CHAPTER 3

Affected Environment and Environmental Consequences

3.1 Introduction

The sections in this chapter address the affected environment and the potential environmental impacts of the proposed Maiden Wind Farm and the No Action Alternative.

The proposed project would be located primarily in Benton County, in the south-central part of Washington. A small portion of the project would be located in Yakima County, also located in the south-central part of Washington. The site is approximately 10 miles northeast of the town of Sunnyside and 15 miles north of Prosser, east of State Route 241 (Figure 2.1-1).

The study area varies for each impact analysis and is defined under Study Methodology in each technical section of this chapter. The actual footprint of permanent project facilities, including roads, wind turbines, transmission line structures, substations, meteorological (met) towers, and operation and maintenance buildings, would occupy about 251 acres. The "project site" is the location of all permanent project facilities (the project footprint) in addition to all temporary facilities such as construction staging, laydown and turnaround areas, and quarries, and would include about 1314 acres.

The project would be located along the ridges and southwestern slopes of the Rattlesnake Hills. Elevations in the study area range from about 2,600 to 3,600 feet above mean sea level. The study area includes portions of Sections 7, 8, 9, 10, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 28, 29, 30, 31, 33, 35, 36, Township 11 North (T11N), Range 24 East (R24E), and R25E in Benton County and portions of Sections 3, 10, 11, 12, 13, 23, 24, 25, 26, 35, 36, T11N, R23E in Yakima County. Sections 16, 36, T11N, R24E in Benton County are public lands managed by the Washington Department of Natural Resources (DNR). The remainder of the study area is on private land.

The rolling fields and rangeland within the study area are used for cattle grazing and dryland wheat farming. Five rural residences are located in the eastern portion of the study area. The Hanford Reach National Monument, including the Fitzner-Eberhardt Arid Lands Ecology (ALE) Reserve, forms the northeastern boundary of the study area. BPA's 230-kilovolt (kV) Big Eddy-Midway and 500-kV John Day-Hanford transmission lines run from south to north across the western portion of the study area. BPA's Midway-Grandview 115-kV transmission line runs west of the study area.

3.2 Land Use and Recreation

3.2.1 Regulatory Framework

Land use in the study area is guided by the *Benton County Comprehensive Land Use Plan* (Benton County, 2000) and *Plan 2015: A Blueprint for Yakima County Progress* (Yakima County, 1997). Both county plans implement the planning requirements and goals of the 1990 Washington State Growth Management Act (GMA). Because the project requires a Conditional Use Permit (CUP) from both counties, it is subject to the requirements of the Washington State Environmental Policy Act (SEPA), which includes completion of this EIS.

3.2.1.1 Benton County

In Benton County, power generation facilities in the GMA agricultural district, in which the proposed project would be located, require a CUP according to Benton County Zoning Ordinance 11.18.070.11. CUPs are issued provided that the facility is located in a manner that minimizes adverse impacts to agricultural productivity on adjacent lands.

Benton County Zoning Code 11.52.090(d) requires the Benton County Board of Adjustment to determine if the proposed use:

- Is compatible with other uses in the surrounding area or is no more incompatible than are any other outright permitted uses in the applicable zoning district.
- Will not materially endanger the health, safety, and welfare of the surrounding community to an extent greater than that associated with any other permitted uses in the applicable zoning district.
- Would not cause pedestrian and vehicular traffic associated with the use to conflict with existing and anticipated traffic in the neighborhood to an extent greater than that associated with any other permitted uses in the applicable zoning district.
- Will be supported by adequate service facilities and would not adversely affect public services to the surrounding area.
- Would not hinder or discourage the development of permitted uses on neighboring properties in the applicable zoning district as a result of the location, size, or height of the buildings, structures, walls, or required fences or screening vegetation to a greater extent than other permitted uses in the applicable zoning district.
- Is not in conflict with the goals and policies expressed in the current version of the County's Comprehensive Plan.

3.2.1.2 Yakima County

In Yakima County the project is defined as a power generating facility. Power generating facilities in agricultural districts are allowed only as a Type III conditional use. According to the Yakima County Zoning Code (15.12.040), approval of this use would be subject to the following conditions:

- Material impacts of the development are mitigated, whether environmental or otherwise.
- The development is compatible with existing neighboring land uses, assuring consistency with the intent and character of the zoning district involved.
- Structures and areas proposed are surfaced, arranged, and screened in such a manner that they are compatible with and not detrimental to existing or reasonable expected future development, or resource uses.

3.2.2 Study Methodology

The study area for analysis of land use and recreation impacts included all land in Benton County and Yakima County approximately 1 mile from the project site (for land use) and 5 miles from the project site (for recreational opportunities). These distances are based on a general estimate of potential impact areas.

Description and analysis of land use and recreation issues were based on a review of plans, maps, and land use documents; discussions with local agency staff; and a visit to the study area by a land use planner. Land use reference documents include the *Benton County Comprehensive Land Use Plan*, the *Benton County Zoning Ordinance* (Benton County, 1995), *Plan 2015: A Blueprint for Yakima County Progress*, and the *Yakima County Zoning Ordinance* (Yakima County, 2000).

3.2.3 Affected Environment

The study area is characterized by an open rural landscape of rolling fields and rangeland interspersed with isolated farm buildings and a few rural residences. Overall population density is low. In both counties, the land on which the project facilities would be located is zoned as agriculture.

3.2.3.1 Zoning

Zoning in the Benton County portion of the study area is GMA Agriculture with a 20-acre minimum lot size. The purpose of this designation is to conserve these lands for agricultural production. The *Benton County Comprehensive Land Use Plan* does not identify any future zoning changes.

Zoning in the Yakima County portion of the study area is Agriculture with a 40-acre minimum lot size. The purpose of designating this designation is to preserve and maintain areas for the continued practice of agriculture and to permit only those new uses that are compatible with agricultural activities. No future zoning changes are expected in the study area.

3.2.3.2 Land Use

All land in the study area has been designated by both counties for agricultural uses (Figure 3.2-1). Existing land uses in the study area are agricultural and include nonirrigated winter wheat and cattle grazing. Five residences and associated farm buildings are located in the eastern portion of the study area. Approximately 595 acres of land within the study area is currently managed as Conservation Reserve Program (CRP) land. The CRP is a federal

program administered by the Natural Resource Conservation Service (NRCS). This program encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover such as native grasses, wildlife, trees, filter strips, or riparian buffers. Farmers receive an annual payment for participating in the multiyear program.

Other land uses within the study area include transportation (county and private roads) and open space. The U.S. Department of Energy (DOE) Hanford Site is adjacent to the northern boundary of the study area and includes the Hanford Reach National Monument and the Fitzner-Eberhardt ALE. The project would be located on privately-owned land except for portions of two sections that are owned by DNR. Several private landowners own land on which the proposed project facilities would be located.

Prime soils for agriculture occur throughout the study area. Prime soils are those that have sufficient depth, moisture, and nutrients to allow crops to achieve their maximum growing potential.

Scoping comments raised a concern about a potential for land use conflicts with two research facilities located on the nearby DOE Hanford Site that are sensitive to seismic vibration and acoustic noise. The Laser Interferometer Gravitational-Wave Observatory (LIGO) is located approximately 11 miles east of the project site. The sensitive gravitational-wave astronomy equipment located at the LIGO facility must be isolated from ground vibrations and acoustic influences in order to measure gravitational waves (Sanders, 2000). The LIGO facility location was chosen for its exceptionally low levels of seismic noise and vibration, and the likelihood that these levels would remain low in the foreseeable future. The Battelle Gravitational Research Observatory (BGRO) also is located at the Hanford Site, approximately 6 miles northeast of the project site. The BGRO facility, located in an old NIKI missile bunker, contains sensitive equipment designed to measure extremely small movements and is very sensitive to ground vibrations (Boynton, 2001). Research at the BGRO facility is currently being conducted by staff from the University of Washington and the University of California Irvine.

There are also several radio towers and communication facilities within the study area located along the ridgetop of the Rattlesnake Hills.

3.2.3.3 Recreation

No designated or developed recreational facilities exist in the study area. The ALE is not open for general public use but is accessible for research studies and field trips through special use permits. Except for two sections of land owned by DNR, the majority of the study area is on private fenced land. The only identified recreational activity is hunting, which is allowed in some areas only with landowner permission. Other types of dispersed outdoor recreation, such as hiking, camping, wildlife observation, photography, and off-road vehicle use, may occur on private land with landowner permission.

Beyond the study area, public park and recreation facilities exist in the communities of Sunnyside, Grandview, and Prosser.

3.2.4 Impacts of the Proposed Action

3.2.4.1 Land Use and Zoning

Evaluation Criteria.

- Impacts to land use would be considered **high** (and significant) if the proposed project substantially impaired a current or planned land use, if it resulted in a change in overall land use patterns, or if it conflicted or was incompatible with permitted land uses or zoning ordinances.
- Impacts to land use would be considered **moderate** if the proposed project resulted in a modest change in the current or planned land use, in overall land use patterns, or in a slight conflict with permitted land uses or zoning ordinances.
- Impacts to land use would be considered **low** if the proposed project resulted in no noticeable changes in the current or planned land use, if it resulted in a minor change in overall land use patterns, or if it did not conflict with permitted land uses or zoning ordinances.

Construction Impacts.

Both Benton and Yakima Counties allow development of wind farms in agricultural districts, and wind turbines are considered compatible with agricultural uses. During construction of the proposed project about 1,063 acres of land would be altered (see Table 2.1-2), which would temporarily interfere with existing agricultural uses. Direct land use impacts from construction activities are anticipated to be moderate but temporary (lasting approximately 9 months). Construction of the project would not substantially or permanently impair land use, change overall land use patterns in the study area, or conflict with permitted land uses.

Construction of facility foundations and gravel access roads would require concrete and gravel sources. Construction of the proposed new quarry site and associated concrete batch plant would require a CUP and a mineral resources extraction permit from Benton County. While existing land use on the proposed 8-acre quarry site would be altered until the land recovered, this is a small portion of the land available for wheat farming and is a temporary change that would result in a low land use impact.

The sensitive research facilities located on the Hanford Site could potentially be impacted by project construction activities (e.g., blasting for foundations, trenches, and quarry operations). It is estimated that these activities would only occur over the first half of the 9-month construction period. There could be as many as five to ten blasts per day, six days a week. However, each blast lasts less than a second. Due to the intermittent nature of these activities and the long distance of the proposed project from the sensitive research facilities, these activities would not be expected to substantially impair these land uses. Nonetheless, because there is the potential for an adverse effect to uses at the facilities, this impact would be considered moderate to high.

Mitigation. To the extent possible, construction activities would be coordinated with landowners to minimize interference with agricultural uses**.** All areas impacted by temporary project facilities such as quarries, laydown areas, and staging areas, would be regraded and

seeded as necessary to restore them as close as possible to their original condition and land uses.

The Benton County Mineral Resources ordinance requires that the quarry site be compatible with existing land uses and that the site be restored as close as possible to its original condition when the quarry is closed.

The LIGO and BGRO research facilities would be notified in advance of construction activities with the potential to cause significant vibration or noise.

Operation Impacts.

Project facilities (including roads) would result in permanent change in land use of about 251 acres of land from agriculture to energy production (see Table 2.1-1). Although the acreage converted for the project no longer would be available for agricultural use, it represents a relatively small portion of the agricultural acreage in the area owned by the landowners involved (approximately 2.5 percent) and a much smaller fraction of the total agricultural acreage in the counties. Current activities could continue in all areas except those occupied by the permanent footprint of project facilities, resulting in a low impact.

Landowners, including DNR, would receive compensation for the use of their property through a lease agreement with the project developer. This steady source of income would increase and diversify overall farm income, creating a beneficial impact and helping to ensure continued agricultural viability.

CRP contracts would be terminated on the acreage where permanent project facilities would be located. The project developer would convert the lease of these properties and withdraw the properties from the CRP program in coordination with the NRCS and landowners. The small area of land (less than 100 acres) that would be taken out of the CRP program would result in a low impact because proposed mitigation measures for vegetation and wildlife impacts include enhancing, protecting, and creating additional natural habitat on existing private lands, particularly CRP land, near the project site.

Land use impacts associated with operation of the proposed project would be low because the project would not substantially or permanently impair land uses, change land use patterns, or be incompatible with existing uses or zoning ordinances.

Beneficial impacts could occur from increased access provided by roads constructed or improved for the project.

The scientific programs at the LIGO and BGRO facilities located on the Hanford Site could potentially be adversely impacted by seismic vibrations and acoustic noise from the operation of the wind turbines. Although such an impact is not expected due to the expected low levels of vibration that would be generated by the project and the distance between the project and these facilities, the levels of impacts are difficult to determine given the unique type of facilities. Completion of a seismic vibration study is required to determine the full impact of the project on the facilities. If operations at the facilities were substantially impaired, this would be considered a high and significant impact.

It is not expected that the radio towers and communication facilities along the ridgetop of the Rattlesnake Hills would be impacted by the proposed project. However, there is a slight possibility that the placement of wind turbines or operation of electronic equipment associ-

ated with the wind turbines could adversely affect these existing facilities. The developer is working with the owners of these facilities to determine if there would be a land use conflict.

Mitigation. Wind turbines would be sited out of the signal paths of existing radio and telecommunications towers.

A seismic study will be completed prior to construction to determine if operation of the proposed project would have a significant impact on the research facilities. Information from the study will be included in the Final EIS.

Decommissioning Impacts.
Upon decommissioning, land use impacts resulting from facility construction and operation would be largely reversible. Once facilities were removed, acreage taken out of agricultural use could be returned to agricultural use. An exception might be some of the access roads, which local landowners may wish to continue to use and maintain. No permanent land use impacts would result from decommissioning.

3.2.4.2 Recreation

Evaluation Criteria.

- Impacts to recreation would be considered **high** (and significant) if the proposed project substantially impaired an existing recreational use, or moderately impaired a recreational use experienced by a large number of people.
- Impacts to recreation would be considered **moderate** if the proposed project resulted in a modest change in recreational opportunities.
- Impacts to recreation would be considered **low** if the proposed project result in a minor change in recreational opportunities.

Construction, Operation, and Decommissioning Impacts.
Given the generally low population density of the area and the limited public lands, few recreational users would be anticipated near the proposed project site; therefore, impacts to recreational activities would be low. No designated public recreational facilities exist in the study area so no impacts would occur. Limited temporary impacts to private landowner-approved activities such as hunting or photography could occur during project construction, operation, and decommissioning; however, these impacts would be low. The ALE is not open for general public use and would therefore not be affected by the project.

3.2.5 Impacts of the No Action Alternative

Under the No Action Alternative, the project most likely would not be constructed and existing land and recreation uses would continue without the influence of the proposed project. However, this does not preclude other development allowed under permitted uses in the study area. If the project were not constructed, the region's power needs could be addressed through development of a gas-fired combustion turbine (CT), which could have greater impacts to land use depending on its location. BPA's Resource Programs EIS (RPEIS) shows that a CT generating 150 average megawatts (aMW) of power could use as much as 687 acres of land for gas extraction, transportation, and the generation plant itself.

3.3 Vegetation

3.3.1 Regulatory Framework

Potential impacts to vegetation and wildlife habitat are regulated by a number of federal, state, and local laws. The regulations described below address federal and state special status species and other issues related to vegetation.

- **Clean Water Act, Section 404.** Affects only federally listed wetland species within jurisdictional waters. See discussion in Section 3.8—Water Resources and Wetlands.
- **Endangered Species Act (16 USC § 1531 et. seq.).** The ESA is the primary federal law directed at protection of species at risk of extinction and defines procedures for listing species, designating critical habitat for listed species, and preparing recovery plans. The ESA also specifies prohibited actions and exceptions. Responsibility for implementation and enforcement of the ESA lies with the USFWS for listed species of plants. Section 9 of the ESA prohibits "take" of endangered species, where take is defined as "harass, harm, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct." Subsequent amendments to the law have extended the prohibition of take to include threatened species. There are no provisions under the ESA for compensating landowners who may have property or habitat occupied by endangered or threatened species.

  In addition to listing species as endangered or threatened under the ESA, the USFWS also identifies candidate species and species of concern. Candidate species are those species for which sufficient data have been gathered to allow the USFWS to propose listing the species. Species of concern are those species for which insufficient data have been gathered.

  Under Section 7 of the ESA, federal agencies are directed to consult with the USFWS if listed species are present in the vicinity of the agency's proposed action. If these species are present and there is potential for them to be affected by the project, the agency must prepare a Biological Assessment (BA) describing the potential effects. Although consultation with the USFWS is only required under the ESA for listed species, it is common practice to also consult with the USFWS if candidate species could be affected by a proposed action.
- **Washington Department of Fish and Wildlife (WDFW) Regulations.** In Washington, state-listed plant species are not specifically protected by state statute or regulation, but are listed to assist with agency management efforts and decisionmaking. Species may be listed because of rarity, vulnerability to disturbance, or other factors.

  Washington Natural Heritage Program (WNHP) maintains a list of endangered, threatened, and sensitive plant species (Revised Code of Washington [RCW] 79.70.030). WDFW publishes a Priority Habitats and Species (PHS) list as a means of providing habitat and wildlife information to local governments, agencies, landowners, and tribes for land use planning purposes. The PHS list is a catalog of habitats and species considered priorities for conservation and management. Priority species require protective measures for their perpetuation due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance. Priority species include state endangered, threatened, sensitive, and candidate species and those

species of recreational, commercial, or tribal importance that are vulnerable. Priority habitats are those habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique habitat type or dominant plant species, a described successional stage, or a specific structural element such as a unique soil or ecological niche.

- **Washington Weed Law.** In accordance with Revised Code of Washington (RCW) 17.10.080, a state noxious weed list of the names of those plants that are determined to be highly destructive, competitive, or difficult to control by cultural or chemical practices, is maintained by the state noxious weed control board (WAC 16-750). The list indicates where in Washington weed control will be required. Each county weed board is responsible for identifying and controlling noxious weeds and counties maintain their own noxious weeds lists. According to this list, there are three classes of noxious weeds in Washington:
  - Class A weeds are non-native species with a limited distribution in the state. Therefore, eradication of all Class A weeds is required by state law.
  - Class B weeds are established in some regions of Washington, but are of limited distribution or not present in other regions of the state. Because of differences in distribution, treatment of Class B weeds varies between regions of the state.
  - Class C weeds are already widely established in Washington or are of special interest to the state's agricultural industry.

3.3.2 Study Methodology

The 13,284-acre study area for priority habitats was defined by a map provided by the project developer and included all sections where project facilities would be located (see Figure 3.3-1). Vegetation in the study area was mapped according to "habitat types," which are considered to be the generally recognizable assemblages of plant species that occur in a pattern across the landscape (see Figure 3.3-1 for the study area boundaries). Habitat types were based on the dominant plant species. Habitat types in the study area were initially mapped using black and white aerial photography at a scale of approximately 1:20,000 obtained from the U.S. Geological Survey (USGS) National Aerial Photography Program and Benton County. General habitat types within the study area were distinguished and the aerial photographs were then taken to the field to be verified and refined (ground-truthed). All roads within and around the study area were driven to survey the habitat types. Some areas, such as steep hillsides and ravines, were covered on foot. Field-verified habitat types were transferred to the topological base map (scale approximately 1:24,000) for the project and then digitized using geographic information systems (GIS).

Special status plant species that could potentially be found in the study area were determined by a review of available literature, contacts with federal and state agencies, and contacts with university and private botanists with local knowledge. Federal status plant species include plant taxa listed as endangered or threatened by the USFWS, plant species formally proposed for listing, and candidates for listing. State status plant species include taxa defined as "endangered," "threatened," "sensitive," "review," or "extirpated" by the Washington Natural Heritage Program (WNHP); and taxa on the WNHP "watch" list (i.e., species that are more abundant or less threatened in Washington than previously assumed).

visually searched on foot. The survey corridors for special status plant species were designed to take in all ground potentially disturbed by the project, including all project facilities. For the turbine strings, the survey corridors included land within 165 feet of the centerline of the proposed turbine strings. In most cases, the surveyed corridors were 330 feet wide, although in many areas several project facilities located together resulted in a wider corridor. The 330-foot corridor width was designed to accommodate mapping inaccuracies and minor changes to the final locations of project facilities.

Surveys were conducted from May 20 through June 6, 2001, and again on July 9, 2001, by two botanists. An additional late summer survey was conducted in late August for the federally-threatened Ute ladies'-tresses orchid (*Spiranthes diluvialis*), which is only identifiable at that time of year. The first survey was designed to locate all spring-identifiable species and cover the entire study area with the exception of cultivated wheat fields. The July survey was designed to locate certain special status species not identifiable in the spring. These were all species associated with riparian habitats, so the survey focused on the springs, seeps, and creeks of the study area (i.e., riparian habitats within 165 feet of the centerline of proposed facilities).

3.3.3 Affected Environment

3.3.3.1 Study Area Overview

The Rattlesnake Hills lie within the center of the Columbia Basin Physiographic Province (Franklin and Dyrness, 1988). A "physiographic province" is a term commonly used by geologists to describe a region of similar geologic structures and climate, and whose pattern of topography differs significantly from that of adjacent regions. The ridgetops and south-facing slopes of the hills support shrub-steppe and grassland-steppe habitat. The term steppe refers to a vast semi-arid plain dominated by either shrubs (e.g., sagebrush) or grasses. The upper north face of the ridgeline and hill slopes and canyon side slopes support relatively lush shrub-steppe vegetation.

Historically, the vegetation of the Columbia Basin Physiographic Province was dominated by shrub-steppe and grassland-steppe dissected by perennial and intermittent streams, some with springs, and scattered deciduous trees and shrubs. Much of the basin has been converted to agriculture.

The study area has been previously classified within the Central Arid Steppe zone as defined by the Washington State Gap Analysis (Cassidy et al., 1997). The Central Arid Steppe zone typically contains plant communities dominated by big sagebrush (*Artemesia tridentata*), bluebunch wheatgrass (*Pseudoroegnaria spicata*), and Sandberg's bluegrass (*Poa secunda*), with the introduced species cheatgrass (*Bromus tectorum*) common in disturbed areas. Franklin et al. (1988) classifies the study area as within the big sagebrush/bluebunch wheatgrass vegetation zone. According to Franklin et al. (1988), other species common in this zone include rabbitbrushes (*Chrysothamnus* spp. and *Ericameria* spp.), threetip sage (*Artemesia tripartita*), spiny hopsage (*Grayia spinosa*), needle-and-thread grass (*Hesperostipa comata*), Thurber's needlegrass (*Achnatherum thurberianum*), Cusick's bluegrass (*Poa cusickii*), bottlebrush (*Elymus elymoides*), Sandberg's bluegrass, cheatgrass, and flatspine stickseed (*Lappula occidentalis*).

From 1994 through 1999, The Nature Conservancy of Washington mapped and described potential vegetation communities on the Hanford Site, which is located adjacent to the study area to the northeast (Soll, 1999). The term "potential vegetation community" refers to the plant association thought to represent the climax community of a site (a climax community is a stable community of organisms in equilibrium with existing environmental conditions that represents the final stage of an ecological succession). Often, this climax community is not currently present at the site due to ongoing or past disturbance (e.g., fire, grazing, noxious species invasion). In the Rattlesnake Hills area, The Nature Conservancy study identified several potential vegetation communities, including big sagebrush/bluebunch wheatgrass, threetip sagebrush/Idaho fescue, buckwheat/Sandberg's bluegrass, and threetip sagebrush/bluebunch wheatgrass. Similar potential vegetation communities occur in the adjacent study area.

3.3.3.2 Existing Vegetation

The study area consists of actively grazed rangeland dominated by shrub-steppe and grassland-steppe in the western portion, and areas of cropland (primarily wheat) in the eastern portion. Most of the springs in the study area have been modified for cattle use; limited natural riparian habitat occurs along streams. Vegetation in the study area has been disturbed and modified through crop production, livestock grazing, and other land uses such as transmission lines and communication towers and their associated roads. Habitat modification has taken place in some areas where cheatgrass and other non-native grasses have displaced native vegetation, especially in areas with deeper soils. Other disturbance factors in the general vicinity of the study area that have likely influenced the vegetation communities include herbicide use, chemical drift from cultivated fields, noxious weed invasion, road building and other activities related to farming and ranching, and changes in wildfire frequency and extent. In certain limited portions of the study area, most notably the shallow-soiled buckwheat and Sandberg's bluegrass communities, native species are still dominant.

Existing Habitat Types.

The vegetation in the study area has been classified into seven habitat types: cropland, riparian, shrub-steppe, grassland-steppe, lithosol, rock outcrop/shrub, and wetlands. Each habitat type is described below. The habitat types are shown in Figure 3.3-1. Wetlands are further described in Section 3.8, Water Resources and Wetlands, and shown in Figure 3.8-1. Table 3.3-1 lists the habitat types used in this EIS and provides brief habitat descriptions. Habitat types were determined based on the dominant and co-dominant plant species. Habitat types varied in quality from site to site depending on the aspect, soil depth, percentage of non-native plants, and land use, all of which influence the extent of wildlife use within the habitat type.

TABLE 3.3-1
Habitat Types in the Maiden Wind Farm Study Area

Basic Type	Habitat Type	Percent of Study Area	Acres	General Habitat Description
Agricultural	Cropland	35	4619	Current cropland or recently abandoned cropland; potential to support wildlife varies depending on season, crops grown, and plant density, structural diversity, and height.
Riparian	Riparian	1	135	Vegetation located along drainages that require more water than upland vegetation. Most drainages in the study area are narrow and steep. Riparian vegetation includes an overstory of choke-cherry, golden current, and/or red-osier dogwood in places, which provide potential habitat for nesting raptors when the trees are sufficiently large to provide nest platforms. Riparian areas with dense shrub/trees also provide cover for big game and other wildlife.
Steppe	Shrub-steppe	32	4217	Big sagebrush or threetip sage is dominant with a grass/forb understory. The potential to support wildlife varies depending on habitat quality (degree of grazing/weeds).
	Grassland-steppe	31	4114	Predominantly grassland (native and non-native grass species), and may have scattered sagebrush patches. Potential to support wildlife varies depending on habitat quality (degree of grazing/ weeds).
	Lithosol habitat	1	184	Shallow-soiled habitat on ridgetops where native buckwheats and Sandberg's bluegrass dominate. Potential to support wildlife varies depending on habitat quality (degree of grazing/weeds).
	Rock outcrop/ shrub	<0.1	12	Rocky outcrops and associated shrubs, including chokecherry and squaw current; giant wildrye often present. Potential feeding, perching, and nesting habitat for birds, and cover for game species and other wildlife.
Wetlands	Emergent wetlands	<0.1	3	Wetland habitat dominated by plants that tend to grow in wet areas; potential to support sensitive wildlife species varies depending on habitat quality (degree of grazing/weeds).
Total acres			13,284	

Cropland. This habitat type consists of all lands within the study area used for the production of crops, primarily nonirrigated wheat. These areas provide limited low quality habitat for some common wildlife species. Cropland habitat is found in the eastern portion of the study area.

Riparian. Riparian habitat includes those areas adjacent to streams, springs, and seeps within the study area. Riparian habitat is typically narrow and often confined within the steep walls of drainages. Tree and shrub species are common, though not continuous, in most riparian habitat. Common native tree and shrub species include chokecherry (*Prunus virginiana*), golden current (*Ribes aureum*), and red-osier dogwood (*Cornus stolonifera*) in the higher elevation riparian habitat, and black cottonwood (*Populus balsamifera* spp. *trichocarpa*) and various willows (*Salix* spp.) in the lower elevations. Common understory species include various rush species (*Juncus* spp.). Where trees are present, riparian areas can provide habitat for nesting birds, particularly raptors. Riparian areas in the study area are of high value to wildlife for water, food, and shelter throughout the year. They also serve as travel corridors for wildlife.

Shrub-Steppe. Big sagebrush and/or threetip sage are the dominant shrub species in the shrub-steppe habitat. Big sagebrush is more common at the lower elevations in deeper soils, where in some areas it reaches 4 to 5 feet tall. Threetip sage is more common on the upper slopes in drier, shallower soils. Bluebunch wheatgrass and cheatgrass are the most common grasses associated with this habitat type; Idaho fescue, Sandberg's bluegrass, and Cusick's bluegrass also occur. Common forbs (i.e., nonwoody plants other than grasses) include longleaf phlox (*Phlox longifolia*), yarrow (*Achellia millifolium*), sulfur lupine (*Lupinus sulphureus*), and largeflower triteleia (*Triteleia grandiflora* var. *grandiflora*). Some areas of shrub-steppe habitat show evidence of recent burns. The condition of this habitat type in the study area, based on visual observation, ranges from poor quality (heavily grazed and weedy) to good quality (lightly grazed, vigorous shrubs) habitat. Shrub-steppe in the study area provides important habitat for many species; for example, deer and small game find escape cover, breeding habitat, and forage in the shrub-steppe.

Grassland-Steppe. The grassland-steppe habitat encompasses those areas where grass species are dominant. Much of the grassland-steppe is dominated by cheatgrass; other common grass species found include non-native bulbous bluegrass (*Poa bulbosa*) and varying amounts of native grasses, such as bluebunch wheatgrass, Sandberg's bluegrass, and Idaho fescue. In some isolated moist areas, giant wildrye is dominant. Common native forbs include longleaf phlox and sulfur lupine. The grassland-steppe tends to occur at higher elevations and on steeper slopes than the shrub-steppe, and those areas where the soils tend to be shallower. Like the shrub-steppe, the grassland-steppe is subject to grazing, with habitat quality varying from poor to good. The grassland-steppe provides cover, breeding habitat, and forage for a variety of bird and wildlife species.

Lithosol. The lithosol habitat is a subset of the grassland-steppe. Lithosol refers to areas of exposed shallow, rocky soils, as found along some areas of the ridgetop. In this habitat, various buckwheats (*Eriogonum* spp.) and Sandberg's bluegrass are dominant. Vegetative cover is sparse. This habitat provides limited value for birds and other wildlife. However, it likely receives occasional use by various birds, small mammals, and reptiles (e.g., short-horned lizard).

Rock Outcrop/Shrub. This habitat type is found on the upper steep, north-facing slope of Rattlesnake Hill. This habitat is limited in size, making up only a small portion of the total habitat in the study area. Dominant shrub species include the native chokecherry and squaw current. Although small in size, this habitat type provides habitat for nesting birds, including raptors, as well as food and shelter throughout the year.

