect the boundaries of existing cell phone signals, and thereby create interference (Reed, pers. comm., 2003). Mitigation measures for this potential impact are discussed in Section 3.13.4.

Radio Interference. Another issue of concern raised by the public is the potential for the wind turbines to interfere with radio frequencies in the project area. For example, one local area resident operates an emergency-powered amateur radio station licensed by the federal government. The question focuses on the possibility of the emission of "harmful interference" in the frequency band of interest to the local resident. The term "harmful interference" is defined as "any emission, radiation or induction that endangers the functioning of a radio navigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radio communications service operating in accordance with this chapter" (CFR Title 47 Section 15.3[m]).

All rotating electrical machines generate a certain amount of electrical noise that is a combination of many frequencies. As a result, each generator and its associated systems may create harmful interference. To date, information regarding the frequency spectrum of electrical noise generated by the wind turbine generators at locations surrounding the generator has been requested from the Applicant, but has not yet been provided. In the absence of this information, the potential for the proposed wind power project to generate harmful interference and disrupt radio communications in the KVWPP area is identified as an unresolved issue. Recommended measures for mitigating this potential impact are provided in Section 3.13.4.

Decommissioning Impacts

Potential fire risks and fire prevention measures associated with decommissioning are similar in nature to those for project construction. Anticipated effects on other public services and utilities would be similar to those described for during project construction. Any solid waste generated during the facility shutdown or decommissioning process would be disposed of, as necessary, to comply with Kittitas County solid waste regulations.

3.13.3 Impacts of No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated. However, development by others, and of a different nature, including residential development, could occur at the project site in accordance with Kittitas County's existing Comprehensive Plan and zoning regulations. Depending on the location, type, and magnitude of future development at the project site, impacts to public services and utilities could be similar to or even greater than the proposed action.

If the proposed project were not constructed, the region's power needs could be delivered through development of other generation facilities, most likely a gas-fired combustion turbine. The public service and utility impacts of such an alternative facility would depend on its location, but would require a greater amount of water for project operations. For example, it is estimated that a 60-average megawatt combusting turbine project would consume approximately 200 acre-feet of water annually, the appropriation of which may have adverse impacts on surface water or groundwater resources. In addition, drill cuttings for the on-shore gas extraction component of such a project would generate approximately 135 tons of solid waste (Bonneville and U.S. Department of Energy 1993), substantially greater than the amount anticipated to be generated by the proposed project.

3.13.4 Mitigation Measures

Mitigation Measures Proposed by the Applicant

<u>General</u>

The following mitigation measures would be implemented to reduce impacts to public services and utilities resulting from construction of the project:

- Tax revenues generated by the Applicant's project would mitigate potential impacts to public services and utilities. Should there be construction impacts requiring additional staffing levels during construction, or other impacts or costs related to services that would not be covered in a timely manner by tax revenues, the Applicant would enter into agreement(s)

with the appropriate local governmental agency for prepayment of taxes for mitigation of the cost impacts. This would include fire, police, and county roads.
- If emergency fire protection services are required during project operations prior to having an agreement in place, local fire officials informed the Applicant that the costs of these services could be billed to the project on a cost-recovery basis. Therefore, if an emergency occurs, the responding district(s) would bill the Applicant for their actual costs of responding.
- The Applicant would provide all local police, fire, and emergency medical agencies with emergency response information for the project including employee contact information, procedures for rescue operations to the nacelles, and location of rescue basket.

Law Enforcement

- The Applicant would consult with the county regarding the impact on county law enforcement staffing. If additional staffing is required, the Applicant proposes to mitigate by prepaying taxes in a sufficient amount to provide adequate staffing levels during construction.
- As described in Chapter 2, Section 2.2.4, Construction Activities, a full time security plan would be implemented during project construction to reduce the potential need for increased police services to the project site. For example, temporary fencing with a locked gate would be installed for a roughly 1.5-acre area adjacent to the site trailers for the temporary storage of special equipment or materials. In addition, construction trailers would be equipped with outdoor lighting and motion-sensor lighting, and access to the project site would be controlled. These measures would help to significantly reduce the potential for incidents at the project site that would require a response by local law enforcement agencies.
- As described in Chapter 2, Section 2.2.5, Operations and Maintenance Activities, the plant operations group would prepare a detailed security plan to protect the security of the project and project personnel. Site visitors including vendor equipment personnel, maintenance contractors, material suppliers, and all other third parties would require permission for access from authorized project staff prior to entrance. The plant operations manager, or designee, would grant access to critical areas of the site on an as-needed basis. Arrangements would be made with adjacent landowners that have legal ingress and egress easements across areas where project facilities would be located to ensure their continued access.

Fire Protection

- Fire risk potential is constantly tracked and reported during the summer fire season by the DNR; fire danger levels would be actively posted at the construction job site during the high-risk season.
- The construction manager would be responsible for monitoring fire conditions in the project area by contacting Washington DNR and implementing necessary fire precautions. A Fire Protection and Prevention Plan would be developed and implemented, in coordination with the Kittitas County Fire Marshall and other appropriate agencies. In addition, all onsite construction employees would be responsible for contributing to fire prevention through the following programs:
  - Construction Written Safety Program;
  - Construction Onsite Fire Suppression and Prevention; and

- Construction Offsite Fire Suppression Support.

- All turbines and towers and the substations would be built with engineered lightning protection systems and the footprint areas around these facilities would be graveled with no vegetation. In the event of a nacelle fire, project operations staff and fire personnel would not attempt to put it out, but would prevent the fire from spreading to adjacent lands. This can be achieved either by use of fire suppressant material or a small, controlled burn around the base of the tower (Sagebrush Power Partners LLC 2003a, Section 5.3.3.2.2).
- All onsite operations employees would be responsible for contributing to ongoing fire prevention in the project area through the following programs:
  - Operational Safety Program;
  - Operations Written Safety Program;
  - Emergency Action Plan;
  - Fire Prevention Plan.
- Onsite emergency plans would be prepared for the project in case of a major natural disaster or accident relating to or affecting the project. The plans would describe the emergency response procedures to be implemented during various emergency situations that may affect the project or surrounding community or environment.
- The Applicant would also be responsible for the following fire protection and prevention measures:
  - Contract with fire district(s) for protection services during construction;
  - Provide special training to fire district personnel on how to respond to fires related to wind turbines, and to EMS personnel in how to use a rescue basket that would be kept at the operations and maintenance facility for the purpose of removing injured employees from the towers;
  - Provide detailed maps that show all access roads to the project;
  - Provide keys to a master lock system that would enable emergency personnel to unlock gates that would otherwise limit access to the project;
  - Use spark arresters on all power equipment, e.g., cutting torches and cutting tools;
  - Inform workers at the project site of emergency contact phone numbers and train them in emergency response procedures;
  - Carry fire extinguishers in all maintenance vehicles; and
  - Coordinate with DNR when the fire danger is high.

The Applicant's proposed Fire and Explosion Risk Mitigation Plan is presented in Table 3.4-2 in Section 3.4, Health and Safety.

<u>Emergency Medical Services</u>

- Onsite emergency plans would be prepared to protect the public health, safety, and environment on and off the project site in the case of a major natural disaster or industrial accident relating to or affecting the project. The construction specifications would require that the contractors prepare and implement a Construction Health and Safety Program that includes an emergency plan. The Construction Health and Safety Program would include the following provisions:
  - Construction Injury and Illness Prevention Plan;
  - Construction Written Safety Program;

- Construction Personnel Protective Devices;
- Construction Onsite Fire Suppression Prevention; and
- Construction Offsite Fire Suppression Support.

- In the event that operations personnel are seriously injured and require evacuation from a remote location within the project area, the Applicant would make arrangements with the Kittitas Valley Community Hospital for helicopter transportation service.

Schools

Pursuant to the terms of the project lease agreement signed between the Applicant and DNR in July 2003, approximately $5.6 million dollars would be generated by the project and diverted into a state trust fund for school construction over the life of the project (Daily Journal of Commerce 2003). Therefore, project-generated funding could be used to help offset the capacity issues being faced by the local school districts.

Water Supply

A licensed well contractor, in compliance with the requirements and standards of Chapter 173-160 WAC (Department of Ecology Minimum Standards for Construction and Maintenance of Wells) would install the domestic water well.

Wastewater

The Applicant would coordinate with Kittitas County and comply with the county's septic tank and subsurface disposal field design, installation, and maintenance requirements for systems with designed flows of less than 3,500 gallons/day pursuant to Kittitas County Code Title 13.04.

Communication Services

- Once the specific location and configuration of the turbines is identified on paper, the Applicant proposes to conduct final field measurement test surveys of communication microwave paths. If the results of these final surveys identify that the proposed turbines would interfere with or obstruct communication microwave paths, the Applicant would adjust the tower location, accordingly, to avoid line-of-sight interference.
- The Applicant plans baseline field studies to more precisely determine the existing quality of television reception in the Swauk Prairie prior to construction of the project. After the project is built, the Applicant plans follow-up field studies to determine if the quality of television reception could be degraded by project operations. In the event that the project creates significant television reception problems for residents in this area, the Applicant would consult with affected residents to develop an appropriate solution.

