

## **3.11 AIR QUALITY**

This section describes existing air quality conditions in the KVVPP 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<sub>10</sub>) and 2.5 micrometers in size (PM<sub>2.5</sub>), 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<sub>10</sub> is monitored in Ellensburg, the largest urban area in Kittitas County, which is approximately 10 miles southeast of the project site. PM<sub>10</sub> levels monitored in Ellensburg in 2002 reached a maximum concentration of 77 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) on January 23, 2002. This maximum 2002 concentration was below the NAAQS/WAAQS for PM<sub>10</sub> of 150  $\mu\text{g}/\text{m}^3$  (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 KVVPP. 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)
<b>Construction Impacts</b>			
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)
<b>Operations and Maintenance Impacts</b>			
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
<b>Decommissioning Impacts</b>			
	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, NO<sub>x</sub>, 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<sub>2</sub> 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<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>), tropospheric ozone (O<sub>3</sub>), 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<sub>2</sub>, 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<sub>2</sub> emission factors for typical fossil-fueled generating stations operating today.

**Table 3.11-2: Typical CO<sub>2</sub> Emission Factors for Electrical Generating Stations**

Generating Station Fuel Type	CO <sub>2</sub> Emission Factor in pound per kilowatt-hour (lbs CO <sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> 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 KVVPP, 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> 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.