Wetlands. The wetland habitat type includes those areas that meet the U.S. Army Corps of Engineers' (ACOE) definition of a wetland and may be regulated by that agency (see Section 3.8 for further discussion of wetlands and their location in the study area). In the study area, six locations qualify as wetlands; five are associated with springs, and the sixth is located along Sulphur Creek where the existing western access road crosses the creek. All these wetlands are emergent wetlands dominated by herbaceous species. The wetland habitats are small in size (the largest is 0.23 acres, the others are 0.06 acres or less), and are heavily used by cattle as evidenced by trampled vegetation and congregations of cattle observed at the wetlands during a site visit. Common plant species associated with the wetlands include the native celery-leaved buttercup (*Ranunculus sceleratus*), yellow

monkeyflower (*Mimulus guttatus*), speedwell (*Veronica anagallis-aquatica*), and non-native water-cress (*Rorippa nasturtium-aquaticum*). Although the wetlands receive heavy cattle use, they also provide important habitat for other species such as amphibians, songbirds, and bats. Game animals likely concentrate their activities near these watering sites at various times of the year.

Priority Habitats.

According to the WDFW, priority habitats are those habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type or dominant plant species, a described successional stage, or a specific structural element. Priority habitats are discussed here as they relate to vegetation; additional information on priority animal species is provided in Section 3.4, Wildlife.

Portions of shrub-steppe habitat in the study area were designated by the WDFW as a priority habitat based on the good to excellent condition of the shrub-steppe and because some areas are remnant shrub-steppe, mainly in draws, within croplands. However, because much of the shrub-steppe in the study area is of good quality and may meet WDFW criteria for priority habitat, all shrub-steppe habitat within the study area is considered priority habitat for this evaluation. These areas provide important habitat for some raptors, game species, and possibly sage grouse. Priority habitat is also found along the ridgetops of the Rattlesnake Hills based on the stony soils (lithosols) and buckwheat/Sandberg's bluegrass communities (lithosol habitat type). The riparian corridor along Sulphur Creek is also considered priority habitat based upon its location within shrub-steppe habitat, including cliffs, rock outcrops, and talus, and the concentration of raptor nest sites (WDFW database). Sulphur Creek also has a fringe wetland associated with it (see Section 3.8, Water Resources and Wetlands).

Noxious Weeds.

The state of Washington designates three classes of weeds and each county maintains a noxious weed list based on the state classification. Placement on the noxious weed list allows counties to enforce control if locally desired. No Class A , B, or C noxious weeds were observed in the study area; however, one Class B species, perennial sowthistle, could occur, but positive identification could not be made during the timing of the field visits. Three species on the Benton County "Education List" (list of weeds for which the weed board will assist landowners with control) were found in the study area: Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), and puncturevine (*Tribulus terrestris*). In addition to these weeds, several non-native species were observed and in some cases (e.g., cheatgrass) have taken over large areas.

Special Status Plant Species.

The pre-field review resulted in a list of 54 special status plant species with the potential to occur in the study area (Table 3.3-2). These species were searched for during the field surveys. These species include federal- and state-listed as well as review, extirpated, and watch list species determined by the WNHP. Although review, extirpated, and watch list species have no legislated protection, they are often a matter of public concern. For example, the Audubon Society has expressed concern about the project's effect on rosy balsamroot (a watch list species). In addition, for long-term projects such as this one, it is possible that the status of these species may be elevated prior to final permitting; by

integrating these species into the initial surveys, a later assessment of project-related impacts for these species would not be necessary.

It should be noted that unusually dry conditions were present during the spring of 2001, with lower than normal rainfall. This may have affected some of the survey's target species. In the case of certain perennial species, the dry conditions may have affected blooming times, seed set, or vegetative development. For the annuals, certain individuals may not have germinated at all during 2001. Although blooming times, seed set, or vegetative development may not have been typical during 2001, it is unlikely that the variations would have put the identification periods for any of the target species outside of the range of the surveys.

The USFWS identified one federally-threatened species, Ute ladies-tresses, and one federal candidate species, Umtanum wild buckwheat, as having potential to occur in the project vicinity. Two federal candidates (basalt daisy and White Bluffs bladderpod) and five federal species of concern (Columbia milkvetch, gray cryptantha, Hoover's desert-parsley, Wanapum crazyweed, and Hoover's tauschia) potentially occur in the study area and were included in the survey based on information obtained from other sources. The WNHP reported no known occurrence records of special status plant species in the study area. However, they did note that several rare plant populations are known from the Hanford Site, adjacent to the study area.

The field surveys did not locate any Ute ladies'-tresses in the study area. The federally-threatened Ute ladies'-tresses are found in open wetland and riparian areas, including spring habitats, moist to wet meadows, river meanders, and floodplains. They seem to require "permanent sub-irrigation," indicating a close affinity with floodplain areas where the water table is close to the surface throughout the growing season. They also require open habitats, and populations decline if trees and shrubs invade the habitat. They are not tolerant of permanent standing water, and do not compete well with aggressive species. In the study area, potential habitat for Ute ladies'-tresses was found at the five springs and the riparian area along Sulphur Creek, though the habitat in these areas was degraded from heavy cattle use. Individual plants may not flower in consecutive years or under adverse environmental conditions; however, because the habitat is degraded, it is unlikely individuals occur at these sites.

Marginal habitat was also found for two federal candidate plant species: basalt daisy and Umtanum wild buckwheat. Basalt daisy, a federal candidate and state threatened species, is only known to occur in Kittitas and Yakima counties. This endemic species occurs as a single population within an area approximately 10 miles long by 2 miles wide (WNHP, 2000). It grows in crevices in basalt cliffs on canyon walls along the Yakima River and Selah Creek, both of which cut through the Yakima Basalt Formation. This habitat does not occur in the study area, and none were located during 2001 surveys.

Umtanum wild buckwheat, a federal candidate and state endangered species, is endemic species that is only known to occur in one area in Benton County. The habitat of Umtanum wild buckwheat is the exposed tops of one ridgeline that is composed of basalt. The known elevational range of this species is 1,100 to 1,320 feet. Habitat for Umtanum wild buckwheat is not found in the study area and none were located during 2001 surveys.

The survey located three state-level special status plant species: Columbia milkvetch (state threatened; federal species of concern), Snake River cryptantha (state sensitive), and Rickard's Idaho milkvetch (state Review Group 1 [R1]). In addition, two "watch list" species were found, rosy balsamroot and curvepod milkvetch. A watch list ranking means the species is more abundant and less threatened than previously thought.

TABLE 3.3-2
Federal and State Special Status Plant Species Potentially Occurring in the Study Area

Common Name and Scientific Name	Typical Habitat	Status[1]	ID Period[2]
Federal Status Species			
Columbia milkvetch *Astragalus columbianus*	sandy loam, gravelly soil, shrub-steppe	SoC (State T)	Mar-May
Gray cryptantha *Cryptantha leucophaea*	shrub-steppe, dry open sandy areas	SoC (State S)	May-Jun
Basalt daisy *Erigeron basalticus*	cliff crevices, rocky canyons	C (State T)	May-Oct
Umtanum desert buckwheat *Eriogonum codium*	basalt gravel on cliff edges	C (State E)	May-Aug
White Bluffs bladderpod *Lesquerella tuplashensis*	caliche soils in shrub-steppe	C (State E)	May-Jul
Hoover's desert-parsley *Lomatium tuberosum*	talus, basalt outcrops, rocky hills	SoC (State T)	Mar-May
Wanapum crazyweed *Oxytropis campestris* var. *wanapum*	lithosol, ridgetops	SoC (State E)	May-Jun
Ute-ladies'-tresses *Spiranthes diluvialis*	springs, seeps, riparian areas	LT (State T)	Aug-Sep
Hoover's tauschia *Tauschia hooveri*	sagebrush scablands	SoC (State T)	Feb-Apr
State Status Species *(see above for additional state status species)*			
Constructed douglas' onion *Allium constrictum*	shrub-steppe	S	May-Jul
Grand redstem *Ammannia robusta*	wet soil, springs, seeps, riparian areas	R1	Jul-Sep
Palouse milkvetch *Astragalus arrectus*	shrub-steppe, grassy hillsides	S	May-Jun
Rickard's Idaho milkvetch *Astragalus conjunctus* var. *rickardii*	shrub-steppe	R1	May-Jun
Geyer's milkvetch *Astragalus geyeri*	dunes, sandy areas	S	Jun-Jul
Pauper milkvetch *Astragalus misellus* var. *pauper*	shrub-steppe	S	May-Jun
Curvepod milkvetch *Astragalus speirocarpus*	shrub-steppe	Watch	Apr-May
Rosy balsamroot *Balsamorhiza rosea*	open, rocky places in thin soils, frequently on ridgetops	Watch	Apr-May
Rosy pussypaws *Calyptridium roseum*	shrub-steppe, swales	S	May-Jun
Small-flower evening primrose *Camissonia minor*	shrub-steppe, flood gravels	R1	May-Jun

TABLE 3.3-2
Federal and State Special Status Plant Species Potentially Occurring in the Study Area

Common Name and Scientific Name	Typical Habitat	Status[1]	ID Period[2]
Dwarf evening primrose *Camissonia pygmaea*	shrub-steppe, flood gravels	T	May-Jul
Naked-stemmed evening primrose *Camissonia scapoidea*	shrub-steppe, sandy soil	S	May-Jun
Dense sedge *Carex densa*	riparian areas, wetlands, moist ground	S	Apr-Jul
Porcupine sedge *Carex hystericina*	marshy areas, wetlands, moist ground	S	May-Aug
Chaffweed *Centunculus minimus*	wet soil, river edges	R1	Jun-Sep
Bristle-flowered collomia *Collomia macrocalyx*	shrub-steppe	S	May-Jun
Beaked cryptantha *Cryptantha rostellata*	shrub-steppe, talus, canyons	S	May-Jun
Miner's candle *Cryptantha scoparia*	shrub-steppe	R1	May-Jun
Snake River cryptantha *Cryptantha spiculifera*	sage steppe, open slopes and flats	S	May-Jul
Desert dodder *Cuscuta denticulate*	shrub-steppe	S	May-Aug
Beaked spike-rush *Eleocharis rostellata*	stream edges, alkaline wetlands	S	Jun-Sep
Giant helleborine *Epipactis gigantean*	stream banks, lakes, springs, seeps	S	Apr-Jul
Piper's daisy *Erigeron piperianus*	sage steppe, dry open areas	S	May-Jun
Great Basin gilia *Gilia leptomeria*	shrub-steppe	R1	May-Jun
Sagebrush stickseed *Hackelia hispida* var. *disjuncta*	cliffs, talus	S	May-Jun
Canadian St. John's-wort *Hypericum majus*	wet soil	S	Jul-Sep
Inch-high rush *Juncus uncialis*	wet soil	R1	Jun-Aug
Awned half-chaff sedge *Lipocarpha aristulata*	wet soil	R1	Jun-Sep
Kalm's lobelia *Lobelia kalmii*	wetlands, along shores	E	Jul-Aug
Loeflingia *Loeflingia squarrosa* var. *squarrosa*	sage-steppe, sandy areas	T	May-Jun
Suksdorf's monkey-flower *Mimulus suksdorfii*	open, moist to dry places	S	Apr-Jun
Nuttall's sandwort *Minuartia nuttallii* var. *fragilis*	gravelly benches or talus	S	May-Aug
Small-flowered nama *Nama densum* var. *parviflorum*	sandy areas, sage-steppe	R1	Apr-Jun
Coyote tobacco *Nicotiana attenuata*	dry sandy bottoms, dry open places	S	Jun-Sep

TABLE 3.3-2
Federal and State Special Status Plant Species Potentially Occurring in the Study Area

Common Name and Scientific Name	Typical Habitat	Status[1]	ID Period[2]
Caespitose evening-primrose *Oenothera caespitosa* ssp. *caespitosa*	road cuts, dry hills and talus slopes	S	May-Jul
Long-tubed evening-primrose *Oenothera flava*	hard-packed soils, swales, vernal pools	X	Jul-Aug
Brittle prickley-pear *Opuntia fragilis*	dry hillsides, open ground	R1	May-Jun
Winged combseed *Pectocarya linearis*	open dry places	R1	Apr-May
Hedgehog cactus *Pediocactus simpsonii* var. *robustior*	desert valleys, low mountains	R1	May-Jul
Fuzzytongue penstemon *Penstemon eriantherus* var. *whitedii*	foothills, sage-steppe	R1	May-Jul
Dwarf phacelia *Phacelia tetramera*	alkaline flats and washes	R1	May-Jun
Austin's knotweed *Polygonum austiniae*	dry to moist flats or banks	S	Jun-Aug
Persistant-sepal yellowcress *Rorippa columbiae*	riparian shorelines, moist sandy soil, springs	T	Jul-Oct
Lowland toothcup *Rotala ramosior*	wet, swampy places	R1	Jun-Sep
Prairie cordgrass *Spartina pectinata*	ditches, ponds, freshwater marshes	S	Jun-Jul

Source: Eagle Cap Consulting, 2001
Notes:
[1]**Federal Status** (U.S. Fish and Wildlife Service)

LT: Federal Listed Threatened. Taxa likely to be classified as Endangered within the foreseeable future throughout all or a significant portion of their range.

C: Federal Candidate. Taxa that are candidates for formal listing as Endangered or Threatened.

SoC: Federal Species of Concern. Available information supports tracking the status and threats to these species because of one or more of the following factors: negative population trends have been documented; habitat is declining or threats to the habitat are known; subpopulations or closely related taxa have been documented to be declining; competition or genetic implications from introduction of exotic species; identified as a species of concern by agencies or professional societies; in combination with any of the other criteria, information is needed on status or threats to these species.

Washington State Status

E: State Endangered. Taxa that are in danger of becoming extinct in Washington within the near future if factors contributing to their decline continue.

T: State Threatened. Taxa that are likely to become Endangered in Washington within the near future if factors contributing to their decline continue.

S: State Sensitive. Taxa that are vulnerable or declining, and could become Endangered or Threatened in Washington without active management or removal of threats.

R1: State Review Group 1. Taxa for which there are insufficient data to support listing in Washington as Threatened, Endangered, or Sensitive.

X: State Extirpated. Taxa possibly extirpated from Washington.

Watch: Washington Natural Heritage Program (WNHP) ranking; species is more abundant and less threatened than previously thought.

[2]ID Period: The normal peak period during which the species is identifiable in the field.

Columbia Milkvetch (WA: Threatened; Federal Species of Concern). Three populations of Columbia milkvetch were found, all located at the extreme western end of the study area. For this evaluation, the term "population" is used to refer to a spatial grouping of all individuals of a particular taxon in a specific area or region at a certain time. The term is used to functionally separate occurrences of the particular taxon, and is not meant to imply complete genetic isolation of each distinct group. Typically, the population boundary was defined at the point where no more individuals of the particular taxon occurred for approximately 330 feet. The populations are located in rocky lithosol habitats along the main ridgetop and secondary ridges. An estimated total of 410 plants were found in the three populations, but only approximately 66 of these are located within the survey corridor. The total estimated area for all three populations is 10.4 acres, with 3.9 acres located in the survey corridor.

In general, Columbia milkvetch is restricted to a limited geographic area within the arid steppe zone in Eastern Washington where it occurs in Yakima, Benton, and Kittitas Counties (WNHP, 1999). Nine populations are known from the Hanford Site, and the species appears to be relatively common on the Yakima Training Center and other areas within its limited range (Soll, 1999).

Snake River Cryptantha (WA: Sensitive). Seven populations of Snake River cryptantha were found in the study area. Three of these populations overlap with the three Columbia milkvetch populations discussed above, while the remaining four were found farther east, off the main ridgetop. All seven populations are located west of the existing BPA transmission lines, in the western portion of the study area. Snake River cryptantha was found growing in similar habitat to Columbia milkvetch: shallow-soiled, rocky, ridgetop habitats. Rocks and bare ground make up a significant percentage of the ground surface in these habitats. A total of approximately 316 Snake River cryptantha plants were found in the seven populations, with more than half of those (approximately 176) occurring within the survey corridors. The total estimated area for all seven populations is 9.3 acres, with 2.4 acres located within the survey corridors. This species is a regional endemic, occurring only in central Washington, eastern Oregon, northeastern California, and northern Nevada, east into the Snake River Plain of Idaho, and western Montana. Four populations are known from the adjacent Hanford Site, with the largest containing several thousand plants.

Rickard's Idaho Milkvetch (WA: Review Group 1). Rickard's Idaho milkvetch is a relatively new taxon to science, described in 1997 from the nearby Hanford Site. It was found throughout the study area, occurring in approximately 61 percent of the noncultivated survey corridor area. Because the taxon was so widespread and common within the study area, populations were not mapped where they extended outside of the survey corridors. Thirteen populations were recorded for Rickard's Idaho milkvetch, with several of the populations covering extremely large areas. Densities were highest along the main ridgetop, and generally sparser with decreasing elevation. In total, over 39,000 individuals were estimated to occur within the survey corridors, with tens of thousands more likely to occur adjacent to the corridors. Rickard's Idaho milkvetch was found growing in the deeper-soiled shrub-steppe habitats. The total estimated area for all populations within the study area is 926 acres. Of that number, approximately 73 acres contain high densities (greater than 1,000 individual plants per acre), 376 acres contain medium densities (between 50 and 1,000 individual plants per acre), and 194 contain low densities (less than 50

individual plants per acre). Prior to the surveys, Rickard's Idaho milkvetch was known from only two locations: one large population within the Hanford Site on Rattlesnake Mountain; and one small population in the Horse Heaven Hills area to the south (Soll, 1999). In addition, a single historical collection exists, dated 1917, from Wasco County, Oregon (Welsh et al., 1997). The Hanford Site population is large, containing several tens of thousands of plants. Due to its large size, the Hanford Site population remains incompletely mapped.

Rosy Balsamroot (WA: Watch List). Rosy balsamroot was found scattered throughout many of the shallow-soiled lithosol plant communities running the length of the main ridge in the western half of the study area. The majority of individuals found during the spring survey were well past blooming, but the leaves, and occasionally the dried flower stalks, persisted. The habitat characteristics of the rosy balsamroot sites were similar to those described for the Columbia milkvetch sites. Approximately 4,600 total rosy balsamroot plants were found within the survey corridors along the main ridgetop.

Curvepod Milkvetch (WA: Watch List). Two small populations of curvepod milkvetch were found along the existing access road near Sulphur Creek. The plant was found in upland, shrub-steppe habitat near the existing road. Most plants were at the fruiting stage during the time of the spring survey. A total of approximately 30 plants were found in the two populations.

3.3.4 Impacts of the Proposed Action

3.3.4.1 Evaluation Criteria

- Impacts to vegetation would be considered **high** (and significant) if 10 percent or more of a priority habitat within the study area was destroyed, noxious weeds were spread to the site and not adequately controlled, a federally-listed (endangered, threatened, or candidate) plant species was taken without effective mitigation, or a state-listed (endangered, threatened, or sensitive) plant species was impacted to the point it was elevated in status (e.g., from sensitive to threatened).

- Impacts to vegetation would be considered **moderate** if 5 to 10 percent of a priority habitat within the study area was destroyed, noxious weeds were spread to the site but controlled, a federally-listed plant species was taken but the loss could be mitigated through habitat enhancement, translocation, or other measures approved by the USFWS, or if more than 50 percent of individuals of a state-listed plant species in the study area were damaged or destroyed, but did not result in elevation in status, or if a federal species of concern or state review group species were impacted to the point it was elevated in status (e.g., from review group to sensitive).

- Impacts to vegetation would be considered **low** if less than 5 percent of a priority habitat within the study area was destroyed, there was no increase in the spread of noxious weeds, or if less than 50 percent of individuals of a federal species of concern or state-status plant species in the study area were damaged or destroyed, with no impact on their status.

3.3.4.2 Construction Impacts

Impacts from project construction activities would include:

- Temporary removal of vegetation (project plans include re-seeding areas that are temporarily disturbed with native species)
- Potential dispersal of noxious or invasive weed seeds by construction equipment entering the site
- Potential erosion of disturbed soils.

Long-term project impacts would include:

- Replacement of vegetative cover with project facilities
- Potential increase in noxious and invasive species
- Potential soil erosion.

Estimates of temporary and long-term disturbance in the various habitat types are shown in Table 3.3-3. One of the seven habitat types in the study area would not be directly impacted by project facilities: rock outcrop/shrub. This type occurs in small isolated pockets on the north slope of Rattlesnake Hills and no project facilities would be located there.

There would be potential impacts to wetlands and riparian areas. Potential impacts to the wetland adjacent to Sulphur Creek would occur due to widening of the existing access road (see Section 3.8, Water Resources and Wetlands). No turbines, buildings, or staging areas have been proposed in riparian habitat types, but impacts would occur from access roads that cross riparian corridors. The riparian habitat associated with Sulphur Creek is considered priority habitat and is discussed below.

Approximately half of the proposed facilities would be located in agricultural areas. While some cropland and rangeland would be lost to project facilities, crop production and grazing could continue up to and around the facilities. The remaining half of the facilities would be located in grassland-steppe, shrub-steppe, and lithosol habitats.

TABLE 3.3-3
Estimated Disturbance to Vegetation by Habitat Type

Habitat Type	Type of Impact[1]	Estimated Ground Disturbance (acres)
Cropland	Permanent	98.3
	Temporary	416.3
Riparian	Permanent	0.7
	Temporary	1.3
Shrub-Steppe	Permanent	57.5
	Temporary	174.4
Grassland-Steppe	Permanent	57.2
	Temporary	187.0
Lithosol Habitat	Permanent	12.2
	Temporary	50.9

TABLE 3.3-3
Estimated Disturbance to Vegetation by Habitat Type

Habitat Type	Type of Impact[1]	Estimated Ground Disturbance (acres)
Rock Outcrop/Shrub	Permanent	0.0
	Temporary	0.15
Wetlands	Permanent	0.0
	Temporary	0.05
	Total Permanent Habitat Impacted	**226**
	Total Temporary Habitat Impacted	**830**

[1]Tables 2.1-1 and 2.1-2 in Chapter 2 show the area to be occupied by permanent and temporary project facilities. The total acres of disturbance shown on those tables is greater than shown above because some project facilities overlap. For example, underground cable lines and overhead power lines overlap roadway shoulders so the total habitat area disturbed would likely be smaller than the area indicated on the tables in Chapter 2.

Priority Habitats.

For this evaluation, all shrub-steppe and lithosol habitats were considered to meet the WDFW criteria for priority habitats, along with riparian habitat along Sulphur Creek. If the full project is built, approximately 57.5 acres of shrub-steppe would be permanently displaced by project facilities and 174.4 acres temporarily impacted by project construction activities (Table 3.3-3). The total 231.9 acres represents about 5.5 percent of the shrub-steppe habitat in the study area so temporary construction impacts would be moderate. Because 57.5 acres represents approximately 1.3 percent of the shrub-steppe habitat in the study area, long-term impacts from project construction would be considered low. Approximately 12.2 acres of lithosol habitat would be permanently impacted and 50.9 acres temporarily impacted by project facilities (Table 3.3-3). The total 63.1 acres represents about 34.3 percent of the lithosol habitat in the study area so temporary construction impacts would be high. Because 12.2 acres represents approximately 6.6 percent of the lithosol habitat in the study area, long-term impacts from project construction would be considered moderate. The existing access road from the west parallels the riparian priority habitat associated with Sulphur Creek. Improvements to this existing access road would be planned as part of the proposed project. Impacts to this priority riparian habitat would be low because less than 5 percent of the habitat would be impacted by improvements to the existing access road.

Noxious Weeds.

Most noxious and invasive species are aggressive pioneer species that have a competitive advantage over other species on disturbed sites. Therefore, all areas disturbed by the project are potential habitat for noxious and invasive species, particularly for those species previously observed or known to occur in the study area. The introduction of new noxious species from other areas can occur from construction equipment, other vehicles, and worker's boots transporting seeds onto the project site. Once established in an area, negative impacts can include the following, depending on the species, degree of invasion, and control measures:

- Loss of wildlife habitat
- Alteration of wetland and riparian functions

- Reduction in livestock forage and crop production
- Displacement of native plant species
- Reduction in plant diversity
- Changes plant community functions
- Increased soil erosion and sedimentation
- Control and eradication costs to local communities
- Reduction in land value (Sheley et al., 1998).

Noxious weed impacts are difficult to predict and are largely dependent on control measures implemented during and after construction. If noxious weeds were spread to the site and not adequately controlled, impacts would be considered high. If noxious weeds were spread on the site but controlled, impacts would be considered moderate. If no increase in the spread of noxious weeds resulted from construction or operation of the project, impacts would be considered low.

Special Status Species.
Five special status plant species were found in the survey area: one federal species of concern/state threatened, one state sensitive, one state Review Group 1, and two WNHP watch list species. Potential impacts to these species are discussed below.

Columbia Milkvetch (WA: Threatened; Federal Species of Concern). Ground disturbance related to construction of the proposed project would cause direct adverse impacts, including destruction of Columbia milkvetch individuals if they are located in areas to be disturbed. Within the study area, Columbia milkvetch occurs only at the extreme western end. Although the three populations total approximately 410 plants, only an estimated 66 plants are located within the survey corridor. Because only a portion of the survey corridor would receive impacts from the proposed project, less than half of these 66 plants would be expected to be directly impacted. This number represents 8 percent of the total individuals contained in the three populations.

In addition to direct impacts from ground-disturbing activities, the proposed project also has the potential to indirectly impact Columbia milkvetch if degradation of habitat in the area were to occur through the introduction and spread of noxious weeds and other non-native species. Although little is known about how Columbia milkvetch responds to competition from non-native species, it can be assumed that significant increases in non-native species in the area would be detrimental to the species. At the present time, the habitat along the ridgetop where Columbia milkvetch is found is relatively intact. Native species predominate at the milkvetch sites, and few noxious weeds are present. If the project were to lead to the degradation of these ridgetop communities by increasing noxious weed densities, it is likely that some level of adverse impact to the Columbia milkvetch populations would occur.

Direct impacts to Columbia milkvetch populations would likely be low. With implementation of a weed control plan, indirect impacts (from increase in the density of non-native species and changes in fire frequency patterns) would not be expected to reach a level where any of the three Columbia milkvetch populations within the study area would be adversely affected. Therefore, the project would not jeopardize the continued existence of any Columbia milkvetch population, or contribute to the need for federal listing of the species.

Snake River Cryptantha (WA: Sensitive). Within the study area, seven populations of Snake River cryptantha are known. Permanent and temporary ground disturbance related to project construction would directly impact some individuals. Because the populations vary both in size and spatial relationship to the survey corridor, likely ground disturbance impacts to each of the populations are slightly different.

In total, of the 316 individual plants in all seven populations, less than 87 (28 percent) would be expected to receive direct impacts, including destruction of some individuals, from ground disturbance during construction. Because final project facilities placement has not been determined, the exact number of plants likely to be impacted could be higher or lower than the predicted figure. Impacts would be expected to remain below 50 percent of individuals so impacts would be considered low.

Proposed project activities have the potential to indirectly impact Snake River cryptantha populations through the introduction and spread of noxious weeds. Observational evidence suggests that Snake River cryptantha does not tolerate a high level of direct competition with other plant species (WNHP, 1999). In addition, all of the habitats in which it was found within the study area were relatively intact, with few non-native species. This would suggest that if the project were to significantly increase the noxious weed densities, it would have an adverse effect on the species. The extent and severity of this impact is difficult to gauge, but, given the limited numbers and population extent found in the area, the project could result in adverse impacts to one or more populations. This would be considered a low impact.

The project would be expected to have low direct impacts on the Snake River cryptantha populations. Implementation of a weed control plan would minimize indirect impacts (resulting from noxious weed increases or fire frequency changes) that could lead to the degradation or destruction of any Snake River cryptantha population. The proposed project would not be anticipated to jeopardize the continued existence of any Snake River cryptantha population, or contribute to the need for federal listing of the species, so impacts would be low.

Rickard's Idaho Milkvetch (WA: Review Group 1). Because this species is so widespread within the study area, it was not feasible to map the exact boundaries of the populations. One population extended along much of the main ridge and down the slope. It contained over 31,000 individuals within the survey corridors alone, with many times that number thought to occur between the corridors. It is possible that many of the recorded populations may actually connect up as one population outside of the survey corridors, or even connect with the Hanford Site population further along the Rattlesnake ridgeline.

Direct impacts to Rickard's Idaho milkvetch would be low. It is anticipated that no more than 11 percent (19,500 individuals) of the predicted population in the immediate area would be directly impacted. It is not anticipated that the loss of less than 11 percent of the population would significantly jeopardize the continued existence of the local population of Rickard's Idaho milkvetch. It was found vigorously growing throughout a variety of study area habitats, and would likely continue to thrive in the area even with the direct impacts predicted from the proposed project.

Indirect impacts to Rickard's Idaho milkvetch would be low. The proposed project has the potential to indirectly impact Rickard's Idaho milkvetch populations through the introduction and spread of noxious weeds. Although little is known about how Rickard's Idaho milkvetch responds to competition from non-native species, observational evidence suggests that the species may be adversely impacted. The highest densities of Rickard's Idaho milkvetch were generally found in the least disturbed portions of the study area. While individual plants were also found in some of the more degraded habitats (i.e., in the vicinity of heavy concentrations of cheatgrass), Rickard's Idaho milkvetch densities in these habitats was typically low. While this observed correlation may be due to other factors, it is safest to assume that increased noxious weed densities would have an adverse effect on the species.

Because the populations of Rickard's Idaho milkvetch cover most of the study area, it would not be feasible for the project to avoid all direct impacts to the species. In most cases, relocating a particular facility to avoid known Rickard's Idaho milkvetch individuals would impact other individuals in the new corridor. However, the proposed project would have a low direct impact on the local population because it is so widespread in the study area. With implementation of a weed control plan, indirect project-related impacts (resulting from changes in fire frequency or increases in noxious weeds) would not be expected to adversely affect the local population. While some individuals could be affected by these changes if they occurred, the majority of the local population would likely remain unaffected.

Watch List Species. Impacts to state watch list species would be low. Ground disturbance related to construction would likely directly impact some individuals of the two state watch list species, rosy balsamroot and curvepod milkvetch. While individual plants would likely be impacted, the proposed project would not be expected to result in a change of status of these species because these species are abundant in the study area and the number likely to be impacted would be low. The status of these species on the watch list indicates that they are more abundant than previously thought.

Mitigation.