Additional Recommended Mitigation Measures

Fire Protection

Additional mitigation measures recommended by the County Fire Marshall (Kittitas County 2003) but not specified by the Applicant include the following:

- Comply with equipment rules and regulations required by DNR for work conducted in wildland/forested lands (e.g., fire extinguishers and shovels would be required on each piece of equipment);
- Limit parking areas for vehicles;
- Provide garbage containers; and
- Implement restrictions on burning.

In addition, the following mitigation measure is recommended to further reduce the potential for wildland fires during project construction:

- Implement the terms of any negotiated agreements between Fire District No. 1 and the Applicant regarding improvements to the southern portion of Hayward Hill Road to ensure adequate fire protection to the project area. If Hayward Hill Road were upgraded to meet fire department standards, it is estimated that Fire District No. 1 could respond to a project area fire in approximately seven to eight minutes. If the southern portion of Hayward Hill Road is not improved, Fire District No. 1 trucks responding to an emergency fire in the project area would need to be re-routed from Thorp to US 97. Under this scenario, estimated response times to the project area would be approximately three times longer (Evans, pers. comm., 2003).

Communication Services

If the Applicant's follow-up studies determine that the project creates significant television reception problems in the area, one of the following mitigation measures to minimize television interference impacts should be implemented by the Applicant:

- Improve the receiving antenna system;
- Install a remote antenna;
- Install an antenna for TV stations less vulnerable to interference;
- Connect affected residents to an existing cable system; or
- Connect affected residents to an existing satellite system.

To reduce the impact of potential cell phone degradation in the project area, the Applicant should implement the following mitigation measures:

- The Applicant should conduct a field study before and after project construction to determine if the quality of cell phone service in the project area is degraded by project operations.
- If cell phone degradation is identified as a result of project operations, the Applicant should be responsible for implementing appropriate mitigation to minimize impacts. This could

include developing and funding a program under which the cell phone service provider would establish new antenna locations to ensure continued high-quality reception and transmission. These locations could include the wind turbine generator towers or other locations as determined by the cell phone service provider.

Regarding the potential impact of radio interference in the project area, the Applicant should implement the following mitigation measures:

- Prior to construction, but after the final turbine make, model, and size and site configuration have been selected, the Applicant should provide data regarding the frequency spectrum of electrical noise generated by the wind turbine generators at locations surrounding the generator similar to those made for audible noise emissions. The Applicant should then compare this frequency spectrum with frequency spectrums from existing, operating radio communication devices in the project area to identify if potential harmful interference could occur.
- If radio interference is identified as a potential impact, mitigation could be accomplished by reducing the amount of noise generated or by screening the electrical equipment to prevent radiation of unwanted frequencies.

3.13.5 Significant Unavoidable Adverse Impacts

With implementation of the mitigation measures outlined above, no significant unavoidable adverse impacts to public services and utilities would be anticipated.

3.14 CUMULATIVE IMPACTS

3.14.1 Introduction

The State Environmental Policy Act requires that agencies address cumulative impacts. According to Ecology's SEPA Handbook, an EIS should look at how the impacts of a proposal would contribute to the total impact of development in the region over time (Ecology 1998). In the context of the proposed KVWPP, cumulative impacts are identified largely on the basis of significant proposed and reasonably foreseeable future developments.

For the purpose of the analysis, the proposed Desert Claim and Wild Horse wind power projects were identified as the only major reasonably foreseeable developments in the area that could contribute to cumulative impacts. The wind power projects are shown in Figure 3.14-1. The KVWPP and Desert Claim project are relatively close to each other (within 1.6 miles at the closest point), while the Wild Horse project is 14 miles from Desert Claim and 21 miles from the KVWPP. The Desert Claim and Wild Horse wind power projects are summarized below.

No other present or reasonably anticipated future project is expected to result in cumulative impacts near the KVWPP. Several other wind power projects in the Pacific Northwest are either operating or proposed. These projects are identified in Table 3.5-2 in Section 3.5, Energy and Natural Resources. The cumulative effects of these other wind power projects could be similar in nature to the effects described herein. However, for the purposes of defining the geographic scope of the cumulative study area, the Kittitas Valley, Desert Claim, and Wild Horse wind power projects in Kittitas County are sufficient for the evaluation of cumulative impacts.

3.14.2 Desert Claim Wind Power Project

On January 28, 2003, Desert Claim Wind Power, a limited liability company wholly owned and managed by enXco, Inc., submitted an application to Kittitas County for permits to build and operate a wind electrical generation facility in the Reecer Creek area approximately 8 miles north of Ellensburg (Desert Claim Wind Power LLC 2003). The Desert Claim project consists of up to 120 wind turbines with a total nameplate capacity of 180 megawatts, associated generators, towers, foundations, and pad-mounted transformers on 5,237 acres. Other project elements include:

- Project access roads, control cables, and power collection cables necessary to serve the project;
- One or more substations to convert project-generated electricity to the higher voltage required to interconnect into the regional electric transmission grid;
- An overhead transmission line required to connect the project substation with nearby high-capacity electrical transmission lines; and
- An O&M facility co-located at the project substation site or, alternatively, located in an area zoned for industrial use within or near Ellensburg.

3.14.3 Wild Horse Wind Power Project

Wind Ridge Power Partners, LLC, a wholly owned subsidiary of Zilkha Renewable Energy, plans to construct, own, and operate a 180-MW wind electrical generating facility (referred to as Wild Horse) in eastern Kittitas County, approximately 10 miles east of the town of Kittitas, Washington. A request for a Potential Site Study was submitted to EFSEC in July 2003 for this proposal. The Wild Horse project site consists of approximately 5,000 acres of open rangeland currently used for grazing. It is anticipated that transmission feeder lines would have to be constructed from the project site to the point where they would interconnect to existing PSE and/or Bonneville transmission systems (Peeples 2003).

3.14.4 Project Comparison

The availability of baseline environmental information for the three projects varies because they are on different schedules for environmental review and permitting. However, based on information gathered from available sources, including Desert Claim's Development Activities Application to Kittitas County (Desert Claim Wind Power LLC 2003), the basic features of the three projects are summarized in Table 3.14-1.

Table 3.14-1: Summary of Proposed Wind Power Project Features in Kittitas County (Assumes 1.5 MW Turbines)

Feature	Kittitas Valley[1]	Desert Claim	Wild Horse
Number of Turbines	121	120	120[2]
Total Nameplate Capacity	181.5 MW	180 MW	180 MW
Project Area Size	7,000 acres	5,237 acres	5,000 acres
Existing Zoning	Agriculture-20 Forest and Range	Agriculture-20 Forest and Range	Agriculture-20 Forest and Range
Construction Duration	12 months	9 months	12 months
Construction Employees	253 workers	150 workers	253 workers
Operational Employees	12-14 workers	10 workers	12-14 employees

Sources: Sagebrush Power Partners LLC 2003a; Desert Claim Wind Power LLC 2003; Peeples 2003; Weinman 2003; Taylor, pers. comm., 2003; Kittitas County 2003.

1 Data represent middle scenario, as defined in Chapter 2.

2 Assumes use of 1.5 MW turbines.

The construction schedules for the three projects are uncertain at this time. However, the most recent preliminary schedules for the Kittitas Valley and Wild Horse projects indicated that their construction could, under the worst case, overlap for a period of about eight months. The proposed construction schedule for the Desert Claim project is not known. However, to present a worst-case scenario, the cumulative impact analyses assume that all three projects could possibly be constructed simultaneously during an eight-month period.

Figure 3.14-1

3.14.5 Earth Resources

Significant cumulative impacts on soil, topography, and geology resulting from construction of the three proposed wind power projects in Kittitas County are not anticipated. The three project areas are not characterized by high geologic hazards. Impacts on earth resources from development of the three wind power projects would be limited to localized, temporary erosion impacts from ground disturbance during construction. The impacts on near-surface soils would be within the construction footprint for the respective project; they would not geographically overlap each other. Consequently, there would not be an interactive effect among any two of the projects or all three projects (e.g., erosion impacts related to the Desert Claim project would not exacerbate erosion conditions near the KVWPP). The combined effects of the three projects would not result in a significant cumulative impact on earth resources.

Cut and fill would be required to construct access roads, tower foundations, transformer pads, and other project facilities. The specific quantities of anticipated cut and fill materials required for the Desert Claim and Wild Horse wind projects are not known at this time. However, if substantial amounts of fill are required to construct facilities such as access roads, this could result in increased demand for offsite resources such as gravel or crushed rock. Given the magnitude of offsite gravel resources that could be imported to the KVWPP site (approximately 145,000 cubic yards), the cumulative effect on offsite fill resources could be substantial if all projects require similar amounts of construction materials.

Construction of the three proposed wind power projects could result in a loss in area where Ellensburg Blue agate is potentially found and a potential reduction in the amount of this resource available for prospecting. Cumulative cut and fill activities could also result in agate destruction.

3.14.6 Vegetation, Wetlands, Wildlife, and Fisheries

Vegetation

Implementation of the proposed projects would result in the loss of vegetation through clearing and ground disturbance. Of particular concern would be the potential loss of lithosols, a unique habitat often associated within the shrub-steppe region. WDFW is concerned about lithosols because it may prove to be important in the life cycles of many animal species (WDFW 2003b). The potential cumulative impacts on this unique habitat would depend on the quality of habitat at each project site and the combined amount of permanent disturbance.

