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.

<u>Earthquakes</u>

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.