The following mitigation measures would be implemented to reduce impacts to vegetation (see Section 3.8 for mitigation related to wetland impacts):

- Total acres of steppe habitat types removed or damaged as a result of project construction would be replaced or enhanced in similar proportions at a ratio of 3:1 (3 acres enhanced or replaced for each acre impacted) either by enhancing local CRP lands to facilitate their recovery to high-quality steppe habitat, or by creating steppe habitat from nearby agriculture lands by reclaiming them with native grass and shrub species. In selecting mitigation areas, priority may be given to areas with remnant lithosol habitat, as lithosol is extremely difficult to replicate, as well as areas that would best enhance reproductive rates of wildlife species likely to be impacted by the project. Any enhanced or replacement acres would be protected for the life of the project from development, grazing, or conversion to other habitat types.
- Prior to the start of construction, a Site Management Plan Team (SMPT) would be convened to prepare a Site Management Plan (SMP). The SMPT would include representatives from the USFWS, WDFW, DNR, BPA, county representatives, landowners, and the project developer. The role of the SMPT would be to 1) protect the

natural and agricultural resources identified in this EIS during construction by minimizing the areal extent and pattern of construction activities to that necessary for the efficient conduct of construction operations; 2) protect sensitive and unique species and habitats; and 3) assure the effective implementation of the standard design and construction measures proposed as part of the project, as well as mitigation measures included both during and post-construction.

The SMP would include provisions for:

- the siting of towers to minimize impacts on lithosol and rare plant communities;
- the design and implementation of a fire management and erosion control program/procedures;
- the location and physical marking of the boundaries of project storage and staging areas and soil deposition sites;
- procedures to keep the site clean daily of unconstrained project waste and toxics (petroleum products, paper, cans, materials remnants etc.) designate areas, and provide facilities and procedures for safe storage of toxic and hazardous substances;
- minimizing the extent of construction related roads and access routes;
- methods of delineation and marking (i.e. fencing, taping flagging) off-limit areas such as sensitive plant communities;
- size, location, and type of offsite habitat enhancement/replacement for the estimated 57.5 acres of shrub-steppe and 12.2 acres of lithosol permanently impacted by the project;
- selecting recipient sites, restoration plans, and protocols for the estimated 174.4 acres of shrub-steppe and 50.9 acres of lithosol habitat that would be temporarily impacted by project construction activities;
- route project access roads to avoid, where possible, adverse impacts to sensitive vegetation, including wetlands;
- education of the construction work force relative to respecting and adhering to the physical boundaries, off-limit areas, fire and weed prevention measures, etc., of the SMP;
- a weed control plan with protocols and procedures, vehicle cleaning and parking locations, etc., for minimizing the introduction of weed species to the construction site;
- a complete site plan for the SMP would be laid out (fenced, flagged, taped with use areas designated) on the ground prior to the start of construction of any phase of the project.

- At the start of construction, the SMPT would be superceded by an SMP monitor who would be at the project site daily during construction activities. The monitor would be approved by the SMPT and contracted by Benton County with funds provided by the

project developer. The monitor's principal role would be to ensure adherence to the provisions of the SMP and keep a daily record of activities, decisions, etc., relating to that objective. SMP issues that arise during construction that cannot be resolved onsite (e.g., interpretation, unforeseen problems, adjustments of boundaries) would be resolved between the county and the project developer with technical expertise from the appropriate SMPT representative when needed.

- Prior to construction, a noxious weed control plan would be developed in consultation with local county weed control boards, and the plan would be implemented over the life of the project. The plan would address specific measures such as:
  - Clean construction and transport vehicles prior to bringing them to the project site.
  - Revegetate habitats temporarily disturbed during construction as quickly as practicable with native species to minimize habitat (disturbed areas) for noxious weed invasion. It may be appropriate to initially spray the area to kill newly emerged weeds and then reseed or replant with native species. The revegetation plan would be submitted to the SMPT (see below) for comment.
  - Actively control noxious weeds that have established themselves. Coordinate with the local county weed control boards regarding what control measures are most effective and coordinate with the appropriate agencies on how to avoid impacts to special status plants as a result of weed control measures.
- During project construction, best management practices would be employed to reduce impacts to adjacent vegetation and habitats and to minimize the construction footprint to the extent possible.
- As required by the SMPT, prior to construction, the population boundaries of special status plants would be flagged or fenced to facilitate avoidance, and construction personnel would be instructed to completely avoid these marked areas. During construction, the SMP monitor would inspect the populations to confirm that flagging and/or fencing is intact, and that construction activities avoid these sites to the extent possible.
- Final facility design would be reviewed prior to construction, and any proposed disturbance areas that lie outside of the vegetation survey corridors would be surveyed for special status plants during the appropriate season.

3.3.4.3 Operation Impacts

Impacts to vegetation as a result of operation of the project would likely be low. Vehicles would travel on established roadways and maintenance activities would take place at the wind turbines or at the operation and maintenance buildings and gravel substation sites. Vehicles and workers could introduce and/or spread noxious weeds in the study area. The level of impact would be low with implementation of a weed control plan.

3.3.4.4 Decommissioning Impacts

Impacts from decommissioning the project would be similar but lower than those 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 to be removed would likely be impacted to the same extent as described for construction. Similarly, if the landowners requested that access roads be removed, impacts would be similar to those for construction.

All facilities would be removed to a depth of 3 feet below grade and the soil surface would be restored as close as possible to its original condition, or to match the current land use. Reclamation procedures would be based on site-specific requirements and techniques commonly employed at the time the area would be reclaimed, and would likely include regrading, adding topsoil, and revegetating all disturbed areas. Decommissioned roads would be reclaimed or left in place based on landowner preference.

3.3.5 Impacts of the No Action Alternative

Under the No Action Alternative, the existing conditions would remain unchanged by the proposed project. Other generation facilities would likely be constructed and operated in the region, most likely gas-fired CTs. The construction of a gas-fired turbine generator, the development and extraction of natural gas, and the construction of gas pipelines to provide fuel to the generating facility could use as much as 687 acres for an equivalent amount of power. The significance of such impacts to priority habitats and special status plant species would depend on the location and design of the facility.

3.4 Wildlife

3.4.1 Regulatory Framework

Wildlife, special status species, and wildlife habitat are regulated by several federal and state laws as described below.

- **Fish and Wildlife Coordination Act.** The Fish and Wildlife Coordination Act (16 *U.S. Code* [USC] 661 et. seq.) requires federal and state agencies to consult with the USFWS, National Marine Fisheries Service (NMFS), and state wildlife agencies regarding activities that impact, impound, or modify public waterways. Under the act, USFWS and NMFS are responsible for project review and consultation for projects in which water diversions or water body modifications are proposed. This includes addressing concerns about plant and wildlife species that may not be considered under the federal Endangered Species Act (ESA).

- **Migratory Bird Treaty Act.** The Migratory Bird Treaty Act (MBTA) was passed in 1918 with the purpose of ending commercial trade in birds and their feathers. In general, all migratory as well as most nonmigratory birds in the U.S. are protected under the Act. Under the MBTA, it is unlawful to take, import, export, possess, buy, sell, purchase, or barter any migratory bird, feathers or other parts, nests, eggs, and products made from migratory birds. Take is defined as pursuing, hunting, shooting, poisoning, wounding, killing, capturing, trapping, or collecting.

- **Endangered Species Act (16 USC § 1531 et. seq.).** The ESA is the primary federal law directed at protection of species at risk of extinction. Responsibility for implementation

and enforcement of the ESA lies with the USFWS for listed species of wildlife, resident fish, and plants, and with the NMFS for listed anadromous fish and marine wildlife. Section 9 of the ESA prohibits "take" of endangered species of fish or wildlife, where take is defined as "harass, harm, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct." Subsequent amendments to the law have extended the prohibition of take to include threatened species. There are no provisions under the ESA for compensating landowners who may have property or habitat occupied by endangered or threatened species.

In addition to listing species as endangered or threatened under the ESA, the USFWS also identifies candidate species and species of concern. Candidate species are those species for which sufficient data have been gathered to allow the USFWS to propose listing the species. Species of concern are those species for which insufficient data have been gathered.

Under Section 7 of the ESA, federal agencies are directed to consult with the USFWS if listed species are present in the vicinity of the agency's proposed action. If these species are present and there is potential for them to be affected by the project, the agency must prepare a Biological Assessment (BA) describing the potential effects. Although consultation with the USFWS is only required under the ESA for listed species, it is common practice to also consult with the USFWS if candidate species could be affected by a proposed action.

- **Washington Department of Fish and Wildlife Regulations (WAC 232-12-297).** In Washington, state-listed animal species are not specifically protected by statute or regulation, but are listed to assist with agency wildlife management efforts and decisionmaking. Species may be listed because of rarity, vulnerability to disturbance, or other factors. WDFW maintains and publishes a PHS list and a Species of Concern list as a means of providing habitat and wildlife information to local governments, agencies, landowners, and tribes for land use planning purposes.

  The PHS list is a catalog of habitats and species considered priorities for conservation and management. Priority species include state endangered, threatened, sensitive, and candidate species; animal aggregations considered vulnerable; and those species of recreational, commercial, or tribal importance that are vulnerable. Priority habitats are those habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type or dominant plant species, a described seral (successional ecological community) stage, or a specific structural element such as a unique soil or ecological niche.

  The Species of Concern List, published by the WDFW Wildlife Management Program, includes native Washington fish and wildlife species that are listed as endangered, threatened, or sensitive, or as candidates for these designations. Endangered, threatened, and sensitive species are legally established in Washington Administrative Codes. Candidate species are established by WDFW policy.

- **Bald Eagle Protection Act (16 USC § 668-668d, 54 Stat. 250)**. The Bald Eagle Protection Act was passed in 1940 to protect bald eagles and was later amended to include golden eagles. Under the act it is unlawful to import, export, take, sell, purchase, or barter any

bald eagle or golden eagle, their parts, products, nests, or eggs. Take includes pursuing, shooting, poisoning, wounding, killing, capturing, trapping, collecting, molesting, or disturbing eagles.

- **Benton and Yakima County Critical Areas Ordinances.** Title 15 of the Benton County Ordinance and Title 16A of the Yakima County Ordinance provide county level protection of critical areas and resources. Critical areas and resources include wetlands, rivers and creeks, critical aquifer recharge and interchange areas, frequently flooded areas, geologically hazardous areas, and fish and wildlife conservation areas. Fish and wildlife conservation areas identified in Title 15 of the Benton County Code include Washington State Natural Areas Preserves and Natural Resource Conservation Areas, and WDFW Priority Habitats. The county ordinances provide guidelines for protecting and mitigating impacts to these areas.

3.4.2 Study Methodology

3.4.2.1 Study Area

Two study areas were used for different aspects of the baseline biological investigations, depending on the resource of concern. The primary study area was the proposed location of wind turbines and associated facilities (e.g., roads, met towers, substations, operation and maintenance facilities), including a buffer of approximately 1 mile from all project facilities. This area is referred to as the study area throughout this section. The 1-mile buffer zone was included to assist in addressing potential direct and indirect impacts to wildlife species and habitat for species that have home ranges likely to extend beyond the boundary of the project site. The avian use surveys, vegetation mapping, and general wildlife observations took place within the study area. The second study area, called the raptor nesting area (RNA), was surveyed by helicopter for raptor and other large bird nests. This area included a 5-mile buffer around the project site to survey for nesting raptors that could be affected by the proposed project. The 5-mile buffer was selected to cover the typical home range for most raptors.

3.4.2.2 Information Review

Information about wildlife and threatened and endangered species potentially occurring in the study area was obtained from the USFWS, WDFW, and WNHP. In addition, background information was obtained from scientific literature, internet resources, technical reports, natural resource databases, and resource experts.

The WNHP and WDFW priority habitats databases were used to gather site-specific information about special status species (federal or state endangered, threatened, or candidate, or federal species of concern). A species list of federal special status species was solicited from the USFWS. The WDFW Species of Concern list was queried for state special status species potentially occurring in the study area (WDFW, 2000). In addition, the Biodiversity Inventory and Analysis of the Hanford Site, the WDFW Web page, and the Washington State Breeding Bird Atlas were reviewed for information about special status species in the project vicinity.

3.4.2.3 Field Surveys

An avian baseline study is currently being conducted in the study area to collect specific information regarding wildlife and avian resources within and around proposed project facilities. An interim technical report containing additional details regarding the results of the field surveys is available for review at BPA or the Benton County Planning and Building Department on request. Table 3.4-1 summarizes the field surveys conducted for the avian baseline study that addressed wildlife and their habitat, either directly or peripherally.

TABLE 3.4-1
Summary of Field Surveys

Date	Nature of Survey
4/01 – current	Avian Use Surveys: Emphasis on locating raptors and other large birds; point count surveys at eight permanent (fixed) plots; half-mile radius observation plot.
5/01, 6/01, 7/01	Paired plot bird surveys: Emphasis on recording breeding passerines; point count surveys at 15 paired plots 985 feet apart (30 total plots).
4/30 – 5/02/01 and 6/18 – 19/01	Raptor nest survey: Surveys conducted by helicopter to locate raptor and large bird nests visible from the air; survey area included a 5-mile radius of the site.
5/21 – 25/01	General vegetation mapping: Ground-truthing of plotted vegetation types from Benton County aerial photos.
4/01 – current	General wildlife observations: Conducted while on site during other surveys.

Field surveys in the study area included weekly point counts for raptors and all birds, point count breeding season bird surveys monthly from May to July, raptor nest surveys, general vegetation mapping, and general wildlife observations. In addition to the avian study, rare plant surveys and wetland investigations were also conducted and provided additional information on study area habitats (see Sections 3.3, Vegetation, and 3.8, Water Resources and Wetlands). The field surveys were designed to record avian species seen on the site and provided opportunity for observing and recording other fauna such as mammals and reptiles. The vegetation mapping provided a list of habitat types in the study area. Habitat types were cross referenced with habitat preferences and known distribution of special status species to determine potential for their occurrence in the study area.

Data collected from the field surveys were compiled and analyzed to address specific questions about bird use of the study area. A summary of the major findings from the spring, summer, and fall surveys, and potential impacts to wildlife and special status species is provided in the following sections. The results of the winter surveys will be incorporated into the final technical report and into the Final EIS.

3.4.3 Affected Environment

The proposed project would be located in the Columbia Basin Physiographic Province. Historically, the basin's vegetation was dominated by shrub-steppe and grassland-steppe dissected by perennial and intermittent streams, some with springs, and associated riparian corridors of deciduous trees and shrubs. Much of the basin has been converted to agriculture.

The study area consists of rangeland dominated by shrub-steppe and grassland-steppe that varies from poor to high quality habitat for wildlife. The study area is grazed by livestock (cattle) and receives some human disturbance in the form of recreation (hunting) and facilities (power lines, radio towers) maintenance. Parcels in the eastern portion of the study area are being actively farmed, primarily in wheat fields.

There is one perennial stream in the study area, Sulphur Creek, which has its source in Sulphur Spring. Along the lower reaches of Sulphur Creek there is cottonwood riparian habitat. Ephemeral drainages associated with springs scattered along the south flank of Rattlesnake Ridge, are tributaries of Sulphur Creek. Water from these springs does not extend far along the tributaries before it dries up or goes underground. Maiden Spring and Lower Maiden Spring have been developed for livestock watering. There are also several springs scattered along the north flank of Rattlesnake Ridge. See Section 3.8, Water Resources and Wetlands, for a more detailed discussion of wetlands and waterways.

3.4.3.1 Special Status Species

Thirty federal or state of Washington special status fish, wildlife, or insect species may occur within the study area based on habitat preferences, species' ranges (including migration corridors), known occurrence on the nearby ALE of the Hanford Site, known occurrence in Benton or Yakima Counties, or public or agency comment (Table 3.4-2). No federally-listed or candidate wildlife species were documented in the study area during the field surveys.

Pygmy Rabbit (Federal and State Endangered). Based on work conducted by the WFDW, pygmy rabbits only occur in Washington in five distinct groups in Douglas County (WDFW, 1995). The Washington State Recovery Plan for pygmy rabbit, cites one observation of a single pygmy rabbit from Benton County on the ALE, Hanford Monument, however, no details or supporting information is provided for this sighting (WDFW, 1995). Work conducted for The Nature Conservancy to survey and assess habitat on the ALE for pygmy rabbits did not document any individuals (Marr, 1997). No other historical or current records of pygmy rabbit were located for Benton or Yakima counties. Based on habitat and soils, it is unlikely that pygmy rabbits occur or are likely to occur in the study area.

Bald Eagle (Federal and State Threatened). A bald eagle has been observed nearby on the ALE; however, it has not been recorded during avian or raptor nest surveys of the study area. Due to the aquatic nature of their prey base and the limited nesting opportunities (large trees), bald eagles are unlikely to breed or forage within the study area. However, they may migrate through the study area to suitable wintering areas along the Columbia River.

Middle Columbia River Steelhead and Bull Trout (Federal Threatened; State Candidate). The project would not affect any water resources occupied by the two listed fish species, bull trout and Middle Columbia River steelhead. The project would not affect these fish.

Western Sage Grouse (Federal Candidate; State Threatened). Western sage grouse is a possible rare resident based on recent winter observations of this species on the ALE; however, results of winter surveys when sage grouse could potentially occur in the study area are not yet complete. No Western sage grouse have been documented in the study area and they are unlikely to occur.

Mardon Skipper (Federal Candidate; State Endangered). Mardon skipper is a butterfly that occupies grasslands and native prairie habitats within ponderosa pine woodlands or savanna. The study area is not suitable for this species because it lacks this type of habitat. Mardon skipper have not been documented in the study area and are unlikely to occur.

TABLE 3.4-2
State and Federal Special Status Species of Known or Potential Occurrence in the Study Area

Common Name and Scientific Name	Federal Status	WDFW Status	Occurrence in Study Area	Occurrence Documentation
Mammals				
Pygmy rabbit *(Sylvilagus idahoensis)*	E	E	**Not documented.** One historical record from ALE; unlikely to occur due to lack of suitable habitat and current known range (Douglas County).	WDFW, 1995
Black-tailed jackrabbit *(Lepus californicus)*	N/A	C	**Not documented.** Possible occurrence based on suitable grassland/shrub habitats; documented on ALE.	TNC, 1999
White-tailed jackrabbit *(Lepus townsendi)*	N/A	C	**Not documented.** Possible occurrence based on suitable grassland/shrub habitats; documented on ALE.	TNC, 1999
Merriam's shrew *(Sorex merriami)*	N/A	C	**Not documented.** Possible occurrence based on suitable sagebrush shrub and mesic grass/shrub habitats; documented on ALE.	TNC, 1999, WDFW PHS, 2001
Townsend's big-eared bat *(Coryhorhinus townsendii)*	SoC	C	**Not documented.** Unlikely to occur due to lack of suitable habitat.	TNC, 1999
Birds				
Sandhill crane *(Grus canadensis)*	N/A	E	**Not documented.** Unlikely breeding resident due to lack of habitat, possible migrant or transient during post-breeding dispersal.	LaFramboise and LaFramboise, 1999
Peregrine falcon *(Falco peregrinus)*	SoC	E	**Documented on site.** Unlikely breeder due to lack of suitable nest habitat (cliffs); rare migrant; two individuals observed in September 2001.	Smith et al., 1997, Young et al., 2001
Bald eagle *(Haliaaetus leucocephalus)*	T	T	**Not documented.** Unlikely breeding resident due to lack of habitat, possible migrant or winter transient; observed on ALE.	LaFramboise and LaFramboise, 1999
Ferruginous hawk *(Buteo regalis)*	SoC	T	**Documented on site.** Observed during bird surveys on site; four nest locations located within 5 miles of project site.	Young et al., 2001
Western sage grouse *(Centrocercus urophasianus)*	C	T	**Historical.** Possible resident; scattered habitat (medium to dense sagebrush stands mixed grass and forbs); documented on ALE.	Hays et al., 1998a; WDFW PHS, 2001

TABLE 3.4-2
State and Federal Special Status Species of Known or Potential Occurrence in the Study Area

Common Name and Scientific Name	Federal Status	WDFW Status	Occurrence in Study Area	Occurrence Documentation
Sharp-tailed grouse *(Tympanuchus phasianellus)*	N/A	T	**Not documented.** Possible resident but limited habitat (grasslands, native prairie); historical records from Benton County.	Hays et al., 1998b
Northern goshawk *(Accipiter gentilis)*	N/A	C	**Not documented.** Unlikely rare migrant; no suitable nesting habitat (coniferous and aspen woodlands); observed on ALE.	LaFramboise and LaFramboise, 1999
Golden eagle *(Aquila chrysaetos)*	N/A	C	**Documented on site.** No nest sites found; two observations during fall avian surveys; winter use on ALE; winter use is likely higher than spring/summer/fall; may forage within study area.	LaFramboise and LaFramboise, 1999; Young et al., 2001
Merlin *(Falco columbarius)*	N/A	C	**Documented on site.** Uncommon due to habitat and apparent rare status; possible rare migrant; one observation on site.	Young et al., 2001, LaFramboise and LaFramboise, 1999
Burrowing owl *(Athene cunicularia)*	SoC	C	**Not documented.** Possible but unlikely breeding resident due to lack of habitat; possible migrant; documented breeding on ALE.	LaFramboise and LaFramboise, 1999
Vaux's swift *(Chaetura vauxi)*	N/A	C	**Not documented.** No suitable nesting habitat; unlikely rare migrant.	LaFramboise and LaFramboise, 1999
Streaked horned lark *(Eremophila alpestris strigata)*	N/A	C	**Not documented.** Unlikely due to subspecies range.	Smith et al., 1997
Lewis woodpecker *(Melanerpes lewis)*	N/A	C	**Not documented.** No suitable nesting habitat; unlikely rare migrant; observed on ALE.	LaFramboise and LaFramboise, 1999
Sage thrasher *(Oreoscoptes montanus)*	N/A	C	**Documented on site.** Observed during avian surveys on site; suitable sagebrush cover for nesting.	Young et al., 2001
Loggerhead shrike *(Lanius ludovicianus)*	SoC	C	**Documented on site.** Observed during avian surveys on site; suitable sagebrush cover for nesting.	Young et al., 2001
Sage sparrow *(Amphispiza belli)*	N/A	C	**Documented on site.** Observed incidentally south of study area boundary; patches of suitable sagebrush cover for nesting occur on site but not observed during bird surveys.	Young et al., 2001

TABLE 3.4-2
State and Federal Special Status Species of Known or Potential Occurrence in the Study Area

Common Name and Scientific Name	Federal Status	WDFW Status	Occurrence in Study Area	Occurrence Documentation
Reptiles				
California mountain kingsnake *(Lampropeltis zonata)*	N/A	C	**Not documented.** Unlikely due to lack of suitable habitat (oak, pine woodlands, chaparral slopes); one isolated historical record from eastern Yakima County.	Nussbaum et al., 1983
Striped whipsnake *(Masticophis taeniatus)*	N/A	C	**Not documented.** Possible due to suitable habitat (grasslands, sagebrush, dry rocky canyons); records from Yakima and Benton Counties and ALE.	Nussbaum et al., 1983; TNC, 1999
Amphibians				
Northern leopard frog *(Rana pipiens)*	N/A	E	**Not documented.** Unlikely due to lack of suitable habitat; historical record from Benton County near tri-cities.	McAllister et al., 1999
Oregon spotted frog *(Rana pretiosa)*	N/A	E	**Not documented.** Unlikely due to lack of suitable habitat; no records from Benton or Yakima Counties.	McAllister and Leonard, 1997
Columbia spotted frog *(Rana luteiventris)*	N/A	C	**Not documented.** Unlikely due to lack of suitable habitat; no records from Benton or Yakima Counties.	Nussbaum et al., 1983
Western toad *(Bufo boreas)*	SoC	C	**Not documented.** Unlikely due to lack of suitable habitat; no records from Benton or Yakima Counties.	Nussbaum et al., 1983
Fish				
Middle Columbia River steelhead *(Oncorhynchus mykiss)*	T	C	**Not documented.** Unlikely due to lack of habitat (rivers, perennial streams); possible in the mainstem Yakima River and larger perennial tributaries.	Chapman et al., 1994
Bull trout *(Salvelinus confluentus)*	T	C	**Not documented.** Unlikely due to lack of habitat (near pristine stream habitat with cold water and loose clean gravel); generally in mountainous areas.	WDFW, 2000
Insects				
Mardon skipper *(Polites mardon)*	C	E	**Not documented.** Unlikely due to lack of habitat (native grassland, prairie habitats within ponderosa pine savanna/woodlands).	Potter et al., 1999

Codes:
E = Endangered.
T = Threatened.
C = Candidates.
SoC = Species of concern (Federal).
N/A = Not applicable.

State-listed or candidate breeding resident species observed in the study area include ferruginous hawk, sage thrasher, loggerhead shrike, and sage sparrow. Sage grouse and burrowing owl have been documented near the study area on the ALE.

Other state-listed or candidate species that are migrants through the area or do not breed in the area and have been recorded in the study area include golden eagle, peregrine falcon, and merlin. Northern goshawk and Lewis woodpecker have been documented on the ALE Reserve. Sandhill crane and Vaux's swift have not been documented nearby and are unlikely migrants through the study area.

3.4.3.2 Fish

Sulphur Creek is the only perennial stream in the study area. It is crossed by the primary access road from the southwest (Figure 2.1-2). The portion of the creek immediately below Sulphur Spring for approximately 1.25 miles is mapped as a perennial stream based on the USGS topographic map. Downstream, Sulphur Creek is mapped as an intermittent stream. According to the WDFW, there are no known fish in this stream near the study area (LaRiviere, 2001).

3.4.3.3 Bats

During public scoping, concern was raised over potential bat use in the study area. Based on general information and literature about bat range and habitat preferences, 14 species of bats could potentially occur in the study area (Table 3.4-3). California bat, small-footed myotis, little brown bat, long-legged myotis, Yuma myotis, western pipistrelle, big brown bat, and pallid bat have all been documented on the nearby ALE Reserve (TNC, 1999). Both hoary bats and silver-haired bats, two common fatalities at other wind plants, have also been recorded on the nearby ALE, and are expected to migrate through the study area. Bat species diversity, abundance, and activity in the study area are unknown. No field surveys for bats were conducted.

Townsend's big-eared bat, a federal species of concern and state candidate, is not expected to be present in the study area. Although it has been known to occur in desert scrub habitats, it tends to prefer forested areas, riparian areas, and is less common in xeric shrub/grass vegetation types (Kunz and Martin, 1982). There are no records of Townsend's big-eared bat from the ALE (TNC, 1999) and no records could be located for this species in the project region. Generally speaking, very little is known about bats in the vicinity and particularly in the study area.

TABLE 3.4-3
Bat Species of Potential Occurrence in the Study Area

Common Name and Scientific Name	Typical Habitat	Expected Occurrence in Study Area	Occurrence Documentation
California Bat *Myotis californicus*	Generally found in open habitats where it forages along tree edges, riparian areas, open water; roosts in cliffs, caves, trees	Likely; documented on ALE	Fitzner and Gray, 1991
Small-Footed Myotis *Myotis ciliolabrum*	Varied arid grass/shrublands, ponderosa pine and mixed forests; roosts in crevices and cliffs; hibernates in caves, mines	Likely; documented on ALE	West et al., 1998, 1999
Long-Eared Myotis *Myotis evotis*	Primarily forested habitats and edges, juniper woodland, mixed conifers, riparian areas; roosts snags, crevices, bridges, buildings, mines	Unlikely due to habitat; not documented on ALE	TNC, 1999
Little Brown Bat *Myotis lucifugus*	Closely associated with water; riparian corridors; roosts buildings, caves, hollow trees; hibernates in caves	Possible; documented on ALE	West et al., 1998, 1999
Fringed Myotis *Myotis thysanodes*	Primarily forested or riparian habitats; roosts buildings, trees; hibernates in mines and caves	Unlikely due to habitat; not documented on ALE	TNC, 1999
Long-Legged Myotis *Myotis volans*	Coniferous and mixed forests, riparian areas; roosts caves, crevices, buildings, mines	Unlikely due to habitat; documented on ALE	Fitzner and Gray, 1991
Yuma Myotis *Myotis ymanensis*	Closely associated with water in a variety of habitats— riparian, shrublands, forests woodlands; roosts in mines buildings, caves, bridges	Likely; documented on ALE	West et al., 1998, 1999
Hoary Bat *Lasiurus cinereus*	Forested habitats, closely associated with trees; roosts in trees; migratory species	Unlikely resident but probable migrant; documented on ALE	West et al., 1998, 1999
Silver-Haired Bat *Lasionycteris noctivagans*	Forested habitats; generally coniferous forests; roosts under bark; believed to be a migratory species	Unlikely resident but probable migrant; documented on ALE	West et al., 1998, 1999
Western Pipistrelle *Pipistrellus hesperus*	Primarily desert lowlands; desert shrublands; canyons; roosts under rocks, crevices and possibly in sagebrush	Likely; documented on ALE	West et al., 1998, 1999
Big Brown Bat *Eptesicus fuscus*	Generally deciduous forests; buildings; roosts in buildings, trees, crevices; hibernates in caves, mines	Possible; documented on ALE	West et al., 1998, 1999
Spotted Bat *Euderma maculatum*	Varied habitat—pine forests to desert scrub with nearby cliffs; roosts in crevices, cliff faces	Unlikely due to rarity; not documented on ALE	TNC, 1999
Townsend's Big-Eared Bat *Corynorhinus townsendii* **(Federal Species of Concern; State Candidate)**	Varied habitats—forests to desert scrub; roosts in buildings, caves, mines, bridges; hibernates in caves	Unlikely due to lack of suitable roost sites; not documented on ALE	TNC, 1999
Pallid Bat *Antrozous pallidus*	Generally occurs in arid regions, desert scrub habitats; roosts in cliff faces, caves, mines, buildings	Unlikely due to lack of suitable roost sites; documented on ALE	West et al., 1998, 1999

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, caves, and old buildings are scarce throughout the study area; however, ample talus slopes and rock crevices occur along Rattlesnake Ridge on both the north and south flanks and likely provide suitable roost sites for some species. The riparian corridor of Sulphur Creek has cottonwood trees which are suitable for roosting bats; this corridor is crossed by the primary access road. Sulphur Creek likely provides a source of water and forage in emergent insects. Maiden Spring, developed for livestock watering, also provides an insect source and opportunities for bats to water in the livestock toughs. Shrubs and small trees in the riparian draws below Maiden Spring may provide some roosting opportunities for bats.