Lithosols could occur in grassland, low sagebrush, and shrub-steppe vegetation communities. The permanent footprint for the KVWPP would displace approximately 93 acres (under the middle scenario) or 118 acres (under the lower end scenario) of existing vegetation, including 41 to 53 acres of shrub-steppe and 29 to 36 acres of lithosols. Impacts on vegetation from development of the Desert Claim and/or Wild Horse wind power projects would be similar to those described for the KVWPP and would generally consist of localized impacts on the same types of vegetation communities. Construction of Desert Claim project facilities would result in the permanent loss of 78 acres of existing vegetative cover, including approximately 36 acres of shrub-steppe and 4 acres of grassland lithosol. The permanent footprint for the Wild Horse project would displace approximately 104 acres of existing vegetation, including approximately 87 acres of shrub-steppe habitat; lithosols are also present on the Wild Horse site, but have not been quantified (Kittitas County 2003).

For each wind power project, the area of existing vegetation permanently displaced by the project facilities amounts to a small portion (approximately 2% or less) of the respective project area. The combined figures for the three projects amount to 275 to 300 total acres of existing vegetation lost, including 164 to 176 acres of shrub-steppe and at least 33 (and no more than 100, based on an estimate for Wild Horse) acres of lithosols. In the context of the three wind power project areas that cover approximately 17,000 acres, the approximate 2% loss of vegetation at each project site would not be considered an adverse cumulative effect.

As stated in Section 3.2 of this EIS, habitat types within the proposed KVWPP area, including shrub-steppe, are not regionally unique (Daubenmire 1970; Franklin and Dyrness 1988; Cassidy et al. 1997; Johnson and O'Neil 2001). Within about 50 miles east and south of the proposed project area, there are several large areas of protected grassland, shrub-steppe, and sagebrush vegetation communities (e.g., the Colockum, Quilomene, and L.T. Murray wildlife areas and the Yakima Training Center) (WDFW 2003g). Therefore, the combined loss of between 275 to 300 total acres of vegetation, including 164 to 176 acres of shrub-steppe, would similarly not be considered cumulatively adverse in a more regional context. However, the precise regional extent of lithosols is not quantitatively known. Therefore, it is difficult to assess the specific magnitude of cumulative lithosol impacts at the three wind power project sites within the context of the surrounding region.

Construction of the Kittitas Valley, Desert Claim, and Wild Horse projects would increase existing levels of habitat fragmentation and reduce the amount of habitat available for wildlife. Over time, native vegetation may recolonize the disturbed areas. However, construction of these projects would increase the potential for the spread of weeds into previously undisturbed areas. The presence of weeds makes the recolonization of disturbed area with native vegetation difficult, and generally leads to a long-term reduction in quality wildlife habitat.

No federally listed rare plants were identified at either the Kittitas Valley or Wild Horse project sites. However, one Washington State listed species, hedgehog cactus, was found extensively in lithosolic habitats at the Wild Horse project site. According to the Applicant for this project, less than 10% of the individuals identified during the rare plant survey are considered at risk from direct impact from the Wild Horse project (Taylor, pers. comm., 2003). The wet meadow areas in the Desert Claim project area provide potential habitat for the Ute ladies'-tresses, an orchid that is federally listed as endangered. Field surveys of the wet meadow habitats did not locate this species, however, and no other rare plants protected by either the federal or state governments were found in searches of the areas of likely disturbance in the Desert Claim project area (Kittitas County 2003). The minimal potential impacts of the proposed wind projects on rare plants would not represent a significant cumulative impact on any species.

Wetlands

Project construction could affect wetland resources in the region. Cumulative impacts on wetlands could result from directly filling or grading wetland systems, as well as from indirect effects caused by stormwater runoff, increased pollutant loading, and water quality degradation, which in turn could result in loss of wetland diversity and reduced wetland functions and values. The KVWPP would disturb between 135 and 185 square feet of one potential wetland system at the project site (see Section 3.2 of this EIS). No wetlands were identified within a 164-foot buffer around the planned locations for Wild Horse project facilities; therefore, no impacts on wetlands are anticipated for that project.

Based on current plans for the Desert Claim project, construction activities would temporarily disturb approximately 16 acres of wetland area, while the permanent project footprint would overlap with an area estimated at 9 acres. Final "micro-siting" for project facilities could be used to avoid at least some of these wetland areas. To the extent that avoidance of wetland areas is not feasible, mitigation would be developed to enhance or replace wetland areas (Kittitas County 2003).

The collective effects of the three proposed wind power projects would be the same as the effects identified for the Desert Claim project. The wetland impacts of the Desert Claim project would be minor as a result of wetland avoidance and/or required mitigation for wetlands that could not be avoided. Because the collective effects of these projects would be minor and are not expected to extend to downstream surface waters or wetlands, no significant cumulative impact on wetland resources is expected.

Wildlife

Following is a summary of the wildlife cumulative impacts analysis prepared for the KVWPP, the Desert Claim, and the Wild Horse wind projects (WEST Inc. 2003).

<u>Big Game</u>

The KVWPP, most of the Desert Claim, and all of the Wild Horse project sites are located in mule deer winter range (WDFW Priority Habitats database). The Wild Horse project and the northern portion of the Desert Claim project also are located in elk winter range. The KVWPP is not located in elk winter range. A defined elk migration corridor crosses the northern portion of the Desert Claim project.

Some temporary displacement of wintering mule deer and elk is anticipated from winter construction activities in the three wind power projects. These temporary impacts may be greater if construction occurs simultaneously on two or all three of the projects because of the larger area subject to disturbance.

It is not known if human activity associated with regular maintenance activity would exceed tolerance thresholds for wintering mule deer or elk. If tolerance thresholds during regular maintenance activities are exceeded, some animals are likely to be displaced and use areas away from the wind project development areas. Given the amount of existing residential development and the existing roads and disturbance in the vicinity of the KVWPP and Desert Claim projects, disturbance levels during operation would not increase greatly. The Wild Horse project is located in a relatively undeveloped area used primarily for livestock grazing and recreation, creating seasonal increases in the level of human activity in this area. Human activity levels from operation and maintenance at the Wild Horse site would be less seasonal but would occur at a low level year-round. While operational impacts on wintering mule deer and elk at the Wild Horse site may be greater than under existing conditions, cumulative impacts for all three wind power projects are expected to be low.

Birds

Raptors

Based on the estimated levels of raptor use within the three project study areas, raptor mortality is expected to be slightly higher compared to other new wind generation projects with similar turbine types. Under the three projects, the estimated combined raptor mortality rate would be approximately 14 raptor fatalities per year for the three projects combined with 361 turbines, and 15 raptor fatalities per year with 391 turbines. Because the Wild Horse project is approximately 20 miles from the KVWPP and 13 miles from the Desert Claim project, and given the typical home ranges of the raptors at risk of collision at the three projects, the same breeding raptors that use the KVWPP and Desert Claim project areas are not expected to use the Wild Horse project area (see Appendix A, Wildlife Cumulative Impacts Report, Table 7).

Red-tailed hawks, American kestrels, and northern harriers account for much of the raptor use at the three projects during spring, summer, and fall. During winter and early spring, red-tailed and rough-legged hawks account for most of the raptor use. These species are expected to be the raptor species with the highest risk of mortality across the projects. The mortality risk associated with other raptor species such as turkey vulture, golden eagle, and prairie falcon is expected to be much lower than the risk for red-tailed hawks and American kestrel because of their less frequent use of the sites. Recent published data for new wind energy projects in the West indicate there have been few northern harrier fatalities recorded at these wind power sites, and no bald eagle or rough-legged hawk fatalities have been observed (Erickson et al. 2000). Golden eagle use of the three proposed project areas is low relative to other wind sites, and mortality is also expected to be low.

Bald Eagles

Bald eagles occupy the KVWPP vicinity from approximately late December to early April. The number of bald eagles in the area appears to increase from late December to approximately mid-February. They are not the most common raptor in the area, but their numbers appear to be increasing most likely due to overall recovery of the species in Washington as well as throughout the western states and North America.

Cumulative impacts on bald eagles could be loss of winter habitat and fatalities. None of the projects would contribute to the loss of roosting habitat (which is limited to the Yakima River riparian corridor) or foraging areas (which are primarily cattle lots and calving operations), and the cumulative impact on bald eagle winter habitat from the three proposed wind power projects would be small.

To date, no bald eagle fatalities have been reported from wind power projects in the United States. This is because the foraging behavior of wintering bald eagles, primarily scavenging, may make them less susceptible to collision with wind turbines because they are presumably less focused on moving prey and more attentive to their surroundings while searching for carrion (dead cows). Based on infrequent use of the proposed project areas by bald eagles, and the lack of reported fatalities at any operating wind power project in the United States, fatalities are expected to be low. However, due to nearby roosting and foraging areas, bald eagles might regularly move through the project areas and thereby increase their exposure. Assuming risk of collision is proportional to use, one bald eagle fatality across all three projects may occur every two to three years. The cumulative effect of this low level of mortality on the increasing bald eagle winter population in the Kittitas Valley and the State of Washington would not be measurable.

Passerines

Passerines (bird of the order *Passeriforme*, which includes perching birds and songbirds such as finches, warblers, sparrows, blackbirds, and jays) represent the most abundant avian fatality at other wind projects studied (see Johnson et al. 2002; Young et al. 2003b; Erickson et al. 2000, 2001, 2002). Both migrant and resident passerine fatalities have been observed. Given that passerines make up the vast majority of the avian observations at the three project sites, it is expected that passerines would make up the largest proportion of fatalities for the three projects combined. Passerine species most common to the project sites would likely be most at risk, including European starling, American robin, horned lark, cliff swallow, American goldfinch, Brewer's blackbird, American pipit, and vesper sparrow. Based on the mortality estimates from other wind projects studied, combined passerine mortality for the three projects would range from 430 to 740 fatalities per year. This level of mortality is not expected to have any population-level consequences for individual species because of the expected low fatality rates for most species and the high population sizes of the common passerine species such as European starling, American robin, horned lark, American pipit, and western meadowlark.

Bats

Bat fatalities are likely to occur at all three Kittitas County wind power projects. Bat research at other wind projects indicates that migratory bat species are at some risk of collision with wind turbines, primarily during the fall migration season. Most bat fatalities observed at wind projects have been tree-dwelling migratory bats, with hoary and silver-haired bats being the most prevalent. Although no specific surveys for bats have been conducted, both hoary bats and silver-haired bats may use the forested habitats near the three project sites and likely migrate though the three project areas.

Using mortality estimates from other wind projects (one to two bat fatalities per turbine per year), total annual bat mortality for all three wind power projects in Kittitas County is expected to range from 361 to 782. The significance of bat mortality from the three projects is hard to predict because there is little information available regarding the size of bat populations. Studies suggest, however, that resident bats do not appear to be significantly affected by wind turbines (Johnson et al. 2003; Gruver 2002) because nearly all mortality is observed during the fall migration period. Therefore, significant adverse impacts on resident bat populations are not expected.

Fisheries

Studies conducted for the KVWPP did not identify any fish-bearing habitat within 0.5 mile of any proposed facility or construction location, and no impacts on fish habitat or fish species associated with construction and operation of the KVWPP are anticipated (see Section 3.2 of this EIS). Similarly, no fish are known to use the Wild Horse project area, and the nearest fish habitat is located along Quilomene Creek approximately 1 mile north of the project. The lower reaches of Whiskey Dick and Skookumchuck creeks also provide habitat for salmonids; these areas are approximately 5 miles downstream from the Wild Horse site. Assuming best management practices are used for erosion and sediment control (as would be required permit conditions for all three projects), the Wild Horse project would not adversely affect fish or fish habitat onsite or in downstream areas (Kittitas County 2003).

Development of the Desert Claim project would result in minor disturbance or displacement impacts on streams and riparian zones in the project area. Because none of the affected streams are known to contain fish communities, direct impacts on fish resources are expected to be negligible or nonexistent. Similarly, the potential indirect effect of the project on water quality and quantity would be a negligible effect on downstream water resources or the fish habitat they provide (Kittitas County 2003).

Proposed access road construction at the KVWPP site would affect three streams and their associated riparian habitat for a total disturbance of between 1,041 and 1,245 square feet under the middle and lower end scenarios, respectively. However, potential impacts on the stream channels related to construction are expected to be short term and negligible with proper management (see Section 3.2 of this EIS). At the Desert Claim project site, approximately 41,645 square feet of stream and riparian habitat would be affected by temporary construction activities, with 112 square feet permanently affected by project operations. If relocation of facilities to avoid these areas is not feasible, mitigation would be developed to enhance or replace riparian areas (Kittitas County 2003). The extent of direct impact on streams and riparian zones at the Wild Horse site is not known at this time.

The cumulative effects of the three proposed wind power projects would consist of negligible direct and indirect effects on water resources in three localized areas of the Kittitas Valley. Because the effects of the respective projects would be negligible and would not extend to downstream waters, no significant cumulative effect on fishery resources is expected (Kittitas County 2003).

3.14.7 Water Resources

As described in Section 3.2, the water resource impacts of the project would be localized and temporary, primarily limited to the construction period. The water resource impacts of the Desert Claim and Wild Horse projects would be similar to those described for the KVWPP. All of the projects involve the same types of construction activities and project features, similar areas of ground disturbance, similar restoration and mitigation actions, and similar water demands. However, in the case of the Wild Horse project, proposed construction includes development of gravel quarries and one or more concrete batch plants within the project area. Consequently, water resource impacts associated with gravel extraction and concrete manufacture for the Wild Horse project would be onsite and more concentrated, while these effects for the Kittitas Valley and Desert Claim projects would be offsite and more dispersed. Construction activities for each project would be required to follow stringent surface water protection regulations. None of the projects would require extensive construction activity or permanent project facilities along or near major streams. Overall, the effects of the individual projects on water quantity and quality would be minor and would not result in noticeable changes in downstream areas.

Specific cumulative impacts on water resources from the three wind power projects would depend on the characteristics of common surface water bodies and aquifers to which the three proposed wind power projects are hydrologically linked. Most of the KVWPP area is located within the drainage of Dry Creek, which is an ephemeral stream that joins the Yakima River northwest of Ellensburg, while a portion of the area drains directly to the river. The Desert Claim project area is situated within the drainages of Reecer Creek and several tributaries to Reecer Creek, which flows into the Yakima River near its confluence with Dry Creek. Neither of these streams is a major tributary to the Yakima River; Dry Creek is not a perennial stream, while Reecer Creek is perennial but has a documented flow range of 4 to 68 cubic feet per second. Most of the Wild Horse project area is within the drainages of Whiskey Dick and Skookumchuck creeks, which are small streams that drain eastward to the Columbia River. Part of the Wild Horse area drains to Whiskey Jim Creek and subsequently to Parke Creek, which is a minor tributary of the Yakima River that enters the river southeast of Ellensburg.

Because the three projects are sufficiently distant from each other and are located in different tributary watersheds, there would not be a combined effect from multiple projects on the same stream. The minor, localized effects of each project would occur within the drainages of minor tributaries to the Yakima River and the Columbia River and at a distance of at least several miles upstream from either river. Therefore, significant cumulative effects on water resources within the Upper Yakima River basin or the northeastern portion of the Kittitas Valley are not expected, even if all three projects were constructed.

3.14.8 Health and Safety

The potential for exposure to fuel and non-fuel hazardous substances would increase, particularly during the construction period if construction periods were to overlap. During construction, diesel fuel and gasoline would be used at the proposed project sites to fuel construction equipment and vehicles. In addition, mineral oil would be used to fill pad-mounted transformers at the turbines as well as to fill substation transformers. However, the effects would be localized in the area of the spill, and not likely to result in an adverse cumulative impact.

The cumulative risk of wildfires in central and eastern Kittitas County could increase during both the construction and operational phases of the three wind power projects. The greatest fire risk for each project would occur during the construction period because of the level of activity and number of workers and equipment active at that time. The greatest cumulative fire risk would occur if and when construction schedules for two or all three of the projects overlapped. The construction program for each project would include contracted fire protection services from the respective local fire district, which would facilitate response to any incidents that might occur. Trained personnel who could respond to fire hazards would also be present at the wind power construction sites. However, even with implementation of strict fire protection and prevention measures, the cumulative risk of potential fires associated with construction of the three proposed wind turbine projects would remain significant.

Certain fire risks specific to wind energy projects would also exist during the operating period for each project. However, specific measures to counteract or manage these risks would be implemented during project operation. The wind turbine machinery is designed with fire safety in mind, and the cleared areas and gravel pads around the base of the turbines and other facilities would minimize the spread of fire. The project facilities would be continuously monitored, and the project areas would be regularly patrolled. Access to the project areas would be limited. Furthermore, wind power operations do not preclude water application from the air for fighting fires (Taylor, pers. comm., 2003). Therefore, with implementation of these protective measures, the concurrent operation of the three proposed wind power projects would not likely pose a significant cumulative fire risk.

Potential risks to the health and safety of site personnel from operations and maintenance of the three proposed wind power projects would be minor because they involve relatively small numbers of workers (ranging from 30 to 42). Worker exposure to health and safety risks at the Desert Claim and Wild Horse wind power sites would not be greater than those potentially experienced at the KVWPP site. No significant cumulative impacts are anticipated if appropriate site safety procedures are implemented at each project site. The production of wind energy raises several health and safety issues specific to wind turbines operations. Site-specific health and safety concerns include the potential for ice to be thrown from rotating blades, blades to disengage and be thrown from the tower, and tower collapse during extreme weather conditions. Potential health and safety impacts from the three projects would be localized in nature, and the combined effects of the three projects would not result in a significant cumulative impact.

While the probability of any specific hazard occurring would be the same for each project (based on similar numbers and sizes of wind turbines), the risk of exposure to those hazards would vary with the level of human activity near each project. In general, the risk of exposure would be greatest (although still low, in probability terms) for turbines that are close to residences or public roads. Some individuals living in the northern portion of the Kittitas Valley might have common travel patterns that would involve trips through or past portions of both the Kittitas Valley and Desert Claim project areas (e.g., along and near Green Canyon Road and Smithson Road). Based on the low probability associated with these hazards and the mitigation measures available to reduce the risks, this situation is not anticipated to involve a significant cumulative increase in health and safety risks. However, these individuals could still experience some increased exposure to ice throw or similar mechanical risks associated with elements of both projects.

Potential shadow-flicker impacts from the three proposed wind power projects would be limited to the immediate vicinity (approximately 2,000 feet) of the wind turbines within each respective project area. There are no occupied residences within this distance of the Wild Horse project, and shadow-flicker impacts from this project would be minimal or nonexistent. Some residences that are close to turbines at the Kittitas Valley or Desert Claim projects would be subject to shadow-flicker for varying hours per year. These impacts would be limited to a number of discrete locations that are well separated from each other and would not constitute a cumulative impact from these two proposed projects (Kittitas County 2003).