3.4.3.4 Big Game Species

During public scoping, concern was raised over potential impacts to big game species from the proposed project. Based on agency information, literature review, and observations on the site, elk (*Cervis elaphus*) and mule deer (*Odocoileus hemionus*) occur in the study area, primarily along the ridgeline of Rattlesnake Ridge and the adjoining slopes. However, mule deer also have been observed in the eastern portion of the study area, which is primarily wheat fields. During avian surveys between April and October 2001, a total of 167 elk and 15 mule deer were observed in four and six groups, respectively (Young et al., 2002).

The Rattlesnake Hills elk herd exists on the ALE east and north of the study area and in surrounding areas of Benton and Yakima counties. Elk seen in the study area are part of this herd. The Rattlesnake Hills herd has expanded slowly from an estimated eight individuals in 1975 to over 800 individuals in 1999. WDFW has attempted to control the herd through liberal hunting seasons; however, restricted access to the ALE and private lands in the Rattlesnake Hills have limited hunter success (WDFW, 2000).

3.4.3.5 Reptiles and Amphibians

While the field surveys did not target reptiles and amphibians, two species of reptiles were documented in the study area—short-horned lizard (*Phrynosoma douglassi*) and yellow-bellied racer (*Coluber constrictor*). Other reptile species documented on the nearby ALE that could potentially occur on the project site include: sagebrush lizard (*Sceloporus graciosus*), side-blotched lizard (*Uta stansburiana*), common garter snake (*Thamnophis sirtalis*), western terrestrial garter snake (*Thamnophis elegans*), gopher snake (*Pituophis melanoleucus*), nightsnake (*Hypsiglena torquata*), striped whipsnake (*Masticophis taeniatus*), and western rattlesnake (*Crotalus viridis*).

Very little habitat is suitable for amphibians or aquatic reptiles (e.g., turtles) in the study area. Maiden Spring does not provide suitable habitat for amphibians. Sulphur Creek and Sulphur Springs may provide some habitat for tiger salamanders (*Ambystoma tigrinum*) or Woodhouse's toad (*Bufo woodhousei*).

3.4.3.6 Birds

During scoping, concerns were raised about potential avian mortality, displacement of breeding birds, loss of prime shrub-steppe habitat, and disruption of migratory pathways. Species of special interest include raptors, particularly ferruginous hawks and eagles, and

state candidate species and grassland and shrubland nesting passerines such as sage sparrows, loggerhead shrikes, and sage thrashers. Migrating birds are also of special interest for this project due to the possibility of the primary Rattlesnake Ridge line providing a migratory corridor for birds.

Avian Baseline Study Results.
While the avian use surveys of the study area were designed to record all birds observed, the surveys focused on two avian groups—raptors and other large birds believed to be susceptible to impacts from wind plants, and grassland-/shrub-steppe passerine species which breed in these habitats in the study area. General results of the surveys are presented below. Results of the paired plot surveys are presented in the interim technical report available for review at BPA or the Benton County Planning and Building Department upon request. In general, results of the two survey types were consistent and the results presented below are representative of the study area. More detailed results of the two studies are found in the interim technical report.

Fixed Point (Raptor and Large Bird) Surveys. A total of 232 30-minute point count surveys were conducted between April 20 and October 28, 2001. Surveys were conducted at eight fixed stations (point count stations) once a week (Figure 3.4-1). A total of 40 avian species were observed during the fixed point surveys (Table 3.4-4). As expected, passerines were by far the most numerous group. Horned lark, western meadowlark, vesper sparrow, and dark-eyed junco were the four most numerous passerines observed. Passerines comprised 82.9 percent of the total number of birds observed and raptors comprised 5.5 percent of all birds observed. Northern harrier, American kestrel, red-tailed hawk, and Swainson's hawk were the four most common raptors observed. Corvids (magpies, crows, and ravens) comprised 9.4 percent of all birds observed. Other birds (primarily upland game birds) comprised 4.0 percent of all birds observed. Only one group of waterfowl (one flock of 15 Canada geese) was observed in the study area during the fixed point surveys. Upland game birds observed on the site included three non-native species (ring-necked pheasant, chukar, and Hungarian [gray] partridge).

TABLE 3.4-4
Avian Species Observed Between April 20 and October 28, 2001

Group/Species (Status: F = Federal; WA = State)	**Total Observations**	**Exposure Index**	**Average Avian Use**	**Frequency of Occurrence (%)**	**Percent Composition**
Corvids					
Black-Billed Magpie	9	0.000	0.0408	3.1	0.33
Common Raven	275	0.543	1.1332	40.2	9.09
Subtotal	284		1.1740	42.0	9.42
Passerines					
American Goldfinch	1	0.000	0.0043	0.4	0.03
American Pipit	22	0.000	0.0996	0.9	0.80
American Robin	4	0.000	0.0172	0.9	0.14
Barn Swallow	4	0.000	0.0179	0.9	0.14
Brewer's Sparrow	22	0.007	0.0951	6.9	0.76
Brown-Headed Cowbird	2	0.000	0.0086	0.4	0.07
Cassin's Finch	11	0.000	0.0474	1.3	0.38
Cliff Swallow	6	0.000	0.0271	1.4	0.22
Dark-Eyed Junco	54	0.000	0.2331	3.5	1.87
European Starling	2	0.000	0.0086	0.4	0.07
Golden-Crowned Kinglet	3	0.000	0.0129	0.9	0.10
Grasshopper Sparrow	7	0.000	0.0305	3.0	0.24
Horned Lark	1631	0.079	7.2237	78.2	57.96
House Finch	3	0.000	0.0129	0.9	0.10
Loggerhead Shrike ***(F: SoC; WA: C)***	3	0.000	0.0129	0.9	0.10
Mountain Bluebird	5	0.000	0.0216	0.9	0.17
N. Rough-Winged Swal.	20	0.089	0.0891	0.9	0.72
Red-Breasted Nuthatch	1	0.000	0.0043	0.4	0.03
Rock Wren	10	0.000	0.0433	3.9	0.35
Sage Thrasher ***(WA: C)***	2	0.000	0.0086	0.9	0.07
Savannah Sparrow	3	0.000	0.0129	0.9	0.10
Say's Phoebe	2	0.000	0.0086	0.9	0.07
Spotted Towhee	4	0.000	0.0172	1.3	0.14
Swainson's Thrush	1	0.000	0.0043	0.4	0.03
Tree Swallow	12	0.000	0.0577	0.5	0.46
Unidentified Blackbird	2	0.000	0.0086	0.4	0.07
Unidentified Finch	35	0.000	0.1563	0.4	1.25
Unidentified Flycatcher	8	0.000	0.0345	1.7	0.28
Unidentified Passerine	151	0.009	0.7234	2.2	5.80
Unidentified Sparrow	1	0.000	0.0043	0.4	0.03
Unidentified Swallow	12	0.009	0.0523	3.1	0.42

TABLE 3.4-4
Avian Species Observed Between April 20 and October 28, 2001

Group/Species (Status: F = Federal; WA = State)	**Total Observations**	**Exposure Index**	**Average Avian Use**	**Frequency of Occurrence (%)**	**Percent Composition**
Unidentified Warbler	1	0.000	0.0043	0.4	0.03
Varied Thrush	1	0.000	0.0043	0.4	0.03
Vesper Sparrow	64	0.000	0.2606	16.9	2.09
Violet-Green Swallow	1	0.000	0.0045	0.4	0.04
Western Kingbird	7	0.000	0.0310	2.2	0.25
Western Meadowlark	195	0.004	0.8244	37.4	6.61
Western Tanager	4	0.000	0.0172	0.4	0.14
White-Crowned Sparrow	14	0.000	0.0619	0.9	0.50
Wilson's Warbler	1	0.000	0.0043	0.4	0.03
Yellow Warbler	1	0.000	0.0043	0.4	0.03
Yellow-Rumped Warbler	1	0.000	0.0043	0.4	0.03
Subtotal	2337		10.3332	89.9	82.90
Raptors					
American Kestrel	32	0.011	0.1393	10.3	1.12
Cooper's Hawk	4	0.006	0.0175	1.8	0.14
Ferruginous Hawk ***(F: SoC: WA: T)***	2	0.009	0.0091	0.9	0.07
Golden Eagle	1	0.005	0.0045	0.4	0.04
Northern Harrier	40	0.040	0.1660	13.8	1.33
Peregrine Falcon	2	0.009	0.0086	0.4	0.07
Prairie Falcon	9	0.032	0.0396	4.0	0.32
Red-Tailed Hawk	28	0.058	0.1055	7.9	0.85
Rough-Legged Hawk	4	0.011	0.0182	1.8	0.15
Sharp-Shinned Hawk	1	0.004	0.0043	0.4	0.03
Swainson's Hawk	26	0.061	0.0937	6.2	0.75
Unidentified Accipiter	3	0.000	0.0141	1.4	0.11
Unidentified Buteo	32	0.042	0.0667	5.3	0.53
Subtotal	113		0.6870	42.3	5.51
Shorebirds					
Killdeer	1	0.000	0.0045	0.4	0.04
Waterfowl					
Canada Goose	15	0.000	0.0670	0.4	0.54
Gamebirds					
Chukar	17	0.000	0.0733	3.0	0.59
Gray Partridge	4	0.000	0.0179	0.4	0.14
Ring-Necked Pheasant	2	0.000	0.0045	0.4	0.04
Subtotal	23		0.0956	3.9	0.77

TABLE 3.4-4
Avian Species Observed Between April 20 and October 28, 2001

Group/Species (Status: F = Federal; WA = State)	**Total Observations**	**Exposure Index**	**Average Avian Use**	**Frequency of Occurrence (%)**	**Percent Composition**
Doves					
Mourning Dove	21	0.000	0.0941	2.3	0.76
Rock Dove	6	0.000	0.0375		
Unidentified Pigeon	1	0.000	0.0069		
Subtotal	28		0.0941	2.3	0.76
Other					
Common Flicker	2	0.000	0.0088	0.9	0.07
Unid. Hummingbird	2	0.000	0.0086	0.9	0.07
Common Nighthawk	1	0.004	0.0043	0.4	0.03
Subtotal	5		0.0088	0.9	0.07
Total	**2874**				

Avian Use. A total of 1,078 observations were made of 2,874 individual birds during the fixed point (raptor and large bird) surveys (Table 3.4-4). These are raw counts of observations that were not standardized by the number of hours of observation, but provide an overall list of what was observed. Because individual birds were not marked, these counts also do not distinguish between individuals but provide an estimate of avian use of the study area.

Avian use by species was calculated as the average (mean) number of observations per 30-minute survey. For example, if one red-tailed hawk was observed on five plot surveys, its average use would be 0.2. However, it is unknown if this was the same bird seen five times or five different birds seen once. Table 3.4-4 provides an index of how often red-tailed hawks occur in the study area and therefore are at risk of being impacted by the proposed project. Any reference to abundance refers to the use estimates and not absolute density or numbers of individuals.

The three most abundant species documented in the study area were horned lark (58 percent), common raven (9 percent), and western meadowlark (6.6 percent). Together these species comprised more than 73 percent of all birds observed during the fixed point surveys. On average, more than seven horned larks, one common raven, and approximately one western meadowlark were observed during each 30-minute survey.

The most abundant raptor observed was northern harrier, with 40 individuals observed, or approximately one northern harrier observed every six surveys.

The bird use estimates for the study area, with the exception of a few common species, were similar or lower than other wind plants studied in the U.S. Raptor use of the study area was similar to other wind plants studied through the spring, summer, and fall. The most abundant raptors on the site based on use were northern harrier, American kestrel, and red-tailed hawk. Only two ferruginous hawks (state threatened species and federal species of

concern) were observed during the surveys despite a ferruginous nest being located in the study area. As a group, raptor use of the study area was approximately 0.69 raptors observed per 30-minute survey, or roughly one raptor observed every 1.4 surveys. For comparison, raptor use for spring, summer, and fall at four wind plants studied with the same methods[1] varied from slightly lower to much higher. Raptor use at the Condon Wind Plant, Oregon, was approximately 0.49 raptors per 30-minute survey[2]; at the Vansycle Wind Plant, Oregon, raptor use was approximately 0.55 raptors per 30-minute survey; at the Buffalo Ridge Wind Plant, Minnesota, raptor use was approximately 0.74 raptors per 30-minute survey; and at the Foote Creek Rim Wind Plant, Wyoming, raptor use was approximately 1.10 raptors per 30-minute survey.

Exposure Index. The exposure index is a relative measure of the risk of each species observed on site during the fixed-point surveys coming in contact with a turbine. A higher exposure index implies that there is a potentially greater risk of an individual bird colliding with a turbine. The exposure index is based on the use (measure of abundance) of the site by the species and the flight characteristics observed for that species (percent of observations of the species flying and percent of observations of the species flying within the zone which would be occupied by turbine blades). Common raven, northern rough-winged swallow, and horned lark had the highest exposure indices (Table 3.4-4). Horned lark was nearly always observed below the zone of risk, but because it was by far the most abundant species, it had one of the highest exposure indices. All observations of northern rough-winged swallows were recorded within the zone of risk.

Mortality studies at other wind plants have indicated that although ravens are often observed at wind plants within the zone of risk, they appear to be less susceptible to collision with wind turbines than other similar size birds (e.g., raptors, waterfowl). Raptor species with the highest index include Swainson's hawk, red-tailed hawk, and northern harrier. Although northern harrier and American kestrel were the most abundant raptor species observed, both species were observed less often in the zone of risk than the buteo species (ferruginous hawk, red-tailed hawk, Swainson's hawk).

Avian Diversity (Frequency of Occurrence and Percent Composition). Frequency of occurrence and percent composition provide relative estimates of the avian diversity and species composition of the study area or what are the most frequently observed species in the study area and therefore most likely to be affected by the project. The frequency of occurrence was calculated as the percent of surveys where a particular species was observed within one-half mile (Table 3.4-4). Percent composition is represented by the mean use for a species divided by the total use for all species and multiplied by 100. The vast majority of species were observed in less than 5 percent of the surveys. The most frequently observed raptor was northern harrier, seen in approximately 14 percent of all surveys (frequency of occurrence) but comprising only 1.3 percent of all bird observations based on use estimates (percent composition). In contrast, horned larks were observed during 78 percent of all surveys and comprised nearly 58 percent of all birds observed.

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[1] Fixed point surveys were conducted following the same methods at all four wind plants but had variable survey duration. The calculated use at these wind plants was standardized to 30-minute duration surveys under the assumption that raptor observations were uniform across time for each survey period.

[2] The fixed point survey area at the proposed Condon Wind Plant was approximately 2,000 feet, compared to 2625 feet for other surveys.

As a group, due primarily to the abundance of horned larks on the site, passerines comprised nearly 90 percent of all bird observations and were observed in more than 82 percent of all the surveys. Raptor use of the site as a group was relatively low with less than one raptor observed during each 30-minute survey and during approximately 42 percent of the surveys. Overall, based on the use estimates, raptors, as a group, comprised approximately 5.5 percent of all bird observations.

Raptor Nest Surveys. Two aerial surveys for raptor nests were completed within the RNA. The total RNA was approximately 235 square miles (Figure 3.4-1). A total of 107 raptor or large stick nests were located, 55 of which were classified as active nests during the first survey (Table 3.4-5). Nest density for buteos (ferruginous hawk, red-tailed hawk, Swainson's hawk) was approximately 0.11 nests per square mile. Nest density for all raptors located (buteos, falcons, owls) was approximately 0.16 nests per square mile. This index of raptor nest density falls within the range of other wind plants that have been studied. For example, the nest density in a 10-mile buffer surrounding the Foote Creek Rim Wind Plant, Wyoming, was 0.19 nest per square mile (Johnson et al., 2000a); nest density in a 10-mile buffer around the proposed Condon Wind Plant, Oregon, was 0.03 nest per square mile (URS et al., 2001); and nest density within a 2-mile buffer around the Stateline Wind Plant, Oregon and Washington, was 0.20 nest per square mile (URS and WEST, 2001).

TABLE 3.4-5
Raptor and Large Bird Nests Located in the Maiden Wind Farm Study Area, Including the Area in a 5-Mile Radius Buffer

Species	Number of Active Nests[1]	Number of Nests That Produced Young[2]	Total Young Observed (Young per Successful Nest)
Ferruginous hawk ***(F: SC; WA: T)***	4	2	3 (1.5)
Red-tailed hawk	14	9	16 (1.78)
Swainson's hawk	9	2	Unknown
Prairie falcon	8	3	8 (2.2)
Great-horned owl	2	Unknown	Unknown
Barn owl	1	1	1 (1.0)
Common raven	17	6	11
Inactive nests	52	NA	NA

Notes:
[1] Based on April 30-May 2, 2001, survey.
[2] Based on June 18-19, 2001, survey.
NA = not applicable

During the second raptor nest survey of the study area, two new active Swainson's hawk nests were located and two nests initially recorded as a common raven and great-horned owl were occupied by Swainson's hawks. The second survey was intended to gain as much information as possible about nest success from the active nests located during the first survey. Based on the second survey, five raptors—ferruginous hawk, red-tailed hawk, Swainson's hawk, prairie falcon, and barn owl—as well as common ravens, were confirmed producing or fledging chicks in the study area. Swainson's hawks generally nest later than other buteos and some of the Swainson's hawk nests in the study are had not produced

young by the second visit. While these nest success rates are based on relatively small sample sizes, they provide an estimate of approximate nest success rate (i.e., percent of nests that are successful by species) and a record of successful breeding by several raptor species in the study area. One ferruginous hawk nest site is located along the southern edge of the project approximately 0.25 mile from a proposed turbine string. This nest had a pair of ferruginous hawks present on May 2, 2001, when the initial raptor nest survey was conducted, but was empty during a ground recheck of the nest on May 23.

3.4.4 Impacts of the Proposed Action

3.4.4.1 Evaluation Criteria

Impacts to wildlife and special status species would be considered **high** (and significant) if project activities were to:

- Cause "take," as defined by the ESA (see Section 3.4.1), of a federally-listed endangered or threatened species (pygmy rabbit, bald eagle, middle Columbia steelhead, bull trout)
- Jeopardize the continued existence of any federal candidate species (western sage grouse, Mardon skipper)
- Jeopardize the continued existence of any state-listed endangered, threatened, or candidate species or result in trends that could cause their being proposed for listing as federally endangered or threatened
- Substantially exceed the level of mortality (based on post-construction monitoring) of individual avian or bat species observed at similar newer generation wind plants
- Substantially exceed the level of impact, such as mortality, displacement, and disturbance, to common wildlife species observed at similar newer generation wind plants.

Impacts to wildlife and special status species would be considered **moderate** if project activities were to:

- Cause an adverse effect to a federally-listed endangered or threatened species that can not be adequately mitigated
- Cause adverse effects to a federal candidate or species of concern or state-listed endangered or threatened species which caused a reduction in numbers but without resulting in a trend that could cause their being proposed for listing as federally-threatened or endangered
- Equal the level of mortality of individual avian or bat species observed at similar newer generation wind plants
- Equal the level of impact, such as mortality, displacement, and disturbance, to common wildlife species observed at similar newer generation wind plants
- Permanently interfere with the movement of any resident or migratory fish or wildlife species, including displacement and nesting interference.

Impacts to wildlife and special status species would be considered **low** if project activities were to:

- Cause effects to federally endangered or threatened species which could be completely mitigated
- Cause effects to a federal candidate or species of concern or a state-listed or candidate species which do not contribute or result in trends toward federal listing
- Result in a lower level of mortality to individual avian and bat species than observed at similar newer generation wind plants
- Result in a lower level of impact, such as mortality, displacement, and disturbance, to common wildlife species than observed at similar newer generation wind plants
- Temporarily interfere with the movement of any resident or migratory fish or wildlife species, including displacement and nesting interference.

3.4.4.2 Construction Impacts

As discussed in the following sections, direct impacts to wildlife from construction activities could include loss or destruction of habitat and mortality or injury from collisions with vehicles or construction equipment. Indirect impacts could include disturbance or displacement to resident or nesting avian species from increased traffic, noise, and activity in the study area.

Loss of Habitat.
Approximately 414 acres of native habitat would be temporarily removed or damaged during project construction. Because these areas would be revegetated with native seed mixtures, they could eventually provide wildlife habitat again. See Section 3.3, Vegetation, for more detailed discussion on impacts to habitats.

Special Status Species.
The amount of disturbance to special status species would depend on the construction season(s), methods, duration, and the occurrence of species in the study area. The majority of these species are not expected to occur in the study area with regularity. Overall, disturbance or displacement impacts are expected to be low and would potentially affect only a few species and individuals documented and likely breeding on site.

The following listed or candidate species may occur in the study area during part of the year and have the potential to be affected by construction of the proposed project.

Ferruginous Hawk (Federal Species of Concern; State Threatened). Ferruginous hawks are breeding residents of the study area. They have been observed during surveys, and four active nests were located within 5 miles of the project site during 2001. One nest was located within 0.25 mile of a proposed turbine string. Project construction could affect breeding ferruginous hawks through disturbance of nesting habitat if construction were to occur near an active nest. Without mitigation, this could result in a moderate impact.

Loggerhead Shrike (Federal Species of Concern, State Candidate), sage thrasher, sage sparrow (State Candidates). These species are likely breeding residents in the study area. They were observed during the spring and summer and are expected to breed in big sagebrush stands.

Potential construction impacts to these species are considered low because minimal construction would occur in big sagebrush stands (nesting habitat), which are generally located in the valleys and off of the primary ridgelines.

Bald Eagle (Federal and State Threatened). Based on available information, bald eagles are possible rare migrants in the study area but have not been documented and are not expected to occur on a regular basis. However, results of winter surveys when the bald eagle would be most likely to occur in the study area are not yet complete. Construction of the project would not be likely to impact bald eagles because of their lack of presence in the study area. Impacts to bald eagle would be low.

Peregrine Falcon (Federal Species of Concern; State Endangered). Peregrine falcons are rare migrants through the study area. Two individuals were observed in the study area during a fixed point survey on September 30, 2001. However, they have not been documented on the nearby ALE and are not expected to occur in the study area on a regular basis. Construction would have little to no affect on peregrine falcons; therefore, impacts would be low.

Golden Eagle (State Candidate). Golden eagles are rare migrants and possible winter residents in the study area. One golden eagle was observed in the study area during fixed point surveys in the fall 2001. They have also been documented on the nearby ALE during the winter in low numbers. They are not expected to occur in the study area on a regular basis. Construction activities would have little to no effect on golden eagles; therefore, impacts would be low.

Merlin (State Candidate). A single merlin was observed in the study area in April 2001, and was likely a migrant. Merlins are considered an uncommon migrant and winter resident on the ALE, and occupy riparian areas or migrate along Rattlesnake Ridge (LaFramboise and LaFramboise, 1999). There is no suitable nesting habitat in the study area and they are considered a rare migrant and/or unlikely winter resident. Impacts from construction of the proposed project would be low.

Fish.

Based on available information, no fish occur in the study area; therefore, no impacts to fish would occur. Implementation of best management practices and compliance with applicable permits regarding runoff and sediment control would avoid impacts to downstream fish from construction of the project.

Bats.

Impacts to bats or bat habitat on the site are unlikely during construction. There is little bat habitat in the form of food sources, water, or roost sites where construction would occur; therefore, potential impacts to bats would be low.

Big Game.

Elk and mule deer could potentially be affected by project construction. Impacts to big game would include loss of habitat and potential displacement. The elk and mule deer that use the site primarily occupy the grassland-/shrub-steppe habitats, springs, and riparian corridors. These species also graze in the agricultural areas in the eastern portion of the study area. Temporary loss of big game habitats from project construction would be approximately 114 acres. This impact would be considered low because over time, temporarily disturbed areas could recover and provide big game habitat.

During the construction period, elk and mule deer would likely be displaced from the project site due to the influx of humans and heavy construction equipment and associated disturbance. Individuals of these species would likely seek more remote areas with less disturbance, such as the ALE. Construction-related disturbance and displacement would be expected to be temporary, resulting in a low impact.

Reptiles and Amphibians.
Construction activities could affect reptiles on the project site through loss of habitat and direct mortality of individuals located in construction zones. Reptiles documented in the study area occupy the grassland-/shrub-steppe habitats. The level of mortality to reptiles would be based on the abundance of species on the project site. Some mortality is expected because common reptiles such as short-horned lizards and yellow-bellied racers often retreat to burrows underground for cover or during periods of winter dormancy. Excavation for turbine pads, roads, or other facilities could kill individuals in underground burrows. While aboveground, yellow-bellied racers and other snakes are likely mobile enough to escape construction equipment; however, short-horned lizards do not move fast over long distances and rely heavily on camouflage for predator avoidance. Some individual lizard fatalities would be expected from vehicle activity, resulting in a low impact. Reptile and amphibian mortality has not been specifically studied at other facilities, but is assumed to be low based on informal observations.

Birds.
Construction of the proposed project could affect birds through loss of habitat, potential fatalities from construction equipment, and disturbance or displacement from construction and human occupation of the area. Bird mortality from construction equipment would be expected to be quite low because equipment generally moves at slow rates and is stationary for long periods. The risk of mortality due to construction activities would likely be limited to destruction of a nest with eggs or young for ground and shrub nesting species. Disturbance impacts would be expected to occur if construction activity occurred near an active nest or primary foraging area. Birds displaced from these areas could move to areas with less disturbance; however, displacement would be temporary and therefore result in a low impact. Breeding effort could also be disturbed and foraging opportunities altered during the construction period; however, these impacts would be temporary, resulting in a low impact.

***Raptor Nests*.** Based on the current project design, no raptor nests would be directly impacted by the proposed project. There were five inactive nests and three active nests located within 1 mile of the proposed project facilities. The active nests were a red-tailed hawk nest on an existing BPA transmission line tower, a ferruginous hawk nest in a small tree in the riparian corridor below Maiden Spring, and a prairie falcon nest in a rocky cliff face in the westernmost portion of the project. There was also an active common raven nest on the microwave tower on Rattlesnake Ridge. All three of the active raptor nests are within ¼ mile of proposed project facilities (e.g., turbines, substations) and could be subject to indirect (disturbance-related) impact if they were active during the construction period. With the exception of impacts to the ferruginous hawk nest (see discussion above), this would be considered a low impact.

Mitigation

As discussed in Section 3.3, Vegetation, prior to the start of construction, a Site Management Plan Team (SMPT) would be convened to prepare a Site Management Plan (SMP). In addition to provisions discussed in Section 3.3, the SMP would include provisions for:

- Placement of towers the minimum distance from raptor nesting sites according to WDFW Management Plan criteria
- Maintaining reasonable driving speeds so as not to harass or accidentally strike wildlife
- Methods of delineation and marking (i.e., fencing, taping flagging) off-limit areas such as sensitive plant communities and raptor nest sites
- Mapping, marking, and including in the off-limit areas any new nesting, denning, or otherwise sensitive wildlife sites located during construction
- Seasonal timing of construction to avoid, as best practicable, the courting, nesting, and breeding season of sensitive avi-fauna
- Laying out a complete site plan for the SMP (fenced, flagged, taped with use areas designated) on the ground prior to the start of construction of any phase of the project.

As discussed in 3.3, Vegetation, an SMP monitor would be at the project site daily during construction activities to ensure adherence to the provisions of the SMP and keep a daily record of activities, decisions, etc. relating to that objective.

Results of the baseline avian surveys would be used to help with final project design, turbine siting, and mitigation planning via the SMP.

The ferruginous hawk nest near the project site would be monitored by a wildlife biologist prior to construction to determine occupancy and the need for possible timing restrictions for construction in the vicinity of the nests. If the ferruginous hawk nest is active, a buffer of at least 0.6 miles as recommended by the Washington State Recovery Plan for Ferruginous Hawk (Richardson, 1996), would be established around the nest where no construction activity would occur until the nest was no longer active. This area would be flagged as off-limits to disturbance by construction personnel.

If other raptor nests are found to be active during the construction period, a no-disturbance buffer of 1,000 feet would be marked and maintained until the nest was no longer active.

Big sagebrush stands near construction areas that are suitable for nesting by loggerhead shrikes, sage thrashers, and sage sparrows would be flagged and designated as no disturbance zones. These areas would be flagged as off-limits to disturbance by construction personnel.

3.4.4.3 Operation Impacts

Loss of Habitat.

Approximately 128 acres of native habitat would be permanently removed for project facilities. This area may currently support wildlife by providing food, cover, or space for a variety of species. See Section 3.3, Vegetation, for more detailed discussion on impacts to wildlife habitats.

Special Status Species.
Several special status species have been recorded in the study area and these species are discussed individually below. Several of the breeding resident special status species on site typically occupy mature vegetation types such as shrub- and grassland-steppe and shrubland. The big sagebrush shrub-steppe where loggerhead shrikes, sage thrashers, and sage sparrows occur is located in depressional areas between ridges and off of the ridgetops. Permanent loss of these areas would be minimized by project design, which has most of the project facilities (e.g., turbines, adjacent access roads) located on the ridgetops.

Due to the rare nature of most special status species, it is difficult to quantitatively estimate risk factors or mortality estimates for these species. Table 3.4-6 summarizes risk factors and provides a qualitative estimate of risk of collision with turbines for special status species. Information from other wind plants where rare species have been documented as fatalities is also included in the table to illustrate susceptibility of species to collision and assist in estimating relative risks of collision for the proposed project.

Bald Eagle (Federal and State Threatened). Bald eagles are possible rare migrants or winter residents in the study area. No bald eagle fatalities have been documented at other wind plants (see Erickson et al., 2001). Because of their rare nature and habitat preferences, use estimates for bald eagles at other area wind plants are low. Bald eagle use estimates at the Foote Creek Rim Wind Plant, Wyoming, for spring, summer, and fall was 0.008 birds per 40-minute survey (Johnson et al., 2000a). During 5 years of carcass searches at Foote Creek Rim (69 turbines) no bald eagle casualties were located (Young et al., 2001). Operation of the proposed project would not be expected to cause bald eagle mortality due to their rare occurrence in the study area; therefore, impacts would be low.

Peregrine Falcon (Federal Species of Concern; State Endangered). Peregrine falcons are rare migrants through the study area but have a potential risk of collision with wind turbines. No peregrine falcon fatalities have been documented at other wind plants (see Erickson et al., 2001). Because of their rare nature, use estimates for peregrine falcons at other wind plants are very low. Operation of the proposed project would not be expected to cause peregrine falcon mortality due to their rare occurrence in the study area; therefore, impacts would be low.