The electric and magnetic fields associated with the Kittitas Valley, Desert Claim, and/or Wild Horse wind power projects would be less than those produced by electrical facilities already present near the respective project areas and would diminish to background levels at distances where public exposure could occur. Therefore, the wind power facilities would not add to the strength or extent of electric and magnetic field exposure that may already occur, and there would not be cumulative exposure impacts from development of multiple wind energy projects (Kittitas County 2003).

3.14.9 Energy and Natural Resources

When combined with other planned wind projects in the region, construction activity associated with the KVWPP would contribute to local energy demands. The combined demands of the three projects for fuel and construction materials would cumulatively contribute to the local and regional demand for, and irreversible expenditures of, nonrenewable resources on a temporary basis. Types of nonrenewable resources include diesel fuel and gasoline to operate construction vehicles and equipment, as well as steel and concrete required to build wind power facilities. The single largest demand would be for sand and gravel resources that might, for the Kittitas Valley and Desert Claim projects, be obtained from sources within the project area. Overall, based on timing considerations and the incremental resource demands associated with the projects, the combined effects of the three projects would not result in a significant cumulative impact on energy and natural resources.

The three proposed wind power projects would provide a combined nameplate capacity of 540 to 545 MW of electricity (under the middle scenario for the KVWPP). Assuming long-term operation of the three projects at a net capacity of 33%, the Kittitas Valley, Desert Claim, and Wild Horse projects would produce approximately 180 average MW of electricity on a long-term basis. That collective energy output would represent a substantial increase in the amount of electricity currently produced within Kittitas County. Operation of the three projects would also cumulatively add to the capacity, production, and availability of renewable energy sources in Washington State and the greater Pacific Northwest, and would provide a sustainable, renewable source of electric power supply to supplement the region's existing hydroelectric, nuclear, and coal or gas-fired power projects, although it would represent a relatively small addition to the total regional electricity supply. Utilities receiving the wind energy would be able to diversify their energy resource portfolios and stabilize a portion of their long-term energy supply costs. Power produced by the wind projects would also be responsive to the identified needs of regional utility providers, including PSE.

3.14.10 Land Use and Recreation

Development of the KVWPP concurrent with the proposed Desert Claim and Wild Horse wind projects would result in permanent conversion of approximately 330 acres open space and rangeland uses in central Kittitas County for wind energy production. Existing land uses such as grazing could continue up to the edge of project facilities. In the short term, proposed wind energy facilities would not collectively disrupt or change the underlying land use pattern of this portion of the county. While some localized land use conflicts could occur based on the location of specific turbines, these are seen as site-specific and not indicative of conflict with the broader underlying rural land use pattern.

The three proposed wind energy projects would require either County approval for a rezone and Comprehensive Plan amendment, or EFSEC review and Governor approval. These permitting processes, and the underlying local land use regulations, are designed to prevent incompatible uses and the degradation of agricultural land, in particular. The implementation of these regulations minimize the potential for cumulative impacts would be minimized by implementation of these regulations.

Temporary population increases associated with Kittitas Valley, Desert Claim, and Wild Horse wind project construction workers could cumulatively increase demand for and use of local and regional recreation resources during overlapping construction periods. Peak construction of each project could employ between 150 and 180 workers, or a combined total of 450 to 540 workers. Increased demand would be most anticipated for offsite regional resources that could provide temporary accommodations for transient construction workers, such as campgrounds. It is possible that access to heavily used recreational resources throughout Kittitas Valley and central and eastern Kittitas County could be limited during peak recreation use months, such as during the summer. The exact nature and extent of cumulative demands for recreational resources would depend upon the timing of the three construction projects. It is anticipated that upon construction completion, the permanent population increase associated with these three wind power projects (between 30 to 42 workers) would not result in substantial cumulative demands for recreation resources.

3.14.11 Socioeconomics

Cumulative impacts on population, housing, and employment must be considered when two or more large projects (wind power generating or otherwise) are proposed in the same general area with similar construction schedules. For example, if built at the same time, the construction workforce for the Kittitas Valley and Wild Horse wind power project would be drawn from similar local labor pools and create a demand for the same temporary housing.

Cumulative population and housing impacts would likely be limited to a project radius of approximately 75 miles (as a general rule, it is considered unlikely that construction workers would commute more than 75 miles to work). Furthermore, due to the relatively small area of potential effect, and the differing contexts within which the projects would be built, cumulative impacts would need to be evaluated on a project-specific basis.

The proposed projects could contribute to increases in temporary and permanent job opportunities and populations in the region. Peak construction of each project could employ between 150 and 180 workers, for a combined peak total of 450 to 540 workers. These estimates are based on the experience of applicants at other facilities. The number of construction workers who would reside within or outside Kittitas County cannot be precisely predicted. Using the same assumptions in Section 3.7 of this EIS and based on the Stateline Wind Project in nearby Walla Walla County for purposes of analysis, it is assumed that 30 to 50% of all workers would be local (i.e., already residing within reasonable commuting distance, defined as Kittitas or Yakima counties) and the remainder would come from outside this localized area (e.g., Benton or King counties). If conservatively 30% of wind facility workers are assumed to be local, 105 to 126 non-local workers would be employed by each project, or a cumulative total of 315 to 378. The actual mix of local and non-local would depend on the availability and residence of construction workers with the particular skills needed for wind facilities, and competition from other concurrent construction projects in the region.

The majority of cumulative population and housing impacts would be temporary and would occur during construction. It is likely that some non-local construction workers would choose to live in housing located in Ellensburg or Yakima, both located within a reasonable commuting distance of the project sites.

The workforce analysis conducted for the KVWPP suggests that there is a sufficient labor supply available to complete both the Kittitas Valley and Wild Horse wind power projects within the same time frame. If the Desert Claim project were also to be constructed simultaneously, the local workforce supply might be strained. The result may be to draw more workers from outside of the project area, thus potentially affecting local population and housing.

Assuming that all three projects could be constructed simultaneously, temporary population increases resulting from construction work forces could result in cumulative effects to the local housing supply. Temporary housing would be needed for those workers that would re-locate to the Ellensburg area during construction of these projects. There were more than 1,700 vacant housing units in Kittitas County in 2000 categorized as “seasonal, recreational, or occasional use” units. In addition, more than 40% of the County’s total housing stock is rental housing, with a vacancy rate (per 2000 census data) of almost 7%. Several motels/hotels, RV parks, and other transient lodging establishments in the Ellensburg and Cle Elum/Roslyn area could provide temporary lodging for wind power project construction workers. Therefore, it appears that the study area has an adequate supply of temporary housing to accommodate the potential cumulative increase in construction workers from outside the area. Vacancy rates for temporary housing could decrease for a period of a few months, however.

Over their life times, each wind power project is estimated to employ between 10 and 14 full-time workers for operations and maintenance; cumulative operations employment would be between 30 and 42. These estimates are based on the applicants' experience with other projects, which suggests that about half of the operations workers could be local residents. However, even if all were assumed to come from outside the area, the cumulative housing impact from a population increase of this size would not be considered significant.

Employment Income and County Revenues

The three wind power projects would increase retail sales and overall economic activity in the area, as well as employment opportunities for residents of Kittitas County. The three projects would also increase the amount of annual property tax revenue to the County. Estimated direct, indirect, and induced income generated by the three wind power proposals is shown below for the construction and operation phases. These estimates are based on analyses of jobs, income, wages, and similar economic impacts prepared for each proposal and included in the corresponding EISs or application materials (see Section 3.7 of this EIS for a discussion of the methodology used for the KVWPP analysis).

In general, the analyses indicate that the projects cumulatively would generate substantial income for the local economy and residents, almost $16 million during the construction period and approximately $5.3 million annually thereafter (see Tables 3.14-2 and 3.14-3). The direct impact figures for the construction phase primarily represent local labor income assumed to be paid to construction workers. The indirect and induced impacts reflect the local income effect from local construction purchases and the re-spending of those dollars within the local economy. The direct impacts for the operations phase (Table 3.14-3) include local labor income to operations employees and annual lease payments to landowners (which have been estimated at $4,500 per turbine per year).

Table 3.14-2: Cumulative Income Impacts Generated by Construction Employment in Kittitas County (2002$) for Kittitas Valley and Desert Claim Projects

	Desert Claim	Kittitas Valley [1]	Wild Horse [2]	Cumulative Total
Direct	$ 3,333,000	$ 4,577,100	$ 4,577,100	$ 12,487,200
Indirect	$ 433,000	$ 518,100	$ 518,100	$ 1,469,200
Induced	$ 502,000	$ 701,800	$ 701,800	$ 1,905,600
Total	$ 4,268,000	$ 5,797,000	$ 5,797,000	$ 15,862,000

Sources: ECONorthwest 2002, as amended by Sagebrush Power Partners LLC 2003c; Kittitas County 2003.