Merlin (State Candidate). Merlins are considered an uncommon migrant and winter resident on the ALE, and one merlin was observed in the study area in April 2001. No merlin fatalities have been documented at other wind plants (see Erickson et al., 2001). Because of their rare nature, use estimates at other wind plants are very low. Operation of the proposed project would not be expected to cause merlin mortality due to their rare occurrence in the study area; therefore, impacts would be low.

Ferruginous Hawk (Federal Species of Concern; State Threatened). Ferruginous hawks are breeding residents of the study area. They were observed during surveys on the site and four active nests were located within 5 miles of the project site during 2001. Once the project is operational, ferruginous hawks may be at risk of collision with wind turbines. Ferruginous hawk use of the study area in spring, summer, and fall of 2001 was approximately 0.009 birds per 30-minute survey, much lower than 0.052 birds per 40-minute survey recorded at the Foote Creek Rim Wind Plant in Wyoming (Johnson et al., 2000a). A conservative comparison would assume a uniform distribution of observations over time

and thus approximately 0.04 birds/30 minutes on Foote Creek Rim. This estimate is greater than four times the spring-summer-fall use by ferruginous hawks in the Maiden Wind Farm study area. During three years of carcass searches at Foote Creek Rim (69 turbines) no ferruginous hawk casualties were located (Young et al., 2001); however, collision fatalities have been recorded at the Altamont and Tehachapi Pass Wind Plants in California (Erickson et al., 2001).

Despite higher use estimates at Foote Creek Rim, the closest known ferruginous hawk nest to the Foote Creek Rim wind plant was approximately 2.25 miles away. The presence of an active ferruginous nest in the Maiden Wind Farm study area may increase the risk of ferruginous hawks colliding with turbines. However, due to the low use estimate for ferruginous hawks in the study area, the project would not be expected to cause large numbers of ferruginous hawk deaths. Expected mortality of ferruginous hawks could be as high as one per year, which would be considered a moderate to high (significant) impact.

Golden Eagle (State Candidate). Golden eagles are rare migrants and winter residents in the study area and may be at risk of collision with wind turbines. Golden eagle mortalities have been documented at other wind plants and were common mortalities at the Altamont Pass Wind Plant in California (Erickson et al., 2001). However, due to their rare nature in the study area, the use estimate for golden eagles is very low and the project is not expected to cause eagle deaths at levels experienced at other plants. Expected mortality of golden eagle could be as high as one per year, which would be a low impact.

Loggerhead Shrike (Federal Species of Concern, State Candidate), sage thrasher, sage sparrow (State Candidates). These species are likely breeding residents in the study area. They have been observed during the spring and summer and are expected to breed in big sagebrush stands. Once the project is operational, these species would be at risk of collision with wind turbines due to their occurrence in the study area. A single loggerhead shrike casualty was documented at the Tehachapi Pass Wind Plant in California (Erickson et al., 2001), a single sage thrasher casualty was found at the Foote Creek Rim Wind Plant in Wyoming (Young et al., 2001), but no sage sparrow casualties are known from wind plants (see Erickson et al., 2001). Use estimates for these species at the Maiden Wind Farm project site (based on the spring and summer surveys) are relatively low (see Young et al., 2002). The proposed wind turbines are generally located on ridgelines where soils are shallower and support fewer smaller shrubs. These species tend to occupy big sagebrush stands located between ridges, in depressions, and on the flats south of the main ridgeline where soils are deeper. Turbine placement on the ridge tops minimizes the risk of collisions; and therefore, expected mortality impacts from operation of the project would be low.

TABLE 3.4-6
Collision Risk Factors for Special Status Avian Species Known or Potentially Occurring in the Study Area

Species/ Federal and State Status	Risk Factors: Behavioral and Environmental Factors	Risk Factors: Abundance and Distribution Factors Based on Field Studies and Existing Information	Generalized Level of Risk (Impact Level)
Sandhill crane WA: E	Diurnal migrant typically soars at high altitude; may use thermals to gain elevation above Rattlesnake Ridge; flight elevations may include rotor swept area	Not observed in study area; reported as flyover on ALE; low abundance at Buffalo Ridge and Foote Creek Rim wind plants and no fatalities observed	Level of risk unknown but likely to be low because of low use of the area (low impact)
Peregrine falcon F: SoC WA: E	Uses open habitats usually near water and shorebird/waterfowl habitat; nests on cliffs; flight heights include rotor swept area; prey densities in study area very low	Observed in study area in fall; no records from nearby ALE; considered a very rare migrant or transient; no fatalities known from other wind plants	Level of risk very low (low impact)
Bald eagle F: T WA: T	Feeds on carrion, fish, waterfowl in winter; wintering habitat along Columbia River; flight heights could include the rotor swept area	Not observed in study area, rare migration and winter occurrence on ALE; low abundance at Foote Creek Rim wind plant and no fatalities observed	Level of risk very low due to expected rare occurrence (low impact)
Ferruginous hawk F: SoC WA: T	Grassland and shrub-steppe species; hunts small/medium mammals, birds, reptiles in open country; flight heights include rotor swept area	Nesting resident in study area; migrants also likely pass through in spring and fall; common at Foote Creek Rim wind plant but no fatalities observed during two year study	Level of risk considered low due to low use of the site; however, risk may be high due to presence of nest in study area (moderate to high impact)
Sage grouse F: C WA: T	Sagebrush obligate species; feeds on insects and vegetation; populations declining over the West due to habitat degradation; usually on the ground, but occasionally fly within rotor height	Historic observations from study area; suitable habitat is present; recent winter records from ALE; densities low at Foote Creek Rim wind plant, but no fatalities observed during two year study	Risk considered very low due to rare occurrence in area; risk may be greater in winter (low impact)
Northern goshawk WA: C	Forest-dwelling species, migrant or transient through non-forested areas; would most likely be found in tree patches and/or brush in canyons; flight heights include rotor swept area	Not observed in study area; rare migration and winter occurrence on ALE; no fatalities known from other wind plants	Level of risk very low (low impact)
Golden eagle WA: C	Grassland and shrub-steppe species, nesting in trees or cliffs, hunts small/ medium mammals, birds, reptiles; flight heights include rotor swept area	One observed in study area in fall; migration and winter records from ALE; fatalities at wind plants in California (primarily Altamont); common on Foote Creek Rim wind plant but no fatalities observed during two year study	Level of risk considered low due to rare occurrence; risk may be greater in winter (low impact)

TABLE 3.4-6
Collision Risk Factors for Special Status Avian Species Known or Potentially Occurring in the Study Area

Species/ Federal and State Status	Risk Factors: Behavioral and Environmental Factors	Risk Factors: Abundance and Distribution Factors Based on Field Studies and Existing Information	Generalized Level of Risk (Impact Level)
Merlin WA: C	Uses variety of open and wooded habitats, nests in cliffs or tree cavities, feeds on small birds and mammals; may be attracted to large numbers of wintering horned larks or other prey species; flight heights include rotor swept area	One observation from study area; rare migrant or winter resident on ALE; no fatalities known from other wind plants	Level of risk considered low due to rare occurrence (low impact)
Burrowing owl F: SoC WA: C	Nests in old badger holes in grassland and shrub-steppe habitats; forages on insects and small vertebrates; foraging and migrant at heights that would be within rotor swept area	Not observed in study area; breeding records from ALE; migrants may also pass through area; numerous fatalities have been recorded at a California wind farm during recent study	Level of risk considered low due to rare occurrence (low impact)
Vaux's swift WA: C	Nests in hollow trees and chimneys; typically occurs in western and northern Washington; flight heights probably include rotor swept area	Not observed in study area; very rare migrant on ALE; no fatalities known from other wind plants	Level of risk extremely low (low impact)
Lewis woodpecker WA: C	Nests in tree cavities in woodlands, typically with openings and patchy trees; flight heights unlikely but may include rotor swept area	Not observed in study area; rare migrant on ALE; transients or migrants may occasionally pass through study area; one fatality documented from Vansycle wind plant	Level of risk very low due to rare occurrence (low impact)
Loggerhead shrike F: SoC WA: C	Nests in big sagebrush shrublands or areas with scattered trees in shrub-steppe and grassland habitats; hunts insects and small vertebrates; migrates to winter range in southern U.S.; flight typically below rotor height; migration flights may include rotor swept area	Observed in study area in low numbers; likely a breeding resident and migrant through study area; one fatality known from Tehachapi Pass wind plant	Level of risk is believed low due to low numbers; risk may be greater during migration periods (low impact)
Sage thrasher WA: C	Nests in sagebrush steppe of relatively high quality; migrates to winter range in southern U.S.; flight typically below rotor height; migration flights may include rotor swept area	Observed in study area in low numbers; likely a breeding resident and migrant through study area; one fatality documented at Foote Creek Rim wind plant during two year study	Level of risk is believed low due to low numbers; risk may be greater during migration periods (low impact)
Sage sparrow WA: C	Nests in sagebrush steppe of relatively high quality; migrates to winter range in southern U.S. and Mexico; flight typically below rotor height; migration flights may include rotor swept area	Observed just south of study area in big sagebrush stands; likely breeding resident; no fatalities known from other wind plants	Level of risk is believed low due to low numbers; risk may be greater during migration periods (low impact)

Codes: F = Federal; WA = Washington; E = Endangered; T = Threatened; C = Candidates; SoC = Species of concern (Federal)

Avian Mortality.
Bird casualties due to collisions with turbines have been documented through mortality studies at wind plants across the country (Erickson et al., 2001). Measured use of the site by avian species and mortality estimates from other existing wind plants were used to predict potential mortality of birds for the proposed project. For example, use of the study area by raptors is relatively low compared to other wind plants, and mortality estimates of raptors from other "newer generation" wind plants are also relatively low (e.g., less than 0.04 raptors per turbine per year at the Foote Creek Rim Wind Plant in Wyoming and less than 0.01 raptors per turbine per year at the Buffalo Ridge Wind Plant in Minnesota). Therefore, mortality estimates for raptors from the proposed project are expected to be very low.

Several elements of the project design would help reduce the potential for impacts to birds. Siting the project in an area with low bird use is a fundamental way of reducing avian impacts. In addition, the newer generation wind turbines have rotors that make one revolution approximately every 3 to 4 seconds, which increases the blade visibility to birds compared to older faster-moving turbine models. Newer turbine models also use tubular towers to reduce or eliminate perching opportunities, compared to lattice towers used on older models. Power lines between turbines would be located underground, further reducing perching opportunities and minimizing electrocution risks. Exceptions to this would be the aboveground transitions between turbine strings and the possible 4-mile transmission line.

Raptors. Raptor mortality at "newer generation" wind plants is very low. For example, the estimate of raptor mortality at the Foote Creek Rim Wind Plant is the highest observed and is 0.036 raptors per turbine per year based on a 2-year study of 69 turbines (Erickson et al. 2001). No raptor mortality was observed at the Vansycle Wind Plant in Oregon during a one-year study of 28 turbines, and 0.001 raptors per turbine per year were found at the Buffalo Ridge Wind Plant during a 4-year study of 350 turbines (Erickson et al., 2001).

Considering these mortality results, as well as raptor use estimates at these wind plants (see Avian Use in Section 3.4.3.6), it is estimated that potential mortality of raptors would be less than one-half that of the Foote Creek Rim Wind Plant (or less than 0.016 raptor per turbine per year); approximately two-thirds that of the Buffalo Ridge Wind Plant (or less than 0.0007 raptor per turbine per year); or approximately equal to that of the Vansycle Wind Plant (or zero raptors per turbine per year). Using these raptor mortality rates, a range of zero to nine raptor fatalities per year at the Maiden Wind Farm would be expected for the full project, which represents a low impact (if no raptors were killed) to moderate impact (if up to nine raptors were killed.

Passerines. Small birds with the highest use index of the study area were horned larks, western meadowlarks, vesper sparrows, and grasshopper sparrows. Horned larks were by far the most abundant and are also a common casualty located at other wind plants. At the Foote Creek Rim Wind Plant, 28 horned lark fatalities were found over a 2-year study of 69 turbines, which amounted to 14 percent of all observed bird fatalities. Use estimates for horned larks at Foote Creek Rim were slightly less than the proposed project. Western meadowlarks and vesper sparrows have also been documented casualties at several wind plants. Based on this information, casualties for these species would be expected at the project site.

Based on post-construction mortality monitoring at other newer generation wind plants, passerine mortality has been somewhat variable. Projected impacts for the proposed project are primarily based on data collected at the Vansycle Wind Plant (Erickson et al., 2000), the Foote Creek Rim Wind Plant (Young et al, 2001), and the Buffalo Ridge Wind Plant (Johnson et al., 2000b) where fatality estimates have been made for all birds, including passerines, and adjusted for scavenging and searcher efficiency.

An extensive post-construction study of two wind plants on Buffalo Ridge in Minnesota with 350 total turbines was conducted from 1996 through 1999. Total annual mortality was estimated to average approximately 2.8 birds per turbine. Most of the mortality documented involved nocturnal migrant passerines (Johnson et al., 2000b). Based on a 2-year study at Foote Creek Rim, the total annual mortality associated with 69 turbines was estimated to be approximately 1.7 birds per turbine per year and for five met towers was estimated at 7.5 birds per tower per year. Many of the fatalities at this location were also believed to be nocturnal migrant passerines (Young et al., 2001). At the Vansycle Wind Project, only 12 avian fatalities were located during the first year of operation of 38 turbines. The casualties were comprised of at least six species, and most (58 percent) were passerines. Total estimated mortality was 24 birds per year or approximately 0.6 bird per turbine per year (Erickson et al., 2000).

If these estimates are applied to the proposed project, the range of potential bird mortality would be expected to fall between approximately 360 and 1565 birds per year if all 549 turbines and four met towers were constructed. Based on the regional Vansycle Wind Plant estimate, the actual mortality at the Maiden Wind Farm would be expected to be closer to the low end of this scale. Actual levels of mortality that would result from the proposed project are unknown and could be higher or lower depending on migratory patterns and patterns of movements through the area. The expected per turbine mortality rate for all birds for the proposed project is expected to be between 0.6 and 2.8 birds per turbine per year. The per met tower mortality rate would be expected to be between 7 and 8 birds per tower per year. These would be low impacts unless post-construction monitoring studies indicate higher mortality rates.

Displacement.

Displacement effects related to wind turbine operation have not been evaluated in detail in the United States; however, several studies in Europe have addressed this issue. In the U.S. a single study at the Buffalo Ridge Wind Plant indicates there may be some localized displacement of passerines away from turbines. Avian abundance adjacent to turbines in Buffalo Ridge was only 25 percent that of areas sampled at 590 feet from turbines (Leddy, 1996; Leddy et al., 1999). Further work in Minnesota also documented significantly lower avian abundance near areas where turbines are present (Johnson et al., 2000b).

In European studies, many groups of birds, including waterfowl, shorebirds, waders, and passerines, have shown displacement effects ranging from 820 feet to as far as 2,624 feet from turbines (Peterson and Nohr, 1989; Pederson and Poulsen, 1991; Vauk, 1990; Winkelman, 1989; Winkelman, 1990; Winkelman, 1992). Reductions in use of up to 95 percent near turbines have been recorded (Winkelman, 1994). Disturbance to breeding birds appears negligible and was documented during only one study (Pedersen and Poulsen, 1991). Most disturbance has involved feeding, resting, and migrating birds (Crockford, 1992). Based on the available information, it is probable that some displacement

effects may occur to the grassland/shrub-steppe avian species occupying the study area. The extent of these effects and their significance is unknown and hard to predict but could range from none to several hundred feet, resulting in low to moderate impacts.

Raptor Nests. Operation of the proposed project would not affect raptor nests unless there were displacement effects that caused raptors to not return to the nests close to the project site. Impacts would be low.

Bats.

Bat research at other wind plants indicates that migratory bat species are at risk of collision with wind turbines, most likely during migration. It is likely that some bat fatalities would occur in the proposed project site. Both hoary bats and silver-haired bats, two common fatalities at other wind plants, have been recorded on the nearby ALE and are expected to migrate through the study area.

At the Buffalo Ridge Wind Plant, based on a 2-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 Plant, based on 2 years of study, bat mortality was estimated at 1.51 bats per turbine per year (Young et al., 2001). At the Vansycle Ridge Wind Plant in Oregon, bat mortality was estimated at 0.74 bats per turbine for the first year of operation (Erickson et al., 2000). Most bat fatalities found at wind plants have been tree-dwelling bats, with hoary and silver-haired bats being the most prevalent fatalities.

Although potential future mortality of migratory bats is difficult to predict, an estimate can be calculated based on levels of mortality documented at other wind plants. Estimates have ranged from 0.74 to 2.05 bats per turbine per year; however, it may be most appropriate to estimate bat mortality by comparing the proposed project to the Vansycle Wind Plant in Oregon due to similarity of habitat in the same physiographic province. The 1999 per turbine annual estimate at this wind plant was 0.74 bats per turbine. Using this estimate, full build-out of the proposed project could result in approximately 400 bat fatalities per year. The significance of this impact is hard to predict since there is very little information available regarding bat populations. However, there are no federal or state endangered or threatened bats that would potentially be affected by the project; therefore, impacts would be considered low. Actual levels of mortality that could result from the project are unknown and could be higher or lower depending on migratory patterns of bats, patterns of movement through the area, and the response of bats to turbines, individually and collectively.

Big Game.

There is little information regarding wind plant effects on big game species. The Foote Creek Rim Wind Plant in Wyoming appeared to have no effect on pronghorn (*Antilocapra americana*) (Johnson et al., 2000a). Pronghorn occurred in the area in low numbers and continued to use the area following construction of that project.

The primary disturbances to big game associated with operation and maintenance of the proposed project would be vehicle traffic. While activities on site may periodically displace elk and mule deer, it is expected that they would return to the site. The level of use could be lower during the first few years of operation; however, it is likely that over the long-term, particularly since the Rattlesnake elk herd population is growing, elk and deer would

become accustomed to the project facilities and would use areas in and around the facilities. Therefore, impacts would be expected to be low over the long-term.

Reptiles and Amphibians.
Once operational, the project would not substantially impact reptiles. Operation and maintenance activities could occasionally result in a road killed snake or lizard; however, this would be a rare occurrence due to the limited nature of traffic expected. Impacts would be negligible.

Mitigation
The following mitigation measures would be implemented to reduce impacts to special status species and other wildlife from operation of the project. See Section 3.3, Vegetation, for mitigation of wildlife habitat.

- Ferruginous hawk nesting opportunities as identified by the Washington State Recovery Plan for Ferruginous Hawk would be constructed or created in areas of native habitat more than 5 miles away from the proposed project and any other proposed wind plants in the area. For each nest impacted by the project (closer than 0.6 mile to construction areas), at least three nesting opportunities would be created, monitored, and maintained for a minimum of a 5-year period. The location, type of nesting opportunities, and monitoring program would be approved by the WDFW.
- Long-term impacts of wind turbines on other raptor nesting/foraging areas would be mitigated by: 1) avoiding placement of any facilities within 0.6 mile of any nest; or 2) placing additional nesting structures (three per existing nest within 0.6 mile of wind turbines) in suitable nesting areas at least 1 mile away from any wind turbines.
- Raptor anti-perching devices would be installed on all new overhead power line poles within 1 mile of turbine strings to limit potential ferruginous hawk, peregrine falcon, merlin, bald eagle, golden eagle, and other raptor use near the turbines. All power lines would be constructed following *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996* (APLIC, 1996); specifically, conductors would be spaced as recommended by the study to minimize the potential for bird electrocution.
- A post-construction monitoring program would be developed in coordination with the SMPT. The program would monitor avian use of the site and avian and bat mortality using standardized carcass searches, and scavenging and searcher efficiency trials during the first year of operation of the project.
- Other mitigation may be implemented if identified through Section 7 consultation with the USFWS.

3.4.4.4 Decommissioning Impacts

Impacts from decommissioning the proposed project would be lower than those for construction, assuming that all access roads remain in place. Vehicles would travel on established roadways which would not impact habitat for special status species. If the landowners requested that access roads be removed, short-term impacts would be similar to those for construction, though more land would be restored to potential wildlife habitat in the long-term. 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. Mitigation for impacts to wildlife would follow procedures in use at the time of decommissioning.

3.4.5 Impacts of the No Action Alternative

Under the No Action Alternative, there would be no potential impacts to wildlife, particularly birds, or to threatened and endangered species from construction and operation of the proposed project. It is likely that other power generation facilities would be constructed and operated in the region, most likely a gas-fired CT. The construction of a gas-fired turbine generator, the development and extraction of natural gas, and the construction of gas pipelines to provide fuel to the generating facility could create impacts to wildlife and threatened and endangered species. The significance of such impacts would depend on the location and design of the facility, and would need to be evaluated in coordination with the USFWS and local wildlife agencies.

3.5 Visual Resources

3.5.1 Regulatory Framework

There is no regulatory framework for visual resources. According to Yakima County Plan 2015 and the *Benton County Comprehensive Land Use Plan*, there are no designated scenic areas, routes, or important vistas that would be within the line of sight of the proposed project. While each county has general policies regarding the importance of protecting visual resources, none are specific to wind farm development or to the Rattlesnake Hills. Specific zoning ordinance requirements regarding wind turbines are provided in the regulatory framework section of Section 3.2, Land Use and Recreation.

3.5.2 Study Methodology

The visual resources study area includes an approximate 20-mile radius around the project site. Areas of population concentrations with direct lines of sight to the project site include the cities of Sunnyside, Granger, Grandview, and Prosser. In addition, some roadways to the north and west also provide views of the project site.

Research involved review of topographic maps, aerial photographs, and road maps. Site visits were conducted to obtain an overview of the project vicinity and to make an initial determination of the areas where the project facilities would be most visible by the largest numbers of people. Six locations were selected from which the project would be seen by the general population. Viewpoints such as residences, travel routes, and public areas were chosen. At each location, a photograph was taken with a 35-millimeter (mm) camera to capture the existing view from that location. Visual impacts that would result from the project were evaluated by assessing the visual quality of the study area, viewer sensitivity, and the visibility of wind turbines and other project facilities from sensitive viewpoints.

Computer modeling and rendering techniques were used to simulate what the proposed project would look like from where the photographs were taken. The wind turbines modeled in the visual simulations are based on full build-out of the proposed project using the maximum number of turbines (549 900-kilowatt [kW] turbines) at a height of 355 feet

(with one rotor in the vertical position) and assuming the turbines would be an off-white color. Photographs used for modeling were taken on a clear, sunny day.

While the simulations shown in this section may not be a completely accurate representation of the final project, they provide a concept of the maximum visual impact that would likely occur. Although the project developer is considering using turbines as high as 390 feet (for a 2,000-kW output turbine), full build-out of a 494-megawatt [MW] project using these turbines would require only 247 wind turbines instead of 549 turbines, a significant reduction in the density of turbines. Therefore, the visual simulations provide a "worst case" depiction of the proposed project.

3.5.3 Affected Environment

The visual setting consists of a large, irrigated valley containing a variety of crops (such as apples, pears, grapes, and cherries), rural residences, and the nearby communities of Sunnyside, Granger, Grandview, and Prosser, all located 10 or more miles south of the project site. The Rattlesnake Hills dominate and define the northern portion of the valley and the Horse Heaven Hills dominate and define the southern portion of the valley. On the project site, vegetation consists of rangeland and wheat crops. There are several existing radio towers along the ridgeline of the Rattlesnake Hills, and two BPA transmission lines transect the western portion of the project site. A third BPA line is located just west of the study area. The existing visual quality of the study area is considered moderate to high due to the unique features of the Rattlesnake Hills and the vast expanse of undeveloped area.

3.5.4 Impacts of the Proposed Action

3.5.4.1 Evaluation Criteria

- Impacts would be considered **high** (and significant) if the existing visual character or quality of the site and its surroundings were substantially altered, if light or glare substantially affected day or nighttime views, or if sensitive viewers such as residents and recreationists viewed the proposed project frequently and for long periods of time.
- Impacts would be considered **moderate** if viewers considered to have low sensitivity (such as travelers or commuters on local roadways) viewed the proposed project for moderate periods of time, regardless of the frequency, while engaged in other activities such as working or driving.
- Impacts would be considered **low** if small numbers of people viewed the proposed project for short periods of time, regardless of the frequency.

In applying these criteria to the impact analysis, a variety of factors were considered, including the extent of project visibility from residential areas and roadways, the degree to which the various project facilities would contrast with or be integrated into the existing landscape, the extent of change in the landscape's composition and character, and the number and sensitivity of viewers.

3.5.4.2 Construction Impacts

Visual impacts resulting from construction activities would be limited to the sight of vehicles and equipment used in project construction, and dust from construction activities.

The views of large numbers of construction vehicles or of dust would be episodic rather than constant and most viewers would be 10 or more miles away so that construction vehicles may not be visible. Impacts would be distributed over a large rural area with low-density population. These impacts would be temporary (up to 9 months) and are considered low.

Mitigation.
To minimize visual impacts, vehicles and equipment would be kept on the site and would not be parked near residential or public access areas. Equipment and supplies would be stored out of sight (if practical), and unusable equipment would be removed. Watering activities to control dust would reduce most visual impacts generated by project construction.

3.5.4.3 Operation Impacts

Changes in the appearance of the study area would result from the wind turbines along the ridgeline and down the slopes of the Rattlesnake Hills. The wind turbines would be a maximum of 390 feet high, measured with one rotor in the vertical position. Other facilities that would be less visible due to their smaller size are the potential transmission line towers, overhead conductors between turbine strings, one or two substations, up to three operation and maintenance buildings, and various new access roads. The wind turbines would look similar to the turbines shown in Figures 2.1-3 and 2.1-4.

The perceived dominance of the turbines upon the landscape would vary during the time of day, time of year, and weather conditions, depending upon the angle of the sunlight striking the turbines. During times of the day and year when the angle of the sun is lower, sunlight striking at a lower angle on the side of the turbines would tend to make them more visible and more prominent than when the sun is more directly overhead. Depending on the time of day and weather conditions, the turbines would likely be visible to anyone who can currently see the top of the Rattlesnake Hills.

Some of the turbines would be furnished with lights at the top of the nacelle for aircraft safety. The number of wind turbines with lights and the type of lighting would be determined in consultation with the Federal Aviation Administration (FAA). For the Stateline Wind Project in eastern Washington and Oregon, the FAA required white flashing lights in the daytime and red flashing lights at night. Lights were required to be placed every thousand feet and at the ends of turbine strings. Applying the same requirement to the proposed project results in the potential for 125 to 175 lights if the full project were to be constructed. Although these lights are meant to be visible from aircraft and less visible from ground level, the presence of these lights could create a substantial change in views from residential areas and roadways, even considering the low number of viewers and the distance from which the project would be viewed. Visual impacts due to light and glare at night would be considered low to high, and unavoidable.

In the eastern portion of the study area, five residences would have foreground views of the wind turbines. Two residences belong to landowners who would financially benefit from the project through wind lease payments; therefore, while the visual impact to these residents would be high, it is considered to be an insignificant impact. The three other

residences could perceive impacts to be high resulting from the change in visual landscape of adjacent properties. This would be a significant and unavoidable impact.

All other viewers would see the wind turbines from a distance of several miles, and impacts would range from low to high. Reactions to the location of turbines on the ridges constituting the middle and far distance views would likely vary. Some people may prefer the natural setting as it now exists, without the addition of the towers to the landscape. Others may find them to be an interesting and even aesthetic point of visual interest on the landscape. Potential impacts are discussed further in the following section.

Visual Impacts from Specific Locations.
Photographs were taken on a clear day from six locations where the wind turbines would be clearly visible and where the project would be seen by the general population. Figure 3.5-1 shows these locations and the direction from which the photograph was taken. Wind turbines were then superimposed on the photographs using software that allows the accurate placement and proportion of the turbines in the visual image.

The visual impact of project facilities would be considered low to nonexistent under two circumstances. The first is where the topography would preclude a view of the turbines because ridges higher than those on which turbines are located would block the viewpoint. For example, from the Hanford area along State Route 240, located east of the project site, Rattlesnake Mountain blocks views of the Rattlesnake Hills and the turbines would not be visible.

Secondly, in areas several miles away from the project site and of very low population density, few people would see the towers; therefore, visual impacts would be expected to be low in such locations. No attempt was made to analyze visual resources and impacts from the viewsheds of areas with limited or no population concentrations. For example, traveling east or west on State Route 240 north of the project site, the back of the Rattlesnake Hills can be seen from a very far distance. However, no developed areas or residences exist in the area and few travelers frequent this roadway. As a result, few people would see the project, and only from a long distance.

The visual simulations in Figures 3.5-2 through 3.5-7 show what the 494-MW project would look like at full build-out using 549 off-white turbines 355 feet in height. These simulations present a slightly exaggerated representation of the visibility of the turbines from the six viewpoints. The actual project likely would use fewer wind turbines of a slightly greater height, or shorter turbines.

Location 1: From State Route 241 at Van Belle Road. Figure 3.5-2 is a visual simulation showing how the wind turbines would appear from the intersection of State Route 241 and Van Belle Road looking northeast toward the project site. This viewpoint location provides the greatest number of potential viewers from a moderate distance compared to the other viewpoints selected for analysis. From this distance (approximately 6 miles), the turbines would be visible to residents and passing motorists. The project would likely have a moderate visual impact to motorists and workers in the area. Residents in the area would view the turbines frequently and for long periods of time from their homes and could perceive the visual character of the hillside to be substantially altered, both during the day

and at night. As seen in the visual simulation, the turbines would blend in with the colors of the hillside and sky background. However, visual impacts could be perceived as high by area residents, particularly at night.

Location 2: From Interstate 82 at State Route 223 in Granger. Figure 3.5-3 is a visual simulation showing how the wind turbines would appear from the intersection of Interstate 82 and State Route 223 in the community of Granger. Although a high number of viewers traveling on Interstate 82 would be able to see the wind turbines, they are difficult to discern from this distance (approximately 15 miles), and may not be visible at all during many times of the day and year. Passing motorists would be likely to perceive the project as having a low visual impact due to the distance from the project and the limited viewing time while driving on area roads. Residents living in the area where the photograph was taken would view the proposed project frequently and for long duration; however, when viewed from this distance, the wind turbines do not dominate the landscape or substantially alter the views. The wind turbines would be barely discernable in hazy and cloudy conditions. At nighttime, the flashing lights that would likely be required on some wind turbines would not dominate the landscape from this distance but would present a moderate change in the quality of views to the hills. Overall, impacts would likely be perceived as moderate by area residents.

Location 3: From West Grandview Avenue in Sunnyside. Figure 3.5-4 is a visual simulation showing how the wind turbines would appear from a hilly residential area in Sunnyside. From this distance (approximately 9 miles), the wind turbines would be visible to some residents depending on the orientation of their homes. Residents may perceive the visual character and views of the hillside to be substantially altered, both during the day and at night. As seen in the visual simulation, the wind turbines would blend in with the colors of the hillside and sky background; however, the proposed project could be perceived by these residents as having a high visual impact.

Location 4: From Gap Road at Hanks Road in Prosser. Figure 3.5-5 is a visual simulation showing how the wind turbines would appear from a rural area north of Prosser. The area north of Interstate 82 and Prosser is agricultural with scattered residences. Traffic on the roadways is light except at harvest times, and because there are some gently rolling hills on the roadways, views of the project site are intermittent. From this distance (approximately 9 miles), the wind turbines would be visible to some residents. Passing motorists would be likely to perceive the project as having a low visual impact due to the distance from the project and the limited viewing time while driving on area roads. Residents living in this area would view the proposed project frequently and for long duration; however, when viewed from this distance, the wind turbines do not dominate the landscape or substantially alter the views. The turbines would be barely discernable in hazy and cloudy conditions. At nighttime, flashing lights that would likely be required on some wind turbines would not dominate the landscape from this distance but would present a moderate change in the quality of views to the hills. Overall, impacts would likely be perceived as moderate by area residents.

Location 5: From Junction of State Routes 24 and 241. Figure 3.5-6 is a visual simulation showing how the wind turbines would appear from the north side of the Rattlesnake Hills. These roadways are very lightly traveled and there are only a few scattered residences in the

area. From this distance (approximately 5 miles), the wind turbines would be visible along the ridgetop and may appear prominent to the limited number of residents and motorists that would see the proposed project on a regular basis. The proposed project could be perceived by several residents as having a high visual impact, particularly at night. Overall, the visual impact likely would be considered moderate due to the distance from the hillside and the low number of viewers.

Location 6: From the Junction of Crooks Road and Rotha Road. Figure 3.5-7 is a visual simulation showing how the wind turbines would appear at close range (approximately 1,200 feet). This view is representative of what the proposed project would look like to residents on or adjacent to the project site. The wind turbines would dominate the landscape and substantially alter the surroundings during the day and at night. Residents in the area would have frequent views of long duration from their homes and may consider visual impacts to be high, particularly if they are not financially benefiting from the project.

Mitigation.
Among the FAA-approved lighting devices available, the developer would use those that are designed to be least visible from the ground level of the surrounding landscape.

3.5.4.4 Decommissioning

Upon decommissioning, the project facilities would be removed to below the ground surface. The landscape would no longer be impacted by the presence of wind turbines and other facilities. Visual impacts during decommissioning would be similar to those described for construction and would consist primarily of the sight of construction vehicles and dust and would be low.

3.5.5 Impacts of the No Action Alternative

Under the No Action Alternative, the visual quality of the study area and Rattlesnake Hills would not be influenced by development of the project. It is likely that alternative generation, most likely a gas-fired combustion turbine, would be developed in another location in the region. The visual 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, visual impacts could be minor.

3.6 Cultural Resources

3.6.1 Regulatory Framework

State and federal regulations require consideration of the proposed project's potential effects on historic and/or cultural resources (such as historic properties, Native American cultural resources, and archaeological sites).

The SEPA process requires that impacts to cultural resources be considered in weighing the proposed project's overall impact on the environment (as stipulated in WAC 197-11-960). The Washington State Historic Preservation Office (WASHPO) must be consulted when projects are subject to review under SEPA and/or Section 106 of the National Historic Preservation Act of 1966 (NHPA).

Similar to SEPA, the NHPA requires that all federal agencies consider the effect of their actions on historic properties. Requirements of Section 106 apply to any federal undertaking (action). WASHPO must be consulted to determine whether the site has been surveyed, whether historic resources have been identified onsite, and whether the property is listed or eligible for listing in the National Register of Historic Places (NRHP). If a project adversely affects property that meets NRHP criteria, then WASHPO and, as appropriate, interested tribes, would participate in finding acceptable ways to avoid or mitigate that adverse effect. Further, the Advisory Council on Historic Preservation (ACHP) must be afforded an opportunity to comment on the undertaking.

The ACHP published implementing regulations for Section 106 of the NHPA in 36 *Code of Federal Regulations* (CFR) 800. Federal agencies follow 36 CFR 800 to fulfill the cultural resource coordination and compliance process. These include step-by-step procedures for the entire coordination process (including steps for conducting consultations with Native American tribes), from initial identification of a resource, through its evaluation, and to final mitigation, if required. Table 3.6-1 shows the key applicable federal and state cultural resources requirements that apply to the proposed project.

TABLE 3.6-1
Federal and State Cultural Resources Requirements

Permit or Requirement	Agency/Statute and Regulation
Historic Preservation/ Landmark Review	National Historic Preservation Act, Section 106 (16 USC § 470 et seq.; 36 CFR §§ 60-63, 800); Historic Sites, Buildings, Objects, and Antiquities (16 USC § 469 et seq.; 36 CFR §§ 296.1; 43 CFR §§ 7.1 et seq.)
State Environmental Policy Act	WAC 197-11-960

Major categories of cultural resources include the following:

- **Historic Properties.** Historic properties are places eligible for inclusion in the NRHP. Historic properties eligible for inclusion in the NRHP can include districts, sites, buildings, structures, objects, and landscapes that are significant in American history,

prehistory, architecture, archaeology, engineering, and culture. Historic properties include so-called "traditional cultural properties." Historic properties must be given consideration under the National Environmental Policy Act (NEPA), the NHPA, and their state law counterparts. Section 101(d)(6)(A) of the NHPA allows properties of traditional religious and cultural importance to a tribe to be determined eligible for inclusion in the NRHP where they are associated with cultural practices or beliefs (traditions, beliefs, practices, lifeways, arts, crafts, and social institutions) of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community.

- **Native American Cultural Resources**. Native American cultural resources may include human skeletal remains, funerary items, sacred items, and objects of cultural patrimony. Native American cultural items must be given consideration under NEPA, NHPA, the Native American Graves Protection and Repatriation Act (NAGPRA) (if resources are in federal possession or located on federal lands), the American Indian Religious Freedom Act (AIRFA), and their state law counterparts.
- **Archaeological Sites**. Archaeological sites and other scientific data must be given consideration under NEPA, the Archaeological Resources Protection Act (ARPA), the Archaeological Data Preservation Act (ADPA), and to some extent under NHPA and NAGPRA and their state law counterparts.

BPA has initiated the Section 106 process and is coordinating with WASHPO, the ACHP, and the affected Native American tribes. BPA's proposed action to purchase and transmit the power generated by the project would require compliance with Section 106. BPA is responsible for consulting with the tribes in recognition that cultural resources are of importance to the Indian people whose ancestors used the land in prehistoric and historic times. The interests of the tribes include burial and sacred site protection and perpetuation of traditional hunting, fishing, and native plant gathering activities.

BPA hosts meetings that bring together BPA and tribal cultural resources technical staff. Since the inception of these meetings in January 2001, BPA and the project developer have attended several meetings to facilitate communication between BPA and the participating tribes and to foster opportunities for the tribes to participate in the cultural resources work tasks on a subcontract basis.

3.6.2 Study Methodology

The study area, designed to encompass all areas that could potentially be disturbed by construction and operation of the project, included all land within 50 feet of proposed temporary and permanent facilities. In most cases, the survey corridors were 150 feet wide, although in many areas several project facilities located together resulted in a wider survey area.

Archaeological investigation of the potential wind turbine strings, access roads, and other facilities was conducted in July, August, and September 2001 in collaboration with representatives of the Wanapum Band of Indians.

Additional details on the archaeological investigation are provided in the technical report titled Cultural Resources Assessment for Maiden Wind Farm, which will be available from Benton County and BPA in early 2002.

The Yakama Nation was contacted and briefed on the proposed project but declined to participate in the archaeological surveys. The Yakama Nation also was invited to conduct any needed investigations of traditional use of the study area (such as native plant gathering and hunting) but declined to initiate such studies. The cultural resources analysis is based on information from field studies and from archival research.

3.6.3 Affected Environment

Little cultural resource work has been conducted in the study area, which is likely due to the combination of large tracts of private land and the absence of any regulatory action that would have triggered previous cultural resource compliance studies. Areas such as the adjacent DOE Hanford Site, the nearby Yakima Training Center, and the nearby Yakama Indian Reservation have received more attention from archaeologists and ethnologists and these areas provide most of what is known about the general project vicinity.

3.6.3.1 Regional Archaeology and Ethnohistory

The proposed project would encompass portions of three adjacent USGS quadrangle maps (Sulphur Spring, 1978; Maiden Spring, 1974; and Snively Basin, 1974).

Cultural Chronology/Culture History.
Working with information about prehistoric cultural resources at the nearby Hanford Site, Wright (1997) summarized local and regional prehistoric cultural development sequences. These cultural sequences can be used on this project to help assign any discovered artifacts and archaeological sites into their proper placement in the overall regional framework of prehistoric cultural development.

Before the disruptions caused by non-Indian settlement in the 19th century, the project study area and surrounding areas were traditional occupation and use areas used by several Native American groups now incorporated in the Yakama Nation and/or Wanapum Band.

Potential Site Types in the Study Area.
Wright (1997) reviewed the various site types that occur at the Hanford Site. The site types most likely to occur in the study area are listed below:

- Open Campsite
- Rockshelter
- Butchering/Kill Site
- Hunting Station
- Plant Collection
- Quarry
- Lithic/Tool Scatters
- Plant/Seed Processing
- Rock Cairn
- Petroglyphs and Pictographs (rock art)
- Trails

3.6.3.2 Local Euro-American History

Bard and Cox (1997) summarized the history of Euro-American resettlement of the Hanford Site, starting in 1805 (Lewis and Clark expedition) and ending with the creation of the Hanford Engineer Works in 1943. Sharpe (1999) summarized the historical development of the north face of the Rattlesnake Hills, which is the area immediately adjacent to the northeastern portion of the study area and is now known as the Fitzner-Eberhardt ALE. The ALE occupies about 120 square miles and is located on the southwest side of the 560-square-mile Hanford Site.

The Anderson Ranch.

Swedish immigrant Gust Anderson arrived in the United States in 1887 and first settled in Nebraska, where he met and married Anna Anderson, another Swedish immigrant. With two sons and a daughter, they moved to Prosser in 1905 and homesteaded 160 acres about 10 miles north of Prosser and 10 miles east of Sunnyside (Cole, 1992). Their first crops were wheat and cattle and they maintained a large garden. By 1934, the Anderson Ranch consisted of 800 acres used mostly for grazing sheep and cattle. The Andersons grew wheat, which was combined with the help of neighbors using old-fashioned threshing bees. At one time, the Anderson Ranch covered about 50,000 acres. As explained by Henry Anderson, one of Gust Anderson's sons, there were once up to 3,500 sheep in their flock and they had to pasture them from the Wenatchee National Forest all the way to Republic, Washington.

In 1944, the Anderson Brothers Ranches sold off most of the sheep, fenced the land, and began raising cattle (Cole, 1992). Today, the Anderson Ranch, in its various parts owned and controlled by several Anderson family members, covers the majority of the land in and around the study area.

3.6.3.3 Results of Cultural Resources Survey

The cultural resources of the study area were determined through survey and site recording by CH2M HILL archaeologists and members of the Wanapum Band. During the surveys of proposed wind turbine strings, access roads, underground and overhead electrical transmission lines, operation and maintenance facilities, various laydown/staging areas, and quarries, 54 individual cultural resource features and several isolated finds were identified and will be formally recorded as archaeological "sites" or "isolates" as appropriate (Table 3.6-2).

TABLE 3.6-2
Identified Cultural Resources in the Study Area

Field Number	Description
AS-1	Chert biface fragment and nearby rock cairn
AS-2	Rock cairn and associated lithic scatter
AS-3	Rock cairn
AS-4	Disturbed rock cairn
AS-5	Rock cairn
AS-6	Large prominent rock cairn with possible other embedded rock circle features
AS-7	Large rock cairn
AS-8	Tall rock cairn
AS-9	Three rock cairns with associated lithic scatter
AS-10	Rock cairn with wind break
AS-11	Rock cairn with associated small stack
AS-12	Small rock cairn
AS-13	Stone wall/wind break feature. Large circular-shaped rock feature. End-stacked boulder feature.
AS-14	Circular-shaped rock feature
AS-15	Lithic scatters
AS-16	Quarry
AS-17	Four rock features
AS-18	Possible Frenchman Springs Phase projectile point fragment
AS-19	Lithic scatter
AS-20	Rock cairn
AS-21	Lithic scatter
AS-22	Small lithic scatter
AS-23	Rock cairn
AS-24	Rock cairn with associated chert flake
AS-25	Three rock cairns
AS-26	Rock cairn
AS-27	Five rock cairns
AS-28	Rock cairn/wind break
AS-29	Historic farmstead site
AS-30	Historic farm equipment
AS-31	Rock alignment feature with associated chert flake
45-YK-61	Sulphur Spring site
45-BN-195	Maiden Spring site. Large, extensive lithic scatter and habitation debris; various artifacts and raw materials. Significant archaeological site.

TABLE 3.6-2
Identified Cultural Resources in the Study Area

Field Number	Description
AS-32	Lithic scatter; chert core fragment; chert flakes and angular waste; chalcedony flakes and angular waste. Chert biface fragment.
AS-34	Rock cairn
AS-35	Lithic scatter
AS-36	Historic farm site
AS-37	Two basalt cairns
AS-38	Historic site
AS-39	Lithic scatter
AS-40	Rock cairns and quarry site
AS-41	Rock cairn
AS-42	Rock cairn
AS-44	Trail—north end
AS-44	Trail—south end
AS-45	Firehearth
MSI-1	Obsidian biface thinning flake
MSI-2	Petrified wood flake
MSI-3	Flake
MSI-4	CCS flaked chunk
HF-1	Fence jacks
MSI-5	Chert biface fragment
MSI-6	Cayuse Phase projectile point
Turbine 152 isolate	Obsidian flake

3.6.4 Impacts of the Proposed Action

3.6.4.1 Evaluation Criteria

Impact levels for cultural resources have not been developed for this EIS because any impact to cultural resources is considered a high impact. The proposed project would have a significant and adverse effect if it altered, directly or indirectly, the characteristics of a historic property that qualify the property for inclusion on the NRHP, or if it diminished the integrity of the property's location, design, setting, materials, workmanship, feeling, and association. Adverse effects may include reasonably foreseeable effects caused by an action that may occur later in time, be farther removed in distance, or be cumulative.

3.6.4.2 Construction Impacts

Many of the cultural resources listed in Table 3.6-2 could be significantly and adversely affected by project construction in the study area. Formal recordation of the identified

cultural features as archaeological sites will take place in early 2002. Once formally recorded, the archaeological sites will be evaluated for their potential eligibility for inclusion in either the NRHP or the Washington Register of Historical Resources (WRHR) and would be examined in relationship to the project site.

Direct adverse impacts of the proposed project on archaeological sites (as recorded and potentially included in the NRHP or WRHR) cannot be fully evaluated until the exact location of all project facilities has been determined. However, most archaeological sites in the study area are small in size and appear to be avoidable with careful siting of project facilities. Mitigation measures would be developed to ensure protection of cultural resources to the extent possible during siting and construction of facilities.

Cultural resources other than archaeological features, such as traditional cultural properties (TCPs), may also be present within or adjacent to the project site and could be adversely impacted. Consultation with the Yakama Nation and the Wanapum Band may result in the identification of TCPs or recommendations from the Yakama Nation and Wanapum Band to engage in oral history investigations. Oral history investigations are commonly designed to identify the presence of TCPs and to determine project effects on TCPs. Such studies, if undertaken, can help facilitate consultations regarding impacts to cultural resources among the participating tribes and BPA. If TCPs are determined to be present, mitigation measures would be developed in consultation with the Yakama Nation and Wanapum Band.

Wanapum elders visited the project site in August 2001 and expressed concern about construction of the project harming archaeological sites and cultural values of high importance to the Wanapum. As explained by Wanapum elders (Robert Tomanawash and Rex Buck, Jr.), construction of project facilities on the ridgetops would be incompatible with deeply held cultural values and religious beliefs. The Wanapum elders urged avoidance of archaeological features and avoidance of all construction on the ridgetops because the top of the Rattlesnake Hills is a zone where Indian youth conducted spirit quest activities and where some individuals were buried.

The Yakama Nation has declined participation in archaeological field studies and declined to undertake oral history investigations. Therefore, information about TCPs of importance to the Yakama Nation is presently lacking. The information provided by the Wanapum elders is strongly suggestive that a TCP is present on the ridgetops of the Rattlesnake Hills.

Indirect impacts to cultural resources could occur due to vandalism. However, because the project site is primarily on private property and new access roads would have locked gates, the potential for public access to the project site and study area is low.

Mitigation.

Impacts to cultural resources could be mitigated following procedures outlined in 36 CFR 800. Mitigation measures could include preconstruction data recovery collections and excavations, and monitoring of earth-disturbing construction operations by one or more qualified archaeologists and representatives of the affected tribes (for areas where buried cultural deposits could be present). BPA would adopt mitigation measures in its Record of Decision and would develop contracts as necessary to establish a binding commitment to implement the mitigation measures.

A cultural resources mitigation monitoring plan (CRMMP) could be prepared in consultation with the affected tribes, BPA, Benton County, and the WASHPO. It would provide a detailed plan to guide the archaeological and tribal monitoring of earth-disturbing construction and would outline specific procedures to be followed if unanticipated discoveries were made during construction. The CRMMP would include procedures for issuing stop-work orders to construction contractors if discoveries were made and would also outline possible mitigation measures (treatment plans) to be employed in the event that significant cultural resources were discovered. The CRMMP would include procedures to deal with the unanticipated discovery of Native American skeletal remains consistent with all applicable state and federal laws and regulations.

To minimize the potential for indirect impacts due to vandalism, new access roads would have locked gates installed and "No Trespassing" signs.

3.6.4.3 Operation Impacts

Normal operation and maintenance of the project would not affect cultural resources. 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 harm to the avoided cultural resources. Preparation and implementation of a carefully conceived CRMMP would further reduce the potential for harmful effects of project operation and maintenance.

3.6.4.4 Decommissioning Impacts

Potential impacts to cultural resources during decommissioning would be similar to those for project construction. Mitigation in use at the time of decommissioning would be implemented and would likely be similar to that recommended for construction.

3.6.5 Impacts of the No Action Alternative

Under the No Action Alternative, cultural resources would not be affected by the proposed project. Other generation facilities would likely be constructed in the region and could cause impacts to cultural resources depending on the location and design of the facility.

3.7 Noise

3.7.1 Regulatory Framework

Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Noise is defined as unwanted sound. There are several ways to measure noise, depending on its source, 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 ordinances and standards.

WAC 173-60 provides the applicable noise standards for Washington, including Yakima and Benton Counties. Neither county has promulgated independent state-approved noise

standards. Both counties recommend that wind turbines generate no more than a 10 dBA increase over existing noise levels at residences.

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:

- Class A: Lands where people reside and sleep (e.g., residential uses)
- Class B: Lands requiring protection against noise interference with speech (e.g., commercial/recreational uses)
- Class C: Lands where economic activities are of such a nature that higher noise levels are anticipated (e.g., industrial/agricultural uses).

In this section, noise-sensitive areas are equivalent to Class A EDNA areas. Table 3.7-1 summarizes the maximum permissible levels of noise received at noise-sensitive (residential) areas (Class A EDNA) and at industrial/agricultural areas (Class C EDNA) from an industrial facility.

TABLE 3.7-1
State of Washington Noise Regulations

Noise Descriptor	Maximum Permissible Noise Levels (dBA) from an Industrial Source		
	Class A EDNA (Residential) Receiver		Class C EDNA (Agricultural/Industrial) Receiver
	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

Note: Standard applies at the property line of the receiving property.
Source: Washington Administrative Code 173-60-040.

The following sources are exempt from the limits presented in Table 3.7-1:

- Construction noise between the hours of 7 a.m. and 10 p.m.
- Motor vehicles when regulated by WAC 173-62 ("Motor Vehicle Noise Performance Standards" for vehicles operated on public highways)
- Motor vehicles operated off public highways, except when such noise affects residential receivers.

For the purpose of this analysis, the residences in the study area are considered Class A EDNAs while agricultural lands are considered Class C EDNAs.

3.7.2 Study Methodology

The study area for noise impact analysis included all areas where residents have the potential to hear construction or operational noise from the project.

No completely satisfactory method exists to measure the subjective effects of noise, or to measure the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard primarily is a result of the wide variation in individual thresholds of annoyance and habituation 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 tonal (frequency) variations of a noise exceed the 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], 2001).

With regard to increases in noise levels, knowledge of the following relationships is helpful:

- Except in carefully controlled laboratory experiments, the human ear cannot perceive a change of 1 dB.
- Outside the laboratory, a 3-dB change is considered a just-perceivable difference.
- A change in level of at least 5 dB is required before any noticeable change in community response can be expected.
- A 10-dB increase is subjectively heard as approximately a doubling in loudness and could cause an adverse community response (Kryter, 1970).

The impact analysis was based on noise level measurements taken in the field, vendor-supplied noise data from NEG Micon 900-kW wind turbines, and computer modeling of full build-out of the project with 549 wind turbines. Noise level measurements were taken from August 24 through 26, 2001, in the eastern portion of the study area where several residences are located. Wind speeds were recorded in 1-minute averages and only briefly exceeded 10 miles per hour (mph). Continuous noise measurements were recorded in 10-second intervals from which hourly statistical levels were calculated. Additional information on the noise modeling is available from BPA or Benton County on request.

3.7.3 Affected Environment

There are five residences in the eastern portion of the project site. There are no residences near proposed wind turbines in the western portion of the project site. Figure 3.7-1 shows the location of proposed wind turbines, residences, and the noise level monitoring location from which background noise measurements were taken. Table 3.7-2 indicates the distance from residences to the wind turbines. The closest residence is approximately 350 feet from a turbine string.

TABLE 3.7-2
Distance Between Closest Wind Turbine and Residence

Receptor	Description	Closest Turbine (approx. feet)
1	Section 27, southwest corner	2,675
2	Section 32, northeast corner	970
3	Section 36, northeast corner	755
4	Border of sections 34 and 3	1,880
5	Section 35, northeast corner	350

Under low wind speed conditions, the entire project site is extraordinarily quiet. Occasional noise results from wind, farm machinery, vehicles, and animals. Noise level monitoring results indicated that nighttime noise levels dropped below 20 dBA and daytime levels ranged from the 30s to low 40s dBA. During significant portions of the monitoring period, noise levels dropped below the detection limit of the meter (20 dBA). Even in more windy conditions, the noise level at the project site was subjectively perceived to be low due to the absence of trees or other features that could create noise in the wind.

3.7.4 Impacts of the Proposed Action

3.7.4.1 Evaluation Criteria

The two kinds of noise limits are absolute and relative. An absolute limit is a noise level that should not be exceeded, while a relative limit specifies the permissible increase in noise levels above existing background levels. The state of Washington noise regulations specify absolute limits (see Table 3.7-1). A 10-dBA increase from operation of the wind turbines is used as a threshold in this analysis based on Benton and Yakima County recommendations.

- Noise impacts from operation of wind turbines would be considered **high** (and significant) if the noise increase were 10 dBA or more above existing levels and/or WAC standards were exceeded.
- Noise impacts would be considered **moderate** if the noise increase at residences was nearly 10 dBA above existing levels and/or very close to WAC standards.
- Noise impacts would be considered **low** if existing residences were exposed to project-related noise that is both less than the WAC standard and less than 10 dB above the background sound level.

Construction noise limits are less restrictive because the noise is temporary. Because 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.), there is no absolute limit established. Construction noise is also exempt from relative noise limits.

3.7.4.2 Construction Impacts

Both the U.S. Environmental Protection Agency (EPA) Office of Noise Abatement and Control and the Empire State Electric Energy Research Company have extensively studied noise from individual pieces of construction equipment as well as from construction sites of power plants and other types of facilities (EPA, 1971; Barnes et al., 1976). Because specific information about types, quantities, and operating schedules of construction equipment is not known at this point, information from these documents for similarly sized industrial projects has been used. Use of these data, which are 21 to 26 years old, is conservative because the evolution of construction equipment has been toward quieter designs. These data are derived from the most recent comprehensive study and are still widely used by acoustical professionals.

Table 3.7-3 shows the loudest equipment types that would operate at a major construction site. The composite average or equivalent site noise level, representing noise from all equipment used during each construction phase, is also presented in the table.

TABLE 3.7-3
Construction Equipment and Composite Site Noise Levels

Construction Phase	Loudest Construction Equipment	Equipment Noise Level (dBA) at 50 feet	Long-Term Composite Noise Level (dBA) at 50 feet	Long-Term Composite Noise Level (dBA) at 1000 feet
Site clearing and excavation	Dump truck Backhoe	91 85	89	63
Concrete pouring	Truck Concrete mixer	91 85	85	59
Steel structure erection	Derrick crane Jackhammer	88 88	89	63
Mechanical	Derrick crane Pneumatic tools	88 86	84	58
Cleanup	Rock drill Truck	98 91	79	53

Source: EPA, 1971; Barnes et al., 1976.

Pile driving and blasting, if required, would result in temporary loud noise in the study area. There also would be increased noise from rock quarry activities such as crushing; however, the nearest residence to a proposed rock quarry is over 2 miles away. Construction vehicles traveling on State Route 241 and along Lewandowski, Gap, Snipes, Crosby, Crooks, Bennett, and other nearby roads would temporarily increase noise levels. While temporary construction noise may be audible and exceed current levels, because it is exempt from absolute and relative noise limits during daytime hours when construction would take place, noise impacts would be low. Implementation of mitigation measures would ensure that impacts were reduced to the lowest level possible.

Mitigation.
Mitigation measures for construction activities would include the following:

- Limit construction activities within 1 mile of any residence to the hours between 7 a.m. and 7 p.m.
- Notify nearby residents of planned unusually noisy construction activities (particularly blasting and pile driving) and provide them with a contact phone number for the project.

3.7.4.3 Operation Impacts

In general, wind projects operate about one-quarter to one-third of the time, depending on the seasons and weather conditions. On the project site, winds are highest in the winter and lower in summer. The proposed wind turbines could potentially operate 24 hours per day during windy times, and not at all when the winds are calmer. Without mitigation, noise impacts at the five nearby residences would be high at nighttime when ambient noise levels are extremely low. Daytime ambient noise levels vary more than nighttime levels so daytime noise impacts would range from low to high.

Based on the results of noise modeling, development of the proposed project as currently designed would result in an increase in ambient noise levels at all five residences in the eastern portion of the study area. The analysis is based on information provided by NEG Micon for a 900-kW turbine operating at wind speeds of 18 mph and quiet conditions (10 mph winds) at the residences. Under these conditions, the potential for objectionable noise is the greatest because there is little background noise available to mask turbine noise. The wind turbines being considered begin operating at approximately 9 mph. While a single wind turbine would generate approximately 50 dBA of noise at 165 feet, the noise model assumed that all of the turbines would be operating at the same time, thereby producing significantly more noise.

The predicted noise levels from the 900-kW wind turbines proposed in the eastern portion of the study area are shown in Table 3.7-4. At all five residences, nighttime noise levels would increase over existing conditions (in a range of 21 dBA at residence 3 to 31 dBA at residence 5). Nighttime noise levels at residence 5 would also exceed the WAC standard. Without mitigation, a high noise impact would occur during the nighttime at all five residences because nighttime noise levels would increase well over 10 dBA above existing levels.

TABLE 3.7-4
Comparison of Modeling Results to Nighttime WAC Noise Standard

Residence	Description	Distance to Wind Turbine (feet)	Predicted Sound Pressure Level (dBA)	WAC nighttime Standard (dBA)	Exceeds WAC	Typical Existing nighttime Levels (dBA)	Exceeds Existing Nighttime Levels by (dBA)	Impact Level
1	Section 27, SW corner	2,675	42	50	NO	20	22	High
2	Section 32, NE corner	970	46	50	NO	20	26	High
3	Section 36, NE corner	755	50	50	NO	20	30	High
4	Border of sections 34 and 3	1,880	41	50	NO	20	21	High
5	Section 35, NE corner	350	51	50	YES	20	31	High

During the daytime, the noise levels generated by the wind turbines would not be expected to exceed the daytime WAC standard of 60 dBA at any of the five residences. Daytime ambient noise levels measured at the project site varied more than nighttime levels and ranged from about 24 to 45 dBA. Noise levels during the daytime would increase over ambient levels from zero up to 27 dBA at residence 5 (when ambient levels are at 24 dBA). Without mitigation, daytime noise impacts would range from low to high at all five residences depending on current ambient noise levels.

Because noise diminishes with distance, adequate setbacks are the primary tool for preventing noise problems. Modeling results indicate that using the 900-kW turbines, a setback of 2,700 feet would still create a 20 dBA increase from operation of the wind turbines. Manufacturers data show that at a distance of 3,300 feet the noise level from a single 900-kW turbine is 30 dBA (a 10-dBA increase over existing levels). If the 900-kW turbines are used, it is likely that a minimum setback of more than 3,300 feet would be required to ensure that the noise increase is less than 10 dBA. However, other size turbines are also being evaluated for the proposed project. A 1500-kW turbine would allow generation of the same amount of electricity with 40 percent fewer turbines, and noise levels could be substantially lower.

Mitigation.

Implementing the following mitigation measures would reduce noise impacts to a low level.

- The final turbine layout for the proposed project would include setbacks of turbines from all project vicinity residences to ensure that noise increases at these residences from the project would be less than 10 dBA. If 900-kW turbines are used, this setback likely would be about 3,300 feet. An acoustical analysis of the final turbine layout would be prepared for all wind turbines to be located within 1 mile of an existing residence, prior to obtaining construction permits from Benton County. The analysis would be

conducted using noise level data for the final turbine type, size, and layout and would demonstrate compliance with the 10 dBA increase criteria established by the county.

- If technically and economically feasible, consider installing larger sized turbines for the project, which would require fewer turbines to be installed for the same amount of power, and thus allow turbines to be located farther from project vicinity residences.