1 Assumes 121 turbines.

2 Estimated to be the same as the KVWPP.

Table 3.14-3: Annual Cumulative Income Impacts in Kittitas County during Operations (2002$) for Kittitas Valley and Desert Claim Projects

	Desert Claim	Kittitas Valley [1]	Wild Horse [2]	Cumulative Total
Direct	$1,041,000	$ 1,489,400	$ 1,489,400	$ 4,019,800
Indirect	$124,000	$ 59,400	$ 59,400	$ 242,800
Induced	$168,000	$ 436,700	$ 436,700	$ 1,041,400
Total	$1,333,000	$ 1,985,500	$ 1,985,500	$ 5,304,000

Sources: ECONorthwest 2002, as amended by Sagebrush Power Partners LLC 2003c; Kittitas County 2003.

[1] Assumes 121 turbines.

[2] Estimated to be the same as the KVWPP.

It is possible for some large projects to increase the demand for labor sufficiently to place upward pressure on wages in certain sectors of the construction industry. However, it is expected that contractors for the three proposed wind power projects would have access to a large construction labor pool from a geographic area that includes Seattle and Yakima. Thus, the effect on construction wages and income would not likely be significant (Taylor, pers. comm., 2003).

The Kittitas Valley, Desert Claim, and Wild Horse proposals have each prepared analyses that estimate the fiscal (i.e., governmental cost and revenue) impacts of the individual project. Each project analysis also considered indirect and induced economic impacts (quantitatively or qualitatively) as well as direct fiscal impacts. Although the studies were performed at different times and/or were organized differently, refined information is now available for some of the proposals. As such, they provide a reasonable overview and estimate of the fiscal effects of each wind power proposal. The reader should consult the respective analyses to obtain greater detail about economic and fiscal issues.

Cumulative fiscal impacts, as summarized here, are considered to be the simple addition of the direct costs and revenues of each project. There is no synergistic effect assumed from multiple projects in terms of direct revenues; such an effect could occur, however, in terms of indirect or induced economic effects (e.g., additional jobs, income, spending, etc.). For purposes of estimating cumulative impacts, each project is assumed to be approximately the same size (+/- 120 turbines), and the value of each turbine is assumed to be assessed at approximately $765,000. (This value is slightly higher than the value of $750,000 used in the ECONorthwest report [ECONorthwest 2002, as amended by Sagebrush Power Partners LLC 2003c] that evaluated the KVWPP, which was updated to apply to the three proposed wind power projects.) Therefore, each project would have an initial assessed value of over $90 million and the combined assessed value for all three projects would be over $270 million. The combined value of the three projects would represent an increase of more than 10% over the current assessed valuation for all real and personal property in Kittitas County of approximately $2.5 billion (Kittitas County 2003).

The estimated potential property tax revenues in the first operational year would be more than $3.8 million, and more than $1 million for each project. (Revenues for Wild Horse are assumed to be the same as for the middle scenario for the KVWPP, 121 turbines.) Differences in methodology used among the three projects (in this case, primarily the applied tax levy rate) results in different revenue estimates for projects with similar capital characteristics. The allocation of this potential property tax revenue to various government agencies/funds and special districts is shown in Table 3.14-4.

Because the value of the turbines would depreciate over time, property tax revenues would also decline over their 30-year lifetime. Depreciation schedules applicable to the projects are not available at this time.

Current statewide legal limitations on property taxes would likely result in actual tax revenues lower than those indicated in Table 3.14-4. Initiative 747 limits the growth of local government property tax revenues to 1% per year, although the I-747 cap does not apply to the assessed value of new construction. Because the total assessed valuation for Kittitas County would increase substantially (over 10%) with inclusion of the value of the wind power projects, the tax rates levied against the total assessed valuation base might need to be reduced to stay within the I-747 limit. In that event, actual revenues derived from the projects would be less than indicated in Table 3.14-4, although taxpayers would benefit from the reduced levy rate. On balance, the actual effect of the projects on property taxes would likely be some combination of increased revenues and decreased levy rates (Kittitas County 2003).

The three proposals could also generate some costs for public services (e.g., fire protection, law enforcement, road maintenance) that might not be covered by mitigation requirements. To the extent that this occurred, it would reduce the fiscal benefits that would otherwise be associated with the projects. These potential service costs have not been quantified but are estimated to be minor, both individually and cumulatively. Expected cumulative revenues are projected to be significantly higher than estimated costs for the projects and would result in a substantial benefit (a surplus of revenues relative to costs) for the affected local jurisdictions (Kittitas County 2003).

Table 3.14-4: Cumulative Potential Property Tax Revenues in Kittitas County with Wind Projects (First Operational Year)

	Desert Claim	Kittitas Valley	Wild Horse	Cumulative Total
Local Schools	$ 375,700	$ 407,000	$ 407,000	$ 1,189,700
State	$ 264,800	$ 376,200	$ 376,200	$ 1,017,200
Road District	$ 149,700	$ 135,300	$ 135,300	$ 420,300
Fire Districts	$ 132,700	$ 80,300	$ 80,300	$ 293,300
County Government	$ 123,100	$ 168,300	$ 168,300	$ 459,700
Hospital District/Other Local Services[1]	$ 40,800	$ 63,800	$ 63,800	$ 168,400
Local Communities[2]	NA	$ 112,200	$ 112,200	$ 224,400
Total	$ 1,086,800	$ 1,343,100	$ 1,343,100	$ 3,773,000

Source: Kittitas County 2003.

Notes: Numbers rounded; NA = not available; revenue estimates based on assessed valuation calculated for each project and multiplied by levy rate of 1.18 for Desert Claim and 1.35 for Kittitas Valley and Wild Horse.

1 “Other local services” included for Kittitas Valley and Wild Horse, not for Desert Claim.

2 This category of revenue was not estimated for Desert Claim.

3.14.12 Cultural Resources

The proposed project, in conjunction with other proposed or planned projects, including the Desert Claim and Wild Horse wind power projects, would result in ground disturbance that could potentially impact identified and unidentified prehistoric and/or historic sites, as well as cause impacts on traditional cultural properties. The direct and indirect effects of each project on cultural resources are not yet known with precision; therefore, the combined cultural resource impacts of the three projects are uncertain. Cumulative cultural resources impacts would need to be quantified on a project- and area-specific basis. Cultural resource surveys and coordination with affected Tribes, as required prior to construction of all projects under SEPA, would identify the locations of these resources so they could be avoided to the extent possible. A summary of known resources identified in the wind projects cumulative study area is summarized below.

As identified in Section 3.8 of this EIS, two previously unrecorded archaeological sites (lithic scatters) were documented for the KVWPP. Cultural sites in or near the Wild Horse project area include six previously recorded archaeological and historical sites and three previously unrecorded archaeological sites (Trautman, pers. comm., 2003). None of these cultural sites would likely be disturbed by proposed construction, although visible evidence of project facilities would indirectly affect the setting for three of the sites (Kittitas County 2003).

The density of cultural resources in the Desert Claim project area appears to be considerably greater than in the Kittitas Valley and Wild Horse areas. A field survey of the Desert Claim project area identified 13 previously unrecorded prehistoric sites and 18 previously unrecorded historic sites (as well as one recorded historical site), along with more numerous prehistoric and historic isolates. Potential direct and indirect impacts on those cultural resources could generally be avoided or reduced through final turbine "micro-siting" and other mitigation measures. Therefore, the combined effects of the three proposed wind power projects on cultural resources appear to be the possible disturbance of a small number of sites and the alteration of the visual setting for up to 35 to 40 cultural sites (Kittitas County 2003).

During consultations between EFSEC and the Yakama Nation regarding the KVWPP, tribal representatives expressed concern about the cumulative effect wind power projects could have on tribal lands. Concerns raised on past wind projects include how wind power developments may affect the cultural and spiritual practices of the Yakama People, particularly projects located on sacred lands that could affect sacred foods and medicines (County of Benton and Bonneville 2003). Efforts to bring together wind power facility applicants, state and federal government agencies, and tribal representatives to discuss these and other issues of concern are ongoing.

While impacts from these and other projects in the county could result in a net cumulative loss of cultural resource values in the region, implementation of mitigation programs in each individual project should help to limit project-specific impacts, therefore reducing overall cumulative impacts on cultural resources.

3.14.13 Visual Resources

Figure 3.14-1 shows the locations of the proposed Kittitas Valley, Desert Claim, and Wild Horse wind power projects around the Kittitas Valley. As this map indicates, the Kittitas Valley and Desert Claim projects are relatively close to each other (within 1.6 miles at the closest point), while the Wild Horse Project is 14 miles from the Desert Claim project and 21 miles from the KVWPP.

In addressing the potential cumulative visual impacts of multiple wind power projects, it is most important to consider the Desert Claim and Kittitas Valley projects together because of their proximity. Should both the Kittitas Valley and Desert Claim projects be built, the visual consequences would include approximately 240 wind turbines (120 for each project) on the valley floor and adjacent slopes in the north-central portion of the Kittitas Basin.

The Kittitas Valley and Desert Claim projects were examined to identify the extent to which there are viewpoints from which both projects could be seen in foreground to middle ground views. Because of topographic conditions, there are no areas where the Kittitas Valley project could be seen in the foreground and the Desert Claim project in the middle ground or background. However, there are a number of locations where the Desert Claim project could be seen in the foreground to middle ground and the Kittitas Valley project could be seen in the middle ground to background.

Figure 3.14-2 shows the locations of two viewpoints selected to simulate the cumulative visual impacts of the Kittitas Valley and Desert Claim wind power projects. These two viewpoints are representative examples of the combined effects of both projects on views from these areas.

Viewpoint 1 is located on Reecer Creek Road at a point slightly west of the Kittitas County Fire District Station No. 2. (Figure 3.14-3 illustrates the existing view from Viewpoint 1 on Reecer Creek Road, looking northwest.) Simulated views of the Kittitas Valley project, Desert Claim project, and combined (cumulative) scenario with both projects are shown in Figures 3.14-4, 3.14-5, and 3.14-6, respectively. All views are shown from Viewpoint 1 on Reecer Creek Road looking northwest. The Kittitas Valley project would be seen in the middle ground to background zones, whereas the Desert Claim project would be much more prominent, seen in the near middle ground zone. The addition of the Kittitas Valley project in the middle ground to background zones of the view with the Desert Claim project in the near middle ground would not substantially increase the effect that the Desert Claim project alone would have on the visual character and quality of the view.

Viewpoint 2 is located just outside of the National Forest boundary where the view expands sufficiently to allow substantial portions of both the Kittitas Valley and Desert Claim projects. (Figure 3.14-7 shows the existing view from outside the Wenatchee National Forest, looking south.) Figure 3.14-8 is a simulation from this viewpoint that illustrates what the Kittitas Valley would look like with development of both projects. The view in this figure is also looking south from outside the Wenatchee National Forest. Both projects would be located in the background zone of this view, but would substantially alter the existing visual character and quality of the Kittitas Valley from this viewpoint.

Figure 3.14-2

Figure 3.14-3

Figure 3.14-4

Figure 3.14-5

Figure 3.14-6

Figure 3.14-7

Figure 3.14-8

Because the Wild Horse project is located so far from the other two projects and in an entirely different portion of the landscape, it has limited potential to be seen in the same view as the other two projects. There may be some locations near the Kittitas Valley and Desert Claim wind power project sites from which there is an unobstructed line of sight toward Whiskey Dick Mountain and the Wild Horse project site. However, because of the large distances involved (21 miles from the Kittitas Valley project and 14 miles from the Desert Claim project), the Wild Horse turbines would be barely (if at all) detectable and would have essentially no effect on the view.

There may also be some viewpoints in or near the valley from which all three projects would be visible. One example is a segment of I-90 as it enters the Kittitas Basin near the Elk Heights interchange. The eastbound view in this instance includes the northern margin of the valley (with large portions of both the Kittitas Valley and Desert Claim project areas) and Whiskey Dick Mountain in the distant background. In this case, the Kittitas Valley and Desert Claim turbines would be 2 to 10 miles away, while the Wild Horse project would be so far away as to be an insignificant background feature (Kittitas County 2003).

The preceding discussion addresses the potential for cumulative visual impacts from specific viewpoints or localized areas. The overall effect of multiple wind energy projects on the regional landscape and the experience of viewers when considered over time and at multiple locations is also a consideration. For example, drivers passing through Kittitas County on I-90 would likely notice a major wind development (the Wild Horse project) for a time in the stretch of highway east of the Columbia River and again in the eastern end of the Kittitas Valley (primarily around the community of Kittitas), and could subsequently view a more extensive area of wind turbines to the north and west of Ellensburg (the Desert Claim and Kittitas Valley projects). Travelers would be likely to recall having seen a collection of wind turbines a few minutes before seeing more wind turbines. This progressive realization could leave the impression with some viewers that wind turbines are plentiful in Kittitas Valley.

This type of impression would also occur for residents of and frequent visitors to the local area. While residents of Ellensburg, for example, might not see turbines from one or more of the wind projects on a daily basis, they would likely experience repetitive views of wind turbines through their local travels over a period of weeks, months, or years. Consequently, some local residents and frequent visitors might perceive a substantial change to the overall character of the Kittitas Valley landscape, and such a response would be more likely with the development of multiple wind projects (Kittitas County 2003).

The development of the three proposed wind power projects would also cumulatively contribute to increased nighttime lighting in the Kittitas Valley. At present, the proposed wind power project sites and surrounding areas are relatively dark at night. Proposed flashing red lights required by the FAA on the tops of a certain number of turbine towers would be most noticeable in the areas within a mile of each project. These lights are likely to have an adverse cumulative effect on views from residential properties near the Kittitas Valley and Desert Claim project areas.

3.14.14 Transportation

If two or more large projects were constructed on similar or the same schedules, such as the Kittitas Valley, Desert Claim, and Wild Horse wind projects, commuting construction workers and construction supply and material deliveries could contribute to added congestion on the same local roads and highways. For example, the Kittitas Valley and Desert Claim sites are less than 5 miles apart by surface road, increasing the likelihood that construction workers and delivery trucks at both sites could use common routes.

Planned transportation improvement projects could also reduce capacity on local roads, making the burden of additional commuter traffic difficult to absorb. For example, the proposed paving project on I-90 between milepost 55 and 67, scheduled for the Spring of 2004, could occur during the same time period as construction of one or more of the wind power projects. Some temporary cumulative impacts on the local road and highway network would result from the combined construction activities.

The Applicant for the Kittitas Valley and Wild Horse wind power projects prepared a cumulative traffic impact analysis of construction traffic from the two projects, which was reviewed by the EIS consultant and is summarized below. It is followed by a discussion of the possible added construction traffic effects of the Desert Claim project.

Kittitas Valley and Wild Horse Wind Power Projects

The primary route used to transport equipment to the KVWPP site begins in the City of Seattle and continues east on I-90 to US 97 (Exit 106) in Ellensburg. In the vicinity of the project, I-90 is classified as a rural-interstate, according to the WSDOT road classification system. The segment of I-90 immediately west of Exit 106 carries an ADT volume (in both directions) of 22,000 vehicles, with an estimated 21% trucks (WSDOT 2001).

There are two transporter routes for the Wild Horse project. Both routes also begin in the City of Seattle and continue east on I-90. These routes overlap with the entire I-90 segment of the KVWPP transporter route and continue on to the towns of Kittitas (Exit 115) and Vantage (Exit 136).

In the event that construction occurs simultaneously for the KVWPP and Wild Horse projects, the segment of I-90 immediately west of Exit 106 may temporarily carry construction traffic for both projects. This is the only roadway that may potentially be affected by combined construction traffic.

To analyze the combined effects, base year (2001) traffic volumes on this I-90 segment were forecast to the year 2004 (the presumed year of project construction) using a 2% growth factor. This 2% growth factor is based on historical ADT levels and background growth in the Cle Elum and Ellensburg area due to large nearby capital projects. The growth on this roadway is considered reasonable because of the area's rural nature. This growth resulted in a background 2004 ADT of 23,320 vehicles (Table 3.14-5). Peak-hour traffic volumes in one direction were estimated at 1,210 vehicles for 2001 and 1,283 vehicles for 2004, based a standard 10% peak-hour factor and a 55% directional factor to the respective ADT levels for two-direction traffic in each year.

Methodology from the Highway Capacity Manual (HCM) (Transportation Research Board 2000) is typically used to determine the LOS for a roadway. LOS A represents free flowing conditions (the equivalent of 11 or fewer passenger cars per lane mile for a freeway), while LOS F represents extremely congested conditions (more than 45 passenger cars per lane mile). Applying the HCM methodology for a freeway to the baseline conditions for the segment of I-90 west of Exit 106 indicates this roadway segment would function at LOS A under the baseline condition in both 2001 and 2004.

The estimated construction traffic volumes for the KVWPP and Wild Horse projects were then added to the 2004 background traffic volumes to achieve a combined peak-hour directional volume. As a worst case, the KVWPP is estimated to generate 149 heavy construction trips and 20 light duty delivery truck trips traveling on I-90, for a total of 169 peak-hour trips (middle scenario). The Wild Horse project is estimated to have 143 heavy construction trips and 15 light duty delivery truck trips for a total of 158 peak-hour trips traveling on Transporter Route 1. Transporter Route 2 of the Wild Horse project is estimated to carry six heavy construction trips in the peak hour.

The combined construction traffic for the Kittitas Valley and Wild Horse projects would result in a total maximum peak-hour volume of 1,616 vehicles (Table 3.14-6). The combined volume was then analyzed for LOS. Based on the most current HCM guidance for freeway segments, with the estimated combined baseline and construction traffic volumes during the PM peak hour, this segment of I-90 would continue to operate at LOS B during the construction period. By state standards, the LOS threshold for rural highways is LOS C. Therefore, while the combined construction traffic for the Kittitas Valley and Wild Horse wind power projects could result in a temporary decrease in the LOS on I-90, there would not be a significant impact on traffic operations.

Table 3.14-5: Existing and Future Daily and Peak-Hour Traffic Volumes and LOS without Project

Roadway	Daily		Estimated Directional Peak Hour without Project			
	2001	2004	2001	LOS	2004	LOS
I-90 (west of US 97)	22,000	23,320	1,210 (10.1 cars/lane mile)	A	1,283 (10.7 cars/lane mile)	A

Sources: Taylor, pers. comm., 2003, as amended by Kittitas County 2003.