3.7.4.4 Decommissioning Impacts

Noise impacts from decommissioning of the project would be similar to those during construction. If roads are left in place, the duration of decommissioning noise would be significantly shorter than the construction period. No blasting or pile driving would be required, resulting in lower noise levels than for construction. The same mitigation measures used during construction could also be used during the decommissioning phase.

3.7.5 Impacts of the No Action Alternative

Under the No Action Alternative there would not be any construction-related or operational noise impacts from the proposed project. Both the construction and operational impacts of a gas-fired CT are more noise-intensive than the proposed wind generation. Construction impacts from a conventional plant can exceed 110 dBA at 100 feet during the steam blowdown activities, and operational noise levels can exceed 80 dBA at 100 feet (CEC, 2001). 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.

3.8 Water Resources and Wetlands

3.8.1 Regulatory Framework

- **Clean Water Act, Section 404 –** Section 404 of the federal Clean Water Act requires a permit from the U.S. Army Corps of Engineers (ACOE) for the discharge of dredge or fill material into jurisdictional waters or wetlands of the U.S.
- **Clean Water Act, Section 401 –** Section 401 of the Clean Water Act requires state certification that the discharge of dredge or fill material will not harm jurisdictional waters or wetlands such that an exceedance of state water quality standards will occur.
- **Clean Water Act Section 402 –** A General Stormwater Permit under the NPDES is required for all soil-disturbing activities where 5 or more acres (1 or more acre beginning in December 2002) will be disturbed, and where the acreage will have a discharge of stormwater to a receiving water (for example, wetlands, creeks, unnamed creeks, rivers, marine waters, ditches, estuaries), and/or to storm drains that discharge to a receiving water.
- **Washington Shoreline Management Act –** Washington's Shoreline Management Act (SMA) applies to all marine waters, streams with a mean annual flow greater than 20 cubic feet per second, water areas of the state larger than 20 acres, upland areas called shorelands, and other associated areas (Washington State Department of Ecology [Ecology], 1999).

- **Benton and Yakima County Critical Areas Ordinances –** Title 15 of the Benton County Ordinance and Title 16A of the Yakima County Ordinance provide county level protection of critical areas and resources. Critical areas and resources include wetlands, rivers and creeks, critical aquifer recharge and interchange areas, frequently flooded areas, geologically hazardous areas, and fish and wildlife conservation areas. Fish and wildlife conservation areas identified in Title 15 of the Benton County Code include Washington State Natural Areas Preserves and Natural Resource Conservation Areas, and WDFW Priority Habitats. The county ordinances provide guidelines for protecting and mitigating impacts to these areas.

3.8.2 Study Methodology

The study area evaluated for water resources and wetlands included all locations of project facilities, both temporary and permanent, identified in Figure 2.1-2. Fieldwork was targeted in those locations most likely to have waters or wetlands of the U.S. based on study of existing materials.

Information needed to characterize water flow, quality, and use in the study area was derived from available agency information on the Internet, communications with local residents and public officials, and field reconnaissance conducted in the summer and fall of 2001.

Waters and wetlands of the U.S. in the study area were initially determined by reviewing USGS 7.5-minute topographic maps, National Wetland Inventory maps, the hydric soils list for the state of Washington, and aerial photographs. Probable waters and wetlands of the U.S. included springs, creeks, intermittent drainages, and areas with listed hydric soils. These areas were visited to determine if waters and wetlands of the U.S. are present on the project site. Fieldwork was conducted from May 23 to 25, 2001, and on August 23, 2001. Wetlands were delineated in accordance with the ACOE *1987 Wetland Delineation Manual* (Environmental Laboratory, 1987).

3.8.3 Affected Environment

3.8.3.1 Regional Context

The proposed project would be located in the Yakima River Basin in south central Washington. The Yakima River and its tributaries drain about 6,150 square miles or 4 million acres in Washington. Some drainages on the project site eventually flow to the Yakima River, located about 10 miles south of the study area.

The Yakima River Basin is bounded by the Cascade Range to the west, the Wenatchee Mountains to the north, the Rattlesnake Hills to the east, and by the Horse Heaven Hills to the south. Basin elevations range from 8,184 feet above mean sea level in the Cascades to 340 feet at the Yakima River and the Columbia River confluence (Ecology, 2001).

The Basin consists of nearly 40 percent forest land, 40 percent rangeland, and 15 percent cropland, with the remaining 5 percent composed of other land uses and water bodies (Ecology, 2001).

3.8.3.2 Surface Water Hydrology

Mean annual precipitation ranges from 10 to 15 inches in the Rattlesnake Hills. Approximately 70 percent of the precipitation occurs between November and April, averaging 1 inch per month as either rain or snow in mid-winter months.

Water resources are limited in the study area. The only perennial creek is the portion of Sulphur Creek located below Sulphur Spring. The existing western access road, which would be improved prior to construction, is a private ranch road extending east from Lewandowski Road. The private road parallels Sulphur Creek for approximately 2.5 miles and crosses the creek once. Intermittent creeks include Snipes Creek, Spring Creek, and the portion of Sulphur Creek located above Sulphur Spring, along with numerous unnamed ephemeral (that is, lasting a very short time) drainages.

Five springs occur within the study area: Bennett Spring, Maiden Spring, West Maiden Spring, Lower Maiden Spring, and Canyon Spring. Four other unnamed springs are mapped on the USGS 7.5-minute topographic maps, but no water was present at these sites during the May 2001 field visit. Sulphur Creek, Snipes Creek, and Spring Creek all would likely be considered jurisdictional Waters of the U.S. under Section 404 of the Clean Water Act because they are tributaries to other waters (e.g., Yakima River).

It is unlikely that all of the unnamed ephemeral drainages would be classified as jurisdictional Waters of the U.S.; only those unnamed ephemeral drainages with defined channel beds would probably be considered Waters of the U.S. Ephemeral drainages that are simply swales or slight depressions in the landscape with no connections to jurisdictional waters (and in some cases are within plowed fields) are not Waters of the U.S. (Erkel, personal communication). None of the project facilities would be located within the 100-year floodplains identified in Benton County (Benton County, 2000) or Yakima County (Yakima County, 1997).

3.8.3.3 Water Quality

The EPA Index of Watershed Indicators gives the Lower Yakima Basin an overall rating of "more serious problems, low vulnerability." Of most concern within the basin are population change, agricultural runoff, and hydrologic modification. These problems inhibit the river from meeting its designated uses, contribute to the presence of contaminated sediments, and result in the exceedance of conventional water quality parameters (EPA, 2001).

The Yakima River is listed as being "water quality limited" in Ecology's 1998 303(d) list of streams that do not meet water quality standards. Section 303(d) of the Clean Water Act requires each state to develop a list of water bodies that do not meet state surface water quality standards after implementation of technology-based controls. The state is then required to complete a total maximum daily load (TMDL) program for water bodies on the 303(d) list. The TMDL program must address water quality on a basin-wide scale to ensure that overall water quality standards will be met. A suspended sediment TMDL has been implemented for several years in the Lower Yakima Basin. A fecal coliform TMDL has been submitted and approved for Granger Drain (Linden, personal communication).

3.8.3.4 Water Use

Surface waters within the Yakima River Basin are fully or over appropriated (Yakima County, 1997). Groundwater right permits are not being issued until a groundwater study has been completed for the basin. Wells can be drilled for up to 5,000 gallons per day without the need for a water right (Cramer, 2001). Table 3.8-1 lists the aquifers in the Lower Yakima Basin. In general, there is little recharge to these aquifers in the higher elevations because of limited precipitation.

TABLE 3.8-1
Aquifers in the Lower Yakima Basin

Aquifer	Square Miles	Rock Type
Columbia Plateau aquifer system	1,195	Basalt and other volcanic-rock aquifers
Volcanic- and sedimentary-rock aquifers	154	Basalt and other volcanic-rock aquifers
Pacific Northwest basin-fill aquifers	1,609	Unconsolidated sand and gravel aquifers

Source: U.S. Geological Survey. 1998. *Principal Aquifers of the 48 Contiguous United States*.

3.8.3.5 Wetlands

Six sites located in the study area meet the ACOE/state of Washington criteria (soils, vegetation, hydrology) for a wetland (Environmental Laboratory, 1987; Ecology, 1997). Five sites are associated with springs. A sixth site is associated with Sulphur Creek at the location where the western access road crosses Sulphur Creek (Figure 3.8-1). These wetlands are classified as palustrine systems based on the Cowardin et al. (1979) wetland classification system. Palustrine systems include "nontidal wetlands dominated by trees, shrubs, persistent emergents, or emergent mosses or lichens, and are bounded by uplands" (Cowardin et al., 1979).

The wetlands are all classified as Category III[1] based on the *Washington State Wetlands Rating System for Eastern Washington* (Ecology, 1991) and the Benton and Yakima County Critical Areas Ordinances. These rating systems are designed to assist in identifying management protection standards. The Benton and Yakima County Critical Areas Ordinances identify width requirements of buffer zones. The six wetland sites are described below and are shown in Figure 3.8-1.

Site 1. Canyon Spring.

Canyon Spring is located at the western end of the study area in a narrow, steep drainage. The wetland is approximately 12 feet wide by 150 feet long. It is associated with a series of four or five springs, one of which is piped into a water trough for cattle use. The vegetation is dominated by watercress (*Rorippa nasturtium-aquaticum*), and associated with yellow monkeyflower (*Mimulus guttatus*), celery-leaved buttercup (*Ranunculus sceleratus*), and stinging nettle (*Urtica dioica)*. Chokecherry (*Prunus virginiana*) is present in the adjacent

[1] Category III wetlands provide important functions and values. They are important for a variety of wildlife species and occur more commonly throughout the state than either Category I or II wetlands. Generally these wetlands will be smaller, less diverse, and/or more isolated than Category II wetlands. They will occur more frequently, be difficult to replace, and need a moderate level of protection. (Ecology, 1991)

uplands. The wetland receives heavy cattle use, and is likely frequented by various wildlife species because water resources are limited in the vicinity.

Site 2. Maiden Spring.
Maiden Spring, also located at the western end of the study area, is used as a water source for a cattle trough. Overflow from the trough flows for approximately 500 feet to a narrow, intermittent drainage, creating a linear wetland ranging from 2 to 20 feet wide. The vegetation is dominated by celery-leaved buttercup, yellow monkeyflower, and Kentucky bluegrass (*Poa pratensis*). Watercress, duckweed (*Lemna minor*), and stinging nettle also are present, along with scattered golden current *(Ribes aureum*), chokecherry, and red-osier dogwood *(Cornus stolonifera*). The wetland receives heavy cattle use due to the presence of the trough, and is likely frequented by various wildlife species because water resources are limited in the vicinity.

Site 3. West Maiden Spring.
West Maiden Spring, located approximately one-half mile west of Maiden Spring, creates a narrow, linear wetland approximately 12 feet wide by 150 feet long. Some of the water from the spring is diverted into a water trough for cattle. The vegetation is dominated by celery-leaved buttercup and yellow monkeyflower, with water speedwell (*Veronica anagallis-aquatica*) also present. The wetland is frequented by cattle, and probably by other wildlife species, because water resources are limited in the vicinity.

Site 4. Lower Maiden Spring.
Lower Maiden Spring is located approximately one-half mile southwest of Maiden Spring. Like the other springs, it has been modified for cattle by piping springwater into a trough. Overflow from the trough creates a small wetland approximately 12 feet wide by 35 feet long. Dominant species include celery-leaved buttercup, yellow monkeyflower, Kentucky bluegrass, and foxtail barley (*Hordeum jubatum*). Like the other springs, this site is heavily used by cattle, and probably by other wildlife species, as a watering area.

Site 5. Bennett Spring.
Bennett Spring is located in the eastern portion of the study area on the north slope of the Rattlesnake Hills. The spring is piped into a cattle trough and overflow creates a wetland approximately 50 feet wide by 50 feet long. The dominant species at this site is water speedwell. Like the other springs, this site is heavily used by cattle, and probably by other wildlife species, as a watering area.

Site 6. Sulphur Creek.
Site 6 is a wetland fringe located adjacent to Sulphur Creek. The average width of the wetland is 6 feet. Dominant species include duckweed, willow weed (*Polygonum laptifoliumi),* watercress, celery-leaved buttercup, foxtail barley, spike rush (*Eleocharus palustris*), and various rushes (*Juncus spp.*). Cottonwoods and willows are present on the adjacent upland. This area is heavily used by cattle.

A wetland delineation report will be completed in early 2002 and submitted to the appropriate agencies for their review and concurrence. The report will be available from BPA and Benton County upon request.

3.8.4 Impacts of the Proposed Action

3.8.4.1 Evaluation Criteria

- Impacts related to water resources and wetlands would be considered **high** (and significant) if the proposed project caused a water body that supports sensitive fish, waterfowl, and animal habitat, or human uses such as drinking water to become altered so as to affect its uses or integrity; or it caused water quality in drainages downstream of the project site to degrade below state or local standards; or it caused permanent changes in wetland hydrology, vegetation, or soils to the extent that the area would no longer function as a wetland. Impacts to water use would be considered high if water demand injured an existing water right or exceeded the amount available for beneficial use.

- Impacts related to water resources and wetlands would be considered **moderate** if the proposed project did not affect a sensitive water body but caused water quality in downstream drainages to be degraded below state or local standards, which could be partially mitigated; or it caused a wetland to be partially filled or a wetland function to be partially degraded.

- Impacts related to water resources and wetlands would be considered **low** if the proposed project did not affect a sensitive water body but caused water quality in downstream drainages to be slightly degraded (not below state or local standards) and could be fully mitigated; or it caused a short-term disturbance to a wetland or disruption of a wetland function.

3.8.4.2 Construction Impacts

Surface Water Hydrology.

While construction activities have the potential to create alterations to natural drainage patterns, the alterations would be temporary and localized, constituting a low impact. Natural drainage patterns would be maintained during construction to the extent practicable and all patterns would be restored post-construction. Utility crossings would be located to avoid or greatly reduce impacts.

In general, the proposed layout of the project facilities avoids drainages because the nature of the project requires most facilities to be located on ridges and upland areas. The overhead transmission line would span waterways, thus avoiding drainages. However, 14 access road crossing sites were identified in the study area that may involve jurisdictional Waters of the U.S. Most of the road crossings would also have underground collector cable trench crossings adjacent to or nearby the road. Thirteen crossings occur at intermittent/ephemeral drainages, and one crossing occurs at the perennial section of Sulphur Creek (wetland impacts associated with Sulphur Creek are discussed below). Culverts or fords would be used at all drainage crossings, as specified by the County Critical Areas Ordinance. Impacts to Waters of the U.S. during construction would be low with incorporation of recommended mitigation measures. Estimates of maximum fill for each crossing are shown in Table 3.8-2.

TABLE 3.8.2
Summary of Potential Impacts to ACOE Jurisdictional Waters (Including Wetlands)

Crossing Ref. No.*	Township, Range, and Section No.	Proposed Development	Channel Width (approximate feet)	Channel Depth (approximate feet)	Area of Fill (approximate square feet)	Maximum Fill[1] (approximate volume in cubic feet)	Approximate Slope (degree)	Designation[2]
	T11N R 23E							
1	26	Upgrade existing access road	6	1	180	180	<5°	Includes Sulphur Creek (perennial stream) and adjacent emergent wetland (Wetland Site 6)
	T11N R24E							
2	19	Access road	3	1	90	90	<5°	Shrub-steppe
3	19	Access road	3	1	90	90	<5°	Shrub-steppe
4	23	Access road	3	1	90	90	<5°	Shrub-steppe
5	25	Access road	4	4	120	480	<5°	Shrub-steppe
6	25	Access road	4	4	120	480	<5°	Shrub-steppe
7	25	Access road	4	3	120	360	<5°	Shrub-steppe
8	25	Access road	4	4	120	480	<5°	Shrub-steppe
9	25	Access road	4	4	120	480	<5°	Shrub-steppe
10	26	Access road	4	3	120	360	<5°	Shrub-steppe
11	26	Access road	4	3	120	360	<5°	Shrub-steppe
12	36	Access road	4	4	120	480	<5°	Shrub-steppe
13	36	Access road	4	4	120	480	<5°	Shrub-steppe
	T11N R25E							
14	33	Access road	6	4	180	720	<5°	Shrub-steppe
TOTAL						5,130		

Notes:
* Refer to Figure 3.8-1.
[1] Assumes the proposed access road is 30 feet wide and the maximum fill area is the length of the crossing.
[2] Refers to the habitat type (see Section 3.3).

Given the type and extent of impacts, activities most likely could be conducted under an ACOE Nationwide Permit #14, which covers discharges to Waters of the U.S., including wetlands, for construction of linear transportation crossings. The ACOE would be consulted to determine the appropriate ACOE permit and authorizations that may be required for the proposed project. Such activities must also meet the requirements of the Benton and Yakima Counties Critical Areas Ordinances.

Water Quality.
Construction of project facilities would require extensive earthwork and machinery operation. Erosion from earthwork could subsequently create sedimentation in surface drainages. Heavy machinery use may increase the risk of gasoline or oil spills, which could also pollute waters in the area. These potential impacts would be minimized by obtaining a NPDES General Permit for Stormwater Discharges associated with Construction Activities from Ecology and developing and implementing a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP would include a variety of best management practices (BMPs) to minimize erosion and sediments from rainfall runoff at the site, and to identify, reduce, eliminate, or prevent the pollution of stormwater (see Mitigation discussion, below). This plan would allow onsite stormwater filtering and stormwater passage without damaging roads or adjacent areas and without increasing the sedimentation load to intermittent streams that flow to the Yakima River. Water quality impacts would be low with implementation of these BMPs.

Water Use.
Based on water needs during construction of a similar wind project, it is estimated that up to 18 million gallons of water would be needed for cement mixing and dust control. Given that this amount would be needed during an approximate 9-month construction period, the percentage of the total use within the basin would be less than 1 percent. Peak day demands are not expected to exceed 0.20 million gallons per day (mgd). Several water sources are being considered to satisfy project construction needs. One source involves soliciting a holder of an irrigation water right to obtain a temporary transfer that would be in place for the entire irrigation season. A corresponding reduction in irrigated agriculture would have to occur for that season. Another source would be to solicit a well owner with an approved water right to apply for a Short-term Use of Water for a nonrecurring project. Water would be transported in 5,000-gallon water trucks to the project site. Other nearby municipal sources of water are being evaluated, and appear to be available from the City of Sunnyside. The project's water demand during construction would not be expected to injure an existing water right or exceed the amount of water available for beneficial use within the watershed, and impacts from water use would be low.

Wetlands.
Based on the proposed layout of project facilities, none of the wetlands associated with springs (Canyon Spring, Maiden Spring, West Maiden Spring, Lower Maiden Spring, and Bennett Spring) would be affected, therefore, there would be no impacts.

Improvements to the western access road, including installation of a culvert or upgrade to the existing ford, would impact the fringe wetland associated with Sulphur Creek (Site 6). Installation of a culvert would disturb approximately 180 square feet (0.004 acre) of wetland (assuming the access road is 30 feet wide and the average width of the wetland crossed by

the access road is 6 feet). Because this wetland would be partially filled, impacts to wetlands would be moderate.

Mitigation. Mitigation measures include complying with federal, state, and local requirements and ordinances and implementing BMPs during construction. The developer would obtain a NPDES General Permit for Stormwater Discharges associated with Construction Activities from Ecology and develop and implement a Stormwater Pollution Prevention Plan (SWPPP) that would include a variety of BMPs. BMPs include standard approved construction practices and erosion management techniques to prevent and control erosion, as follows:

- Minimize vegetation removal.
- Avoid construction on steep slopes or areas designated as having a high susceptibility of erosion.
- Properly design cut-and-fill slopes.
- Install roadway drainage to control and disperse runoff; ensure that access roads contain pervious, gravel surfaces.
- Apply erosion control measures such as silt fencing, straw mulch, straw bale check dams, and soil stabilizers, and reseed disturbed areas as required.
- Apply stabilization measures such as temporary seeding, permanent seeding, vegetative buffer strips, and other appropriate practices, and structural measures such as silt fences, sediment traps, and drainage swales.
- Minimize construction and increase gravel cover on roads during wet weather to reduce potential rutting and soil loss.

Use culverts or hardened ford crossings at all drainage crossings.

Natural drainage patterns would be maintained to the extent practicable. Slopes and vegetation would be restored after construction. Utility crossings would be located to avoid natural drainages to the extent practicable.

A permit to fill the Sulphur Creek wetland and Waters of the U.S. would be required from ACOE, Ecology, and Yakima County and replacement wetlands or restoration of existing wetlands would be provided as specified by these agencies.[1] According to Ecology, the required replacement ratio for a Category III emergent wetland (as found in the study area) would be 1.5:1 (1.5 acres replaced for every acre impacted). A mitigation plan describing proposed replacement/restoration would be prepared and submitted to ACOE, the state of Washington, and Yakima County for approval, and this mitigation plan would be implemented.

[1] A Joint Aquatic Resources Permit Application (JARPA) form can be obtained from Ecology. This single form can be used to apply for ACOE, state, and local permits involving wetlands.

3.8.4.3 Operation Impacts

Surface Water Hydrology.
All roads and substation sites would be gravel to reduce the amount of impervious surface on the project site. New permanent structures such as tower foundations and operation and maintenance buildings would slightly increase the amount of impervious surface area. This would be a low impact because the small area occupied by these facilities would not alter runoff rates and patterns enough to degrade water quality downstream.

Water Quality.
Water quality impacts from runoff around project facilities would be low with installation of permanent drainage and erosion control facilities.

Up to about 15 full-time staff would work at up to three operation and maintenance (O&M) facilities and would use the facilities at various times of the day. The O&M facilities would provide potable drinking water and restrooms. A functioning and well-maintained septic system would not impact water quality if designed and operated correctly.

Water Use.
In very dry regions, wind turbine blade washing is required to maintain the efficiency of the turbine. The study area receives sufficient precipitation to keep the blades reasonably clean; therefore, blade wash water would not be required regularly for project operation. Occasional blade washing might be conducted by a contractor who would purchase water from a private or municipal source with a valid water right. The only water normally required for project operation would be a maximum of 5,000 gallons per day for all three O&M facilities combined for normal lavatory and kitchen uses by maintenance employees. Existing water rights would not be detrimentally affected, and sufficient water would be available for the intended uses. Impacts to water use would be low.

Wetlands.
No impacts to wetlands are anticipated from operation of the proposed project. The only wetland that could be affected is the wetland associated with Sulphur Creek where the western access road crosses the creek. However, impacts from any road maintenance activities, such as periodic grading, are not anticipated to have a measurable effect on the wetland and impacts would be low.

Mitigation. Permanent drainage and erosion control facilities would be constructed, as necessary, to allow permanent stormwater passage without damaging the roads or adjacent areas and without increasing sedimentation and runoff to intermittent streams that flow to the Yakima River.

An onsite septic field would be developed for each operation and maintenance facility and would be located according to guidelines provided by the county.

3.8.4.5 Decommissioning Impacts

Impacts from project decommissioning would be similar to those for project construction and could temporarily affect local drainage patterns and jurisdictional Waters of the U.S. However, existing roads would be used for decommissioning activities, thereby reducing soil-disturbing activity. Roads would be removed or left in place according to the landowner's wishes. Facilities would be removed to a depth of 3 feet below grade and the

soil surface would be restored as close as possible to its original condition, or to match the current land use. Reclamation procedures would be based on site-specific requirements and techniques commonly employed at the time the area would be reclaimed, and would likely include regrading, adding topsoil, and revegetating all disturbed areas. Impacts to surface water hydrology and water quality from decommissioning would be low.

It is unlikely that decommissioning would require as much water as is estimated for construction because concrete foundations would not be constructed and access roads would likely remain in place. Decommissioning would result in the abandonment of up to 5,000 gallons of water used per day at the O&M facilities. Impacts to water use from decommissioning would be low.

Decommissioning of project facilities would not impact any of the five wetlands associated with springs. It is reasonable to assume that the culvert or upgraded ford installed at the Sulphur Creek crossing would remain in place once the project is decommissioned. Therefore, no further impacts are expected to fringe wetlands associated with Sulphur Creek.

3.8.5 Impacts of the No Action Alternative

Under the No Action alternative, the project site would likely remain as nonirrigated agriculture, and potential impacts from the project as described in this section would not occur. Other energy resources built in the region instead of the proposed project could result in water or wetlands impacts, although the location of future generation is unknown. The most likely source would be a gas-fired CT, which for a similar-sized facility could use up to 166 million gallons of water per year, or approximately 455,000 gallons per day compared with a maximum of 5,000 gallons per day for operation of the proposed project, according to BPA's RPEIS.

In addition, CTs typically must discharge "cooling tower blowdown" water (water remaining after cooling water has been recirculated and concentrated), which could create potential water quality impacts depending on the location of the facility.

3.9 Transportation and Traffic

3.9.1 Regulatory Framework

Benton and Yakima Counties have design standards related to roadway geometry and paving materials, load limits for bridges, and weight limits or closures under defined circumstances. All new road construction in the counties must be in accordance with the current edition of the Washington State Department of Transportation's (WSDOT) *Standard Specifications for Road and Bridge Construction*.

Program and project planning in Benton and Yakima Counties is reflected in their respective 6-year road construction programs. According to the Benton County Department of Public Works staff, there are currently no construction projects planned on county roads in the study area (Childress, 2001). Yakima County does not have plans to improve Lewandowski Road, the proposed main access road located southwest of the project site (Ballard, personal communication).

Benton and Yakima County roads currently have very low average daily traffic volumes in the project vicinity. As described in both the Benton and Yakima County Comprehensive Plans, the counties have determined that level of service (LOS) C at peak hour is a reasonable and achievable standard for the major arterial roadways.

3.9.2 Study Methodology

The study area for transportation and traffic impact analysis included the project site and the roadways to the south and west of the project site, as shown in Figure 3.9-1. State Route (SR) 241 and Lewandowski Road (in Yakima County) and the Benton County road network would be the primary routes used by vehicles during construction and operation of the project.

Interviews with engineers from the Benton and Yakima County Public Works Departments provided baseline information about the county road systems. Information obtained from or discussed with the counties included load limits on bridges, design standards for county roads, planned repairs and construction, selected traffic counts, circumstances requiring restrictions or limits, and pavement conditions.

To calculate impacts to the state and county road system, a determination was made of the likely haul routes to be used in constructing the project. The types and numbers of construction vehicles needed for various activities were estimated, and traffic volumes were projected for both the construction and operation phases of the project.

3.9.3 Affected Environment

3.9.3.1 Regional Setting

The proposed project would be located in a rural area in both Benton and Yakima Counties between SR 241 (at Lewandowski Road) in Sunnyside (Yakima County) at the western end of the project site, and Pearl Road (also know as Frank's Road) north of Prosser (Benton County) at the eastern end of the project site. The intersections of SR 241 with SR 24 and Interstate 82 are to the immediate north and south of the western side of the study area, respectively. Several rural roads lead to the eastern side of the project site from I-82. These are Gap, Hinzerling, Snipes, and Crosby Roads. Figure 3.9-1 shows the study area and the roads likely to be used to access the project site.

Trucks are used to transport wheat, fruit, and other locally grown crops in the eastern portion of the study area in Benton County. The primary roads used are Gap, Hinzerling, Rothrock, and Snipes Roads. The harvesting season typically falls between July and October, depending on the type of crop and weather conditions.

There are no specific weight and load limits on any of the county roadways in the study area. However, Benton County sometimes imposes weight restrictions on the roads depending on weather conditions. Several of the roads just south of the eastern portion of the project site are not snowplowed in the winter.

Affected Roadways.

SR 241 is a two-lane north/south roadway with narrow 2- to 3-foot gravel shoulders, open drainage ditches, and no sidewalks. SR 241 is classified as a rural-collector roadway by the WSDOT road classification system, and has a posted speed limit of 50 mph. The roadway provides a transportation connection from SR 24 to I-82. SR 241 extends to the City of Sunnyside and to I-82, approximately 10 miles south of the project site. To the north of the site, SR 241 connects to SR 24.

Gap, Hinzerling, Snipes, and Crosby Roads, in the eastern portion of the study area, are two-lane county roadways with narrow 2- to 3-foot gravel shoulders, drainage ditches, and no sidewalks. They are classified as rural–collector roadways by the WSDOT road classification system. The roads have posted speed limits varying from 35 to 50 mph.

Lewandowski Road, in the western portion of the study area (off of SR 241), is an east/west county gravel roadway, without sidewalks, and has an irrigation canal adjacent to the roadway. This gravel 35-mph roadway turns into a private road at Sulphur Springs Ranch.

SR 24 is a two-lane east/west roadway with narrow 2- to 3-foot gravel shoulders, drainage ditches, and no sidewalks. SR 24 is classified as a rural-collector roadway by the WSDOT road classification system, and has variable speed limits ranging from 35 mph to 65 mph.

Interstate 82 is a four-lane east/west roadway with 8-foot shoulders, drainage ditches, and no sidewalks. I-82 is classified as a rural–interstate roadway according to the WSDOT road classification system, and has a posted speed limit of 70 mph for general traffic and 60 mph for heavy vehicles.

Existing Traffic Volumes.

Table 3.9-1 summarizes the existing roadway traffic conditions in the project vicinity. This table includes existing roadway classification, number of lanes, daily volume, design capacity, peak hour volume, and LOS. All of the roadways that would be used for the project currently provide LOS C or better. Figure 3.9-1 shows the existing 2000 average daily traffic (ADT) volumes on the roadway system.

TABLE 3.9-1
Existing Conditions of Affected Roadways

Roadway	Classification	No. of Lanes	Average Daily Traffic Volume[1]	Hourly Design Capacity[2]	PM Peak Hour Volume[3]	PM Peak Hour LOS
SR 241 (*North of I-82*)	Rural-Collector	2	3,335	2,800	335	B
SR 241 (*South of SR 24*)	Rural-Collector	2	1,620	2,800	165	A
Gap Road (*North of I-82*)	Arterial	2	2,375	2,800	240	A
Gap Road (*South of Snipes Road and North of Hanks))*	Arterial	2	340	2,800	35	A
Crosby Road	Arterial	2	N/A	N/A	N/A	N/A
Snipes Road	Arterial	2	N/A	2,800	N/A	N/A
Hinzerling Road (*North of Johnson Road)*	Arterial	2	2,970	2,800	300	B

TABLE 3.9-1
Existing Conditions of Affected Roadways

Roadway	Classification	No. of Lanes	Average Daily Traffic Volume[1]	Hourly Design Capacity[2]	PM Peak Hour Volume[3]	PM Peak Hour LOS
Hinzerling Road (*North of Hanks Road*)	Arterial	2	415	2,800	45	A
SR 24 *(West of SR 241)*	Rural-Minor Arterial	2	2,020	2,800	205	A
SR 24 *(East of SR 241)*	Rural-Minor Arterial	2	2,930	2,800	295	A
I-82 (*West of SR 241)*	Rural-Interstate	4	14,140	11,580	1,415	A
I-82 (*East of SR 241)*	Rural-Interstate	4	16,160	11,580	1,620	A
Lewandowski Road	Arterial	2	N/A	N/A	N/A	N/A

Notes:
[1] Estimated number of vehicles per day both directions.
[2] Maximum number of vehicles per hour both directions for level of service (LOS) D.
[3] Vehicles per hour in both directions.
N/A = Not available.
SR = State Route.

LOS is a qualitative measure describing operational conditions in a traffic stream, and the perception of traffic conditions by motorists and passengers. A LOS definition generally describes these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. The six LOS conditions are given letter designations from A to F. LOS A represents the best operation condition and LOS F the worst. The afternoon rush hour (4 p.m. to 5 p.m.) is assumed to be the period in which the maximum amount of traffic is experienced.

With the exception of SR 241 (north of I-82) and Hinzerling Road (north of Johnson Road), the overall LOS for the roadways surrounding the project site is LOS A. LOS A represents free flow traffic conditions.

Other Transportation.

Public Transportation. There is no public transportation available to the project site. Public transit in Benton County consists of local and intercity bus service. Ben Franklin Transit operates all public transit and vanpools in Benton County serving the cities of Prosser, West Richland, Richland, and Kennewick.

Air Traffic. Benton County is served by five public airports (Tri-Cities Airport, Richland Airport, Vista Field, Port of Sunnyside Airport, and Prosser Airport). The Sunnyside Airport is approximately 4 miles southwest of the project site and the Prosser Airport is approximately 15 miles south of the project site.

The Yakima Firing Center, a military training center operated by the U.S. Army, is located approximately 8 miles northwest of the project site (see Section 3.13, Public Health and Safety, for a discussion of project impacts on local airspace).

Rail Traffic. Freight rail service to the area is provided by Burlington Northern and Santa Fe (BNSF) railroads. The closest line is located approximately 10 miles south of the project site. BNSF has not informed Benton or Yakima County of any future expansion of the rail lines.

Waterborne Traffic. The Port of Benton operates a barge landing facility on its property in north Richland City. Principal use of the facility is the transport of spent U.S. Naval reactors to the 200 plateau areas of the Hanford Site for disposal by burial.

3.9.4 Impacts of the Proposed Action

3.9.4.1 Evaluation Criteria

- Transportation impacts associated with the project would be considered **high** (and significant) if substantial damage occurred to state highways or county roads, if normal use of the roads in the study area were halted or impaired for considerable periods each day, if the project created a substantial increase in traffic hazards, or if the established LOS were reduced to D as a result of project traffic.
- Transportation impacts associated with the project would be considered **moderate** if some minor damage occurred to state highways or county roads, if normal use of the roads in the study area were halted or impaired for relatively short periods of time, or if the project created a minor increase in traffic hazards.
- Transportation impacts associated with the project would be considered **low** if no damage occurred to state highways or county roads, or if normal use of the roads in the study area were halted or impaired for only momentary periods.

3.9.4.2 Construction Impacts

Impacts to Roadways.
Table 3.9-2 shows the types of construction vehicles that would be used for the project, their approximate gross vehicle weight (GVW), and their capacity in units appropriate to the materials that they would haul. The project developer and/or construction contractor would be required to obtain the proper permits for transport of any over-dimensional and overweight loads. Some vehicles would likely have a GVW of more than 80,000 pounds (maximum legal load limit) when fully loaded.

TABLE 3.9-2
Specifications of Vehicles and Equipment Used in Project Construction, Operation, and Decommissioning

Vehicle/ Equipment	Use	Approximate GVW	Legal Load	Capacity	Nature of Trips
Transporter	Bring wind turbine parts to site	90,000 pounds	No	Tower: 2-3 trips Nacelle: 1 trip Blades: 1 trip Total: 4-5 trips per turbine	Ongoing during construction
Transformer truck (lowboy with many wheels)	Haul substation transformer	Transformer weighs 200,000 pounds plus 80,000-pound vehicle weight	No	1 transformer	Two trips to substation sites

TABLE 3.9-2
Specifications of Vehicles and Equipment Used in Project Construction, Operation, and Decommissioning

Vehicle/ Equipment	Use	Approximate GVW	Legal Load	Capacity	Nature of Trips
Transformer trucks	Haul 35-kilovolt transformers located at base of each tower	80,000 pounds	Yes	3 to 4 trans-formers per truck	Ongoing during construction
Gravel trucks with trailer	Haul road fill material	80,0000 pounds	Yes	22 yards gravel	Within project site
Concrete trucks	Cement for pad construction	80,000 pounds	Yes	8 yards concrete	Within project site
Water trucks	Compaction, erosion, and dust control	60,000 to 80,000 pounds	Yes	5,000 gallons water	Ongoing during construction
Bulldozers	Leveling/earth-moving for road and pad construction	D8: 100,000 pounds D9: 400,000 pounds	No	NA	Transported once to site for duration of construction
Cranes	Tower/turbine erection	80,000 pounds	Yes	NA	Transported once to site for duration of construction
Roller/ compactor	Road and pad compaction	24,000 pounds to 28,000 pounds	Yes	NA	Transported once to site for duration of construction
Road grader	Grading roads	80,000 pounds	Yes	NA	Transported once to site for duration of construction
Backhoe/ trenching machine	Digging trenches for underground utilities.	19,600 pounds	Yes	NA	Transported once to site for duration of construction
Truck-mounted drilling rig	Drilling tower foundations	80,000 pounds	Yes	NA	Driven once to site for duration of construction
Flatbed truck	Miscellaneous equipment	21,500 pounds	Yes	Variable	Ongoing during construction
Pick up trucks	General use and hauling minor equipment	5,000 pounds	Yes	Passengers and small equipment	Ongoing during construction
Small hydrau-lic cranes/fork lifts	Loading and unloading equipment	80,000-plus pounds	No	NA	Transported once to site for duration of construction
Rough terrain forklift	Lifting equipment	15,000 pounds	Yes	NA	Transported once to site for duration of construction
Four-wheeled all-terrain vehicles	Rough grade access and underground cable installation	6,000 pounds	Yes	NA	Ongoing during construction

GVW = gross vehicle weight.
NA = not applicable.

Interstate 82, SR 241, and Lewandowski, Gap, Hinzerling, Snipes, and Crosby Roads would be the primary roadways to and from the project site. The surface condition of SR 241 pavement from I-82 to Lewandowski Road is of good quality, and delivery of construction materials and equipment would not be expected to significantly degrade existing roadway conditions. Lewandowski Road is a fairly wide gravel road in good condition; however, it may need upgrading to support construction loads. Impacts to these roads would be expected to be low to moderate.

The Benton County paved roads (Gap, Hinzerling, Snipes, and Crosby) are also of good quality. Construction vehicles would use these roads, in addition to portions of Rothrock, Bennett, Rotha, Crooks, Jones, and Missimer Roads, which are all gravel. However, none of these county roads were built to withstand the proposed loads. Some or all of these roads may need to be upgraded to support construction vehicles. Easements would also need to be obtained prior to reconstructing any of the roads.

Construction-related impacts on the county road system are expected to be moderate to high unless the roads are improved for use by overweight vehicles. The project developer would work with both Benton County and Yakima County Public Works Departments to ensure that any roadwork was performed according to county standards. Additional right-of-way would need to be acquired before improving the roads. Implementation of recommended mitigation measures would reduce potential impacts to a low level.

Impacts to Local Traffic.

Construction of the full project would take approximately 9 months and could be complete in winter 2002-2003. The peak construction period would last for approximately 4 months with a peak workforce of approximately 350 people. This would be the period with the highest number of workers and construction vehicle traffic. The non-peak workforce would occur at both the beginning and end of project construction and would consist of approximately 150 workers. Origins of the workforce would depend on the hiring practices of construction contractors selected to perform the work. It is anticipated that the majority of the workforce would be drawn from the local labor pool.

During construction, water trucks would be required to make ongoing trips to the quarry sites, as well as to the project site for compaction, erosion, and dust control uses. Each truck would hold approximately 5,000 gallons of water. It is difficult to anticipate the exact number of trips needed; however, based on the size of the project site, including two quarries, it is estimated that if the full project is built, a total of 2,300 water truck trips would be required during the 9-month construction period.

Transporter trucks would bring in the wind turbines and transformers that would be located at the base of each turbine. Each turbine requires 4 to 5 truck trips to carry the tower sections, nacelle, and blades. Three or four transformers would be loaded onto one truck. Assuming 5 trips per wind turbine and a maximum of 549 turbines, delivering this equipment to the project site would require about 5,856 one-way trips. In addition, 2000 additional trips are estimated for various other vehicles listed in Table 3.9-3.

To arrive at a conservative estimate of traffic impacts for the peak construction period, a 4-month schedule was assumed. This results in higher traffic volume estimates than would be the case for the forecasted 9-month construction schedule. The total number of one-way

construction vehicle trips was estimated to be no more than 100 trips per day. These trips were estimated to be divided between the western and eastern entrances to the project site (SR 241 to the west and Gap Road to the east).

Using an estimated 1.3 persons per vehicle average automobile occupancy rate, 538 daily trips and 269 p.m. peak hour trips would be generated by the construction workforce during the 4-month peak period. Personnel working on the project site would park at the various staging areas shown in Figure 2.1-2**.** The construction workers could meet at a centralized location before traveling to individual sites along the wind turbine strings. Construction workers usually begin work early (around 7:00 a.m.) and finish before dusk, limiting the number of vehicles during peak hour traffic periods, and thus reducing potential traffic effects.

Table 3.9-3 summarizes the projected average daily construction-related vehicle trips and the peak hour vehicle trips. Table 3.9-4 summarizes the traffic volumes and LOS of the local roadways during the construction period. Information on existing (background) traffic and LOS for Crosby, Snipes, and Lewandowski Roads was not available; however, because background traffic on these roads is very low, it is likely that the LOS would be C or better when project traffic is added to existing conditions. For the peak construction period, LOS C and better is the estimated level of service for a peak hour impacting the roadways. According to the Benton and Yakima County Plans, LOS C and better is acceptable; therefore, construction traffic would not reduce the LOS on the roadways to an unacceptable level and would have a low impact on local traffic.

TABLE 3.9-3
Average Daily Construction-Related Vehicle Trip Generation

Type of Vehicle	Average Daily Vehicle Trips	Peak Hour Vehicle Trips
Construction Vehicles	100	50
Worker vehicles*		
Average work force of 150	230	115
Peak work force of 350	538	269

* This analysis assumes an average vehicle occupancy (AVO) of 1.3.

The months of July through October are peak harvest times when trucks use the rural roadways. Once the harvest begins, haul vehicles need adequate access to the county and private road systems. These road systems do not allow safe two-way passage of large vehicles. The traffic control procedures to be outlined in the construction traffic control plan (and approved by the counties) as part of contract specifications would ensure minimal conflicts among harvest and construction vehicles and impacts would be low.

The use of onsite quarries and concrete batch plants would eliminate the daily hauling of gravel and concrete on roads leading to the project site, reducing the potential for noise and dust impacts.

TABLE 3.9-4
Daily and Peak-Hour Traffic Volumes and LOS During Project Construction

		Daily			PM Peak				
Roadway	**Existing Background Traffic**	**Number of Construction Worker Trips**	**Number of Construction Vehicles**	**Daily Combined Traffic**	**Construction Worker Trips**	**Construction Vehicles**	**Background Traffic**	**Combined PM Peak**	**LOS**
SR 241 (north of I-82)	3,335	538	100	3,973	269	50	335	654	C
SR 241 (south of SR 24)	1,620	538	100	2,258	269	50	165	484	B
Gap Road (north of I-82)	2,375	538	100	3,013	269	50	240	559	C
Gap Road (south of Snipes Road (north of Hanks))	340	538	100	978	269	50	35	354	B
Crosby Road	N/A	538	100	N/A	269	50	N/A	N/A	N/A
Snipes Road	N/A	538	100	N/A	269	50	N/A	N/A	N/A
Hinzerling Road (north of Johnson (I-82))	2,970	538	100	3,608	269	50	300	619	C
Hinzerling Road (north of Hanks)	415	538	100	1,053	269	50	45	364	B
SR 24 (west of SR 241)	2,020	538	100	2,658	269	50	205	524	B
SR 24 (east of SR 241)	2,930	538	100	3,568	269	50	295	614	C
I-82 (west of SR 241)	14,140	538	100	14,778	269	50	1,415	1,734	A
I- 82 (east of SR 241)	16,160	538	100	16,798	269	50	1,620	1,939	A
Lewandowski Road	N/A	538	100	N/A	269	50	N/A	N/A	N/A

N/A = Not available.
SR = State Route.

Mitigation.
Prior to construction, the project developer would coordinate with Yakima and Benton Counties Public Works Departments to determine road capacity limits, obtain any necessary overweight permits, and agree on other steps to accommodate overweight loads or avoid road damage.

Any county roads proposed to be used would be videotaped by the project developer and a representative of the County Public Works Department prior to construction. A written agreement would be established between both Benton and Yakima Counties and the project developer and construction contractor stating that all roads would be restored to the same or better condition than they were before construction.

The project developer would be responsible for requiring the construction contractor to prepare a construction traffic control plan and construction management plan that addresses timing of heavy equipment and material deliveries, signage, lighting, traffic control device placement, dust and noise control, and the establishment of work hours outside of peak traffic periods.

Methods for mitigating potential traffic impacts may include such activities as stationing flag persons at the access roads into the site, and placing advance warning flashes, flag persons, and signage along the roadways.

3.9.4.3 Operation Impacts

The project developer would employ approximately 15 full-time personnel to maintain the project facilities. The majority of the personnel would likely be local (from Sunnyside, Prosser, Pasco, Richland, Kennewick, and/or Yakima). Assuming that each individual drove a personal vehicle to the site each day, there would be approximately 30 daily trips, 15 of which would occur during the peak time periods. This would have a negligible effect on the level of service of the local roadways and no impacts would result.

The new access roads on private land would provide a long-term benefit to landowners and would provide increased access for emergency vehicles.

3.9.4.4 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 consist primarily of transporter trucks carrying wind turbines and transformers and the resulting workforce and vehicle trips would be considerably smaller. Mitigation in use at the time of decommissioning would be implemented, and would likely be similar to that recommended for construction.

3.9.5 Impacts of the No Action Alternative

Under the No Action Alternative, there would be no impacts to transportation or traffic related to project construction or operation. Construction of a power generation facility other than the proposed project could have transportation impacts. The intensity and significance of transportation impacts would depend on the design and location of the generation facility.

3.10 Geology, Seismicity, and Near-Surface Soils

3.10.1 Regulatory Framework

The state of Washington's current regulations for foundation design use the 1997 *Uniform Building Code* (UBC). Pertinent design codes as they relate to geology, seismicity, and near-surface soils are in Chapter 16, Division IV, Earthquake Design and Division V, Soil Profile Types (International Conference of Building Officials, 1997). All facilities for the proposed project must be designed to at least these minimum standards. A number of Benton and Yakima County ordinances are applicable to development projects near mineral resources, geologic hazards, or where soil limitation ratings are of concern. These requirements include the Critical Resources Protection Ordinance, Critical Areas Protection Ordinance, and the Mineral Resources Protection Ordinance.

3.10.2 Study Methodology

The study area for geology, seismicity, and soil includes land approximately 2 miles around the project site. The study methodology for determining the affected environment and impacts from the proposed project consisted of a review of pertinent literature including DNR geology maps, Soil Conservation Service (SCS, now referred to as the Natural Resources Conservation Service) soil maps for the area, and land use plans for Benton and Yakima Counties. This published information was reviewed relative to the planned facility locations, facility developments, construction methods, long-term operations, and facility decommissioning, to evaluate potential effects to the environment.

3.10.3 Affected Environment

3.10.3.1 Study Area Features

Regionally, the study area is in the Columbia River Basin where approximately 17 million years ago massive quantities of basalt lava periodically extruded from fissures located in the area of southeastern Washington. These successive basalt flows covered the central portion of Washington and large areas of northern Oregon and western Idaho. Subsequent crustal stresses created a series of anticline basalt ridges in south-central Washington. The project would be located within the Yakima Fold Belt, which is characterized by a series of east-west trending ridges separated by broad flat valleys. Streams occupy the valleys and discharge to the Columbia and Yakima Rivers.

Rattlesnake Ridge and the Yakima Valley are the nearest prominent land features to the study area. Rattlesnake Ridge is an anticline basalt ridge extending in a northwest/ southeast alignment that separates the Pasco Basin and the Yakima Valley. The western portion of the ridge, located in northeastern Yakima County and northwestern Benton County, is known as the Rattlesnake Hills. The eastern end of the ridge terminates at Rattlesnake Mountain in north-central Benton County. At an elevation of 3,629 feet, Rattlesnake Mountain is the highest point in Benton County (Benton County, 1998).

The study area topography generally consists of an abrupt descent southwesterly from the crest of the Rattlesnake Hills toward the Yakima Valley. Around the project site, the Rattlesnake Hills are incised with southwesterly trending canyons and gulches. The project

site falls primarily within the Snipes, Spring, and Sulphur Creek drainages. Elevations in the study area typically range from 2,600 to 3,600 feet, with slopes up to 65 percent.

3.10.3.2 Geologic Formations

The study area is underlain by the Columbia River Basalt (CRB) Group of Miocene age. The Columbia River Basalt Group is composed of a sequence of basalt flows several thousand feet thick with a few minor interbedded sedimentary strata (Foxworthy, 1962).

Shallow groundwater is scarce along the tops of the basalt ridges, which serve as recharge areas for the limited precipitation and snow melt in the area. Generally, the shallow groundwater recharge moves downward from the anticlinal ridges toward surface water bodies (Bauer and Hansen, 2000).

Generally, more recent windblown and stream sediments cover the basalt bedrock of the Rattlesnake Hills. DNR surficial geology maps developed by Campbell, et al. (1979) and Reidel and Fecht (1994) indicate localized areas of landslide deposits in the vicinity of the study area. The landslide deposits consist of poorly-sorted clay, silt, sand, and gravels. Localized alluvial fan deposits consisting of unconsolidated sand and gravel are also present in the study area.

3.10.3.3 Faults, Seismic Hazards, and Slope Stability

Shallow earthquakes caused by movements along crustal faults are generally in the upper 10 to 15 miles of the earth's crust. In Washington, these movements occur in the crust of the North America tectonic plate when built-up stresses near the surface are released. There are two substantial thrust faults identified northeast of the study area at Rattlesnake Mountain, and several smaller faults are present within the study area. Figure 3.10-1 shows the location of the faults.

The study area is located in the 1997 UBC seismic zone 2B. Seismic zone 2B indicates that earthquakes up to intensity VII on the Modified Mercalli (MM) Scale can be expected to occur in the area (Benton County, 1998). The Federal Emergency Management Agency (FEMA) describes an earthquake of Intensity VII as one where people have difficulty standing, drivers feel their car shaking, loose bricks fall from buildings, and damage is slight to moderate in well-constructed buildings. Intensity VII on the MM Scale corresponds to an equivalent Richter Scale magnitude of 5.5 to 6.1. The *Benton County Comprehensive Land Use Plan* states, "Seismic hazards are not seen as a significant risk to development in Benton County" (Benton County, 1998). According to the University of Washington Geophysics Program Preliminary Earthquake Report (2001), the most recent earthquake in the project vicinity was a micro earthquake that occurred on October 4, 2001. The 1.2-magnitude quake was located approximately 28 miles south of Yakima at a depth of approximately 12 miles. The largest regional earthquake that has affected the study area in recent years occurred on February 28, 2001. The epicenter of this 6.8-magnitude quake, known as the Nisqually Earthquake, was approximately 60 miles south-southwest of Seattle and was felt in the Yakima area.

The *Benton County Comprehensive Land Use Plan* notes that most geologic hazards in the County are associated with steep and unstable slopes. Both Benton County and Yakima County designate areas of steep slopes as critical resources. These areas are associated with

landslides, slumps, unstable soils, and severe erosion. Figure 3.10-2 shows the areas of steep slopes (greater than 15 percent) in the study area. Slopes of up to 65 percent can be found in the Rattlesnake Hills (U.S. Department of Agriculture [USDA], 1971). Mass soil failure occurs when the shear strength of a soil is less than the shear stresses acting on it. Factors associated with increased shear stress include slope steepness, wet soils, geology and soil types susceptible to failure, and vegetation removal (Satterlund and Adams, 1992). Slope steepness is likely the most important cause for mass soil failure. Historic mass soil failure activity has occurred in the study area as evidenced by localized landslide deposits identified in Township 11 N, Range 24 E, Sections 17 and 18. The potential for slope failure, or mass soil failure, is present in the areas of steep slopes shown in Figure 3.10-2.

3.10.3.4 Near-Surface Soils

The near-surface soils within the study area were identified using the U.S. Department of Agriculture SCS Soil Survey of Benton and Yakima Counties (USDA, 1971; USDA, 1979). For purposes of discussion, the near-surface soils within the study area are grouped into two general soil associations, the Walla Walla-Endicott-Lickskillet and the Lickskillet-Starbuck soil associations. The soils within these associations are comprised of several distinct soil types that occur in similar areas and share relatively similar characteristics and engineering properties. One soil type in the study area is considered to be a prime soil—Walla Walla silt loam (WaB) on 0 to 5 percent slopes. Prime soils are those with sufficient depth, moisture, and nutrients to allow crops to achieve their maximum growth potential.

General soil associations in the study area are presented in Figure 3.10-3. The soil distributions depicted in the figure represent conditions in 1964 and 1979 (the most recent information available) in Benton and Yakima Counties. The apparent change in soil type along the county line in Figure 3.10-3 is due to the use of slightly different soil associations in each county study. The Walla Walla-Endicott-Lickskillet association is identified in the Benton County soil survey and consists of gentle to steeply sloping silt loam soils to very stony silt loam soils. These soils range in thickness from very deep to shallow over basalt bedrock. Walla Walla soils range in depth from 0 to 60 inches, Endicott soils range in depth from 0 to 20 inches, and Lickskillet soils range in depth from 0 to 22 inches. In the study area where these soils are shallow and steeply sloped, the vegetation is generally grass and sagebrush.

The Lickskillet-Starbuck soil association is identified in the Yakima County soil survey and consists of nearly level to steeply sloped silt loam soil to very stony silt loam soils. These soils are generally located on uplands, are well drained, and are approximately 12 to 20 inches deep.

3.10.3.5 Gravel Resources

According to the *Benton County Comprehensive Land Use Plan*, mineral resources in Benton County are "aggregates," i.e., sand and gravel deposits and crushed quarry rock typically used for building and road construction. Onsite gravel extraction is an allowable use under Benton County Code Section 11.18.060 (uses requiring permits with director review and approval required), and are subject to appeal to the Benton County Board of Adjustment. The majority of the sand and gravel mineral sites in the County are located along the

Yakima River. These sources have a limited supply of material that is in high demand by the construction industry.

Unlike the sand and gravel sources, quarry rock is in ample supply but not all of it is high-grade material or is close enough to the ground surface to economically extract (Benton County, 1998). The project developer plans to obtain aggregate materials from an existing quarry located in the eastern portion of the study area and to develop a new quarry site in the western portion of the study area (see Figure 2.1.2). Should insufficient quantity or quality of quarry material be available, aggregate would be obtained from existing local sources in the area.

3.10.4 Impacts of the Proposed Action

3.10.4.1 Evaluation Criteria

- Impacts would be considered **high** (and significant) if construction or operation of the project resulted in landslides or mass soil failure, flooding, severe soil erosion or compaction, or permanently altered or inhibited natural drainage patterns; or if these events caused substantial damage to project facilities or other property. Geology impacts also would be considered high if the project caused, or was damaged by, earthquakes, landslides, erosion, excessive soil compaction, or other detrimental seismic and slope-related events.
- Impacts would be considered **moderate** if the project did not cause landslides, if standard soil management techniques would control erosion to acceptable levels, if soil compaction in localized areas resulted in a small amount of lost agricultural productivity, or if moderate damage occurred to project facilities due to earthquakes.
- Impacts would be considered **low** if standard soil management techniques held erosion levels to near existing levels, or if slight damage occurred to the project facilities because of seismic events.

3.10.4.2 Construction Impacts

Geologic Formations.

Construction of the project would alter the landscape with cuts-and-fills for roadways, installation of underground power lines, and leveling for turbine foundations. Because roads and turbine foundations would be designed and engineered according to the UBC, and would be subject to an erosion control plan, it is likely that project facilities would be constructed with more protections against erosion than currently exist in the study area. The use of an existing quarry and development of a new quarry also would temporarily alter the topography at these locations. These alterations would result in low impacts to existing topography and surface drainage with implementation of the best management practices described below.

Standard approved construction practices and erosion management techniques would be employed to prevent and control erosion, and are addressed as mitigation, below. Because standard erosion control measures would be implemented, impacts to geologic formations would be low, and additional mitigation measures would not be required.

Faults, Seismic Hazards, and Slope Stability.

Seismic impact hazard during construction would be negligible. The probability that the crustal faults in the study area are active is relatively low, and, therefore, the potential for fault offsets during a large earthquake also appears to be low (Geomatrix, 1995, 1996). In addition, the study area is not generally susceptible to liquefaction or lateral spreading. The likelihood of a significant earthquake event occurring during construction of project facilities is extremely remote and no impacts would result.

Steep slopes and landslide-prone areas are present in the study area. Historical landslide activity has been identified in localized areas in the greater project vicinity. No project facilities would be constructed at the landslide locations. Benton County's Critical Areas Protection Ordinance requires that these hazards be identified and considered in facility siting and design to ensure long-term structural integrity (Benton County, 1998). The ordinance requirements would be adhered to; therefore, there would be low to negligible impact from these potential geologic hazards.

Near-Surface Soils.

Soil erosion potential in the study area is typically moderate to high with the presence of existing vegetation. Due to steady, high wind speed, areas of vegetation removal would expose soils to accelerated water and wind erosion until stabilized. Repeated equipment and haul truck traffic could cause soil compaction over a limited area. Due to the thin soil horizon and limited water, the land within the study area is mainly suitable for rangeland grazing and dryland wheat farming. The limited areas of potential soil compaction resulting from construction activities are not likely to result in a significant amount of lost agricultural productivity. Because standard approved construction practices and erosion management techniques would be employed to prevent and control erosion, impacts would be considered low to moderate.

Gravel Resources.

The project would require a substantial amount of gravel for access roads and concrete for foundations. Currently, the option for supplying the required building aggregate would be to use one existing quarry pit and to develop a new quarry pit in the study area. A mobile crusher would be brought to the quarry sites and used to reduce the rubble to the required gradations. Concrete batch plants would be co-located with the quarry pits.

Permitting requirements for quarry development and operation are generally based on the size of the quarry. Quarries in Benton County that are 3 acres or less require a mineral resource permit from the Benton County Planning/Building Department. Quarries greater than 3 acres in size, with highwalls greater than 30 feet with 1:1 slopes, require a surface mining permit from DNR. The project may qualify for the DNR onsite construction exemption, which allows quarry development greater than 3 acres, under specific conditions, without a surface mining permit. Conditions of the onsite construction exemption are as follows:

- The quarry must be located onsite.
- The quarry materials can only be used onsite.
- The quarry must be reclaimed under an approved reclamation plan.

Quarries developed under the onsite construction exemption can be as large as necessary; however, if the quarry exceeds the 30-foot (1:1 slope) highwall criterion, a surface mining permit must be obtained. Discussions with DNR would be necessary to confirm that the onsite construction exemption could be applied to the project.

Additional quarry permit requirements may include obtaining a sand and gravel permit from Ecology. Ecology's interest in quarry development and operation is generally focused on stormwater and air issues. Discussion with Ecology would be necessary to determine if a sand and gravel permit would be necessary.

The size of each quarry/batch plant is anticipated to be approximately 8 acres. Impacts from gravel production at each quarry site would include temporary disturbance of land within the 8-acre area. Specifically, areas in the vicinity of the batch plant, crusher, stock-piles, and along access roads would be disturbed. Other impacts would include increased soil compaction potential due to haul trucks, and dust production from the crusher operation and truck traffic. With the mitigation discussed below, construction impacts would be considered low at the existing quarry site and moderate at the new quarry site.

Mitigation. Roads would be designed by a licensed professional engineer and the turbine foundations would be designed and engineered according to the Uniform Building Code. Standard approved construction practices and erosion management techniques would be employed to prevent and control erosion (also discussed in Section 3.8, Water Resources and Wetlands). These practices and management techniques include:

- Minimizing vegetation removal
- Avoiding construction on steep slopes or areas designated as having a high susceptibility of erosion
- Properly designing cut-and-fill slopes
- Installing roadway drainage to control and disperse runoff; ensuring that access roads contain pervious, gravel surfaces
- Applying erosion control measures such as silt fencing, straw mulch, straw bale check dams, and soil stabilizers, as well as reseeding disturbed areas as required
- Apply stabilization measures such as temporary seeding, permanent seeding, vegetative buffer strips and other appropriate practices, and structural measures such as silt fences, sediment traps, and drainage swales
- Minimizing construction and increasing gravel cover on roads during wet weather to reduce potential rutting and soil loss.

In addition, haul truck traffic would be limited to improved road surfaces, minimizing soil compaction and disturbances. The project developer would comply with all land use permit requirements. All disturbed areas would be reclaimed (restored) at the completion of construction activities as outlined in a DNR/Benton County-approved reclamation plan. Water trucks would be used to control dust produced by the construction, as described in Section 3.12, Air Quality.

3.10.4.3 Operation Impacts

Geologic Formations.
Slightly increased runoff water would be produced due to the addition of up to 44.5 miles of gravel access roads and new impervious area from turbine pads and O&M buildings. However, implementation of an erosion control plan would eliminate the potential for significant erosion during operation. Regular maintenance of drainage facilities would ensure continued proper operation