Table 3.14-6: Total PM Peak Hour and LOS for Combined Construction Impacts on the Roadways from the KVWPP and Wild Horse Project

Roadway	2004 PM Peak[1]	Kittitas Valley	Wild Horse		Total PM Peak[1]	LOS
		Transporter Route 1[1]	Transporter Route 1[1]	Transporter Route 2[1]		
I-90 (west of US 97)	1,283	169	158	6	1,616 (13.4 cars/lane mile)	B

Sources: Taylor, pers. comm., 2003, as amended by Kittitas County 2003.
1 Directional volumes

Desert Claim Wind Power Project

Peak-hour construction trips for the Desert Claim project have not yet been estimated, although total turbine delivery trips and potential concrete delivery trips are identified. Assuming that the volume of construction trips for the Desert Claim project would be similar to the volumes estimated for the Kittitas Valley and Wild Horse projects (based on the similar size of the projects), total peak-hour trips shown in Table 3.14-6 would be increased by approximately 120 to 140 trips. Applying a mid-range factor of 130 trips, the total peak-hour trips in 2004 if all three proposed projects were under construction simultaneously would be close to 1,750. This corresponds to an equivalent of 14.7 passenger cars per lane mile, an operating condition that is still within the numerical range for LOS B. Therefore, the added effect of the potential Desert Claim construction traffic would not result in a significant cumulative impact on the operating condition for I-90 during the construction period (Kittitas County 2003).

Aside from the increased traffic on I-90, there would be relatively little combined construction traffic effects on other roadways because of the geographic separation of the three projects. Cumulative increases in general construction traffic volumes would likely be restricted to roadways in the area around the intersection of I-90 and US 97, and would be associated primarily with the Kittitas Valley and Desert Claim projects. If turbine components or offsite gravel materials were being delivered to multiple projects at the same time, there could be increased delays or additional detours within the area near the Kittitas Valley and Desert Claim projects. Additional vehicle delay could affect segments of US 97 and Smithson Road. The potential for delay could be reduced if the contractors for the different projects coordinated the delivery of turbine components to avoid a situation in which a number of transporters were traveling at the same time on a given road segment. WSDOT and/or Kittitas County could also place a condition on the required oversize vehicle permits to limit the number of deliveries per day per project (Kittitas County 2003).

Cumulative Tourist Traffic

Development of multiple wind power projects in the Kittitas Valley area would likely result in a larger total number of tourists visiting these facilities compared to conditions if just one project were built. However, with the geographic separation of the proposed projects, roads adjacent to the KVWPP (for example) would not likely experience substantially more tourist traffic because one or two other projects were developed. In fact, the presence of additional wind power projects could result in spreading tourists over a larger portion of the valley, with fewer tourist visits to a single project than might otherwise be expected. Tourist interest in multiple wind projects would likely result in an increase in the amount of traffic on local roads near the respective project areas. The tourist traffic would likely be localized to the individual areas around the projects and would not likely be cumulative (i.e., it is likely that most tourists interested in wind energy would visit any one of the projects but would not visit two or all three projects).

3.14.15 Air Quality

Construction of the projects would result in construction-related emissions such as fugitive dust from foundation excavation and cable trenching, and vehicle and equipment exhaust. Construction of the KVWPP concurrent with the other two proposed wind power projects would temporarily increase total regional dust loads in the atmosphere. Due to the proximity of the Kittitas Valley and Desert Claim projects, the intensity of this potential cumulative air quality impact would be greatest if construction of these two projects were to occur concurrently. Even with construction-related fugitive dust emission controls, the overall number of truck trips required to haul materials to the different construction sites could be significant. Gravel required for the Wild Horse project would be quarried onsite, and transportation would not be required. However, gravel needed for construction of the Kittitas Valley and Desert Claim projects would likely be transported from offsite sources. If substantial amounts of heavy duty truck trips are required to haul gravel to the Kittitas Valley and Desert Claim project sites, there could be greater exhaust emissions from additional vehicle traffic and greater dust emissions from additional traffic on gravel roads for these two projects. This activity could result in a temporary increase in localized cumulative air quality impacts on travel routes shared by the two projects but not at a broader countywide level. This potential impact would be greatest if construction activities for the Kittitas Valley and Desert Claim projects overlapped and occurred during periods of peak winds.

The air emissions from contemporaneous construction of multiple wind projects would be additive in terms of their contribution to total regional pollutant loads. Based on the combined area of wind project construction activity and volume of construction traffic relative to existing sources of air emissions in Kittitas County (e.g., vehicle traffic on I-90 and other roads and agricultural activities on over 350,000 acres of commercial agricultural lands), however, the incremental impact of the aggregate air emissions from construction of multiple wind power projects would not be sufficient for regional air pollutant concentrations to temporarily exceed the applicable air quality standards. Consequently, there does not appear to be a potential for significant regional cumulative air quality impacts from the development of multiple wind power projects in the Kittitas Valley, even if all three projects were constructed during the same period (Kittitas County 2003).

The only anticipated cumulative air emissions during operation of the three proposed wind power projects would be from vehicles used for operations and maintenance activities. Given the small number of employees and associated trips anticipated during project operations, no significant aggregated air pollutant concentrations that would exceed NAAQS/WAAQS standards are anticipated. In addition, the generation of electricity by the three proposed wind power projects would avoid cumulative emissions of regulated pollutants from other fossil-fuel sources of power that would have otherwise been built or operated to produce an equivalent amount of electricity.

3.14.16 Noise

Construction noise would be temporary in nature, and would primarily be from operation of construction equipment and vehicles. The magnitude of this temporary cumulative impact would depend upon the timing of construction activities, but any adverse effects would be limited to the area immediately surrounding each construction site. The proposed Kittitas Valley and Desert Claim project sites are located near each other (within 1.6 miles at the closest point). However, receptors located between these two projects should not be affected by combined construction activities even if their construction schedules were to overlap. There would be significant decreases in construction equipment noise levels at distances of about 5,000 feet (less than one mile) from the source, therefore minimizing potential cumulative noise effects.

Residents near the KVWPP area could experience a noticeable change in the ambient sound level during project operations relative to baseline noise conditions, similar to selected noise receptors near the Desert Claim project. The two projects are a sufficient distance apart that residents near the Desert Claim project would not also experience elevated noise levels from Kittitas Valley project facilities and vice versa. Noise modeling results for both projects indicate that receptors located between the two projects would be unlikely to notice increases in noise levels as a combined effect of the projects (Kittitas County 2003).

The Wild Horse project would not affect noise levels at any residences or other permanent receptors. Given the distances that separate the Wild Horse project from the Kittitas Valley and Desert Claim projects, Wild Horse project operations would not contribute to cumulative noise impacts in the region. Consequently, potential noise impacts from the proposed wind energy projects would be confined to certain project-specific locations, and there would not be cumulative noise impacts from the development of multiple wind projects. Furthermore, proposed wind energy facilities would be subject to Ecology noise restrictions and mitigation could be required if permissible levels are exceeded for nearby EDNAs (i.e., the area or zone within which maximum permissible noise levels are established).

3.14.17 Public Services and Utilities

Cumulative impacts on public services would result from development of the three wind power projects. Concurrent development of the three projects could create significant additional demand for law enforcement, fire protection, and emergency medical service response during both construction and operations and maintenance phases. The level of impact would depend on the timing of concurrent construction activities as well as the availability of emergency response resources at the time of an incident.

For example, calls for law enforcement service could increase during the construction phase because of traffic accidents and construction site theft or vandalism. The cumulative potential number of increased calls has not been quantified but is not anticipated to be significant. Both wind power project applicants would provide onsite security for their respective projects.

Impacts during project operations could result from calls for service in connection with vandalism or trespass but would not be expected to be cumulatively significant.

The three proposed projects would increase the risk of fire and the potential need for emergency medical services from accidents during both construction and operation. The western portion of the Desert Claim project area is included within Kittitas County Fire District 2, while the remainder is not within an existing fire district service area (Kittitas County 2003). Most of the KVWPP area is outside existing fire district boundaries, although Fire District 1 serves a portion of the site. No part of the Wild Horse site is within a rural fire district. The project proponents would need to contract with the appropriate rural fire district to obtain required fire protection services. For all three projects, such contracts would extend coverage to areas not presently served by a fire district. If a fire service contract does not cover the actual costs of extending service to a project, there could be a gap between the time service is provided and the realization of project-generated property tax revenues. Successful implementation of emergency response and fire prevention and risk mitigation plans would help to minimize potential significant cumulative impacts.

Increased permanent worker populations required to operate the three proposed wind power facilities could contribute to increased cumulative demands for school services in central and eastern Kittitas County. The combined operations work force of the three projects would be 30 to 42 workers. If all of these workers were hired from outside the local area and all or most of those were located in a school district with capacity limitations, there could be adverse impacts on school services. These circumstances, however, are considered unlikely because local residents would probably fill a portion of the operations jobs, and it is unlikely that all of the in-migrants would locate in the same school district. Therefore, no significant cumulative adverse impacts on schools are anticipated from project operation.

Cumulative impacts on utility service providers would consist primarily of cumulative increases in the demand for solid waste disposal services. However, this cumulative increased demand would be limited to project construction and is not anticipated to be significant with respect to either collection capability or the capacity of the County's construction and demolition waste disposal site.

No long-term cumulative impacts on regional water and wastewater treatment plants are anticipated because water and wastewater demands would be limited to temporary needs generated during construction activities and those from operations and maintenance staff. It is anticipated that long-term cumulative water and wastewater needs would be met through project-specific water wells and septic tanks, and would therefore not burden the region's treatment processes. The combined effects of the three projects would not result in a significant cumulative impact.

No significant cumulative impacts on electricity or telecommunications are anticipated. Based on the distances between residences and the respective project facilities, there does not appear to be a potential for significant cumulative interference impacts on radio and television reception in the areas near the proposed wind power projects (Kittitas County 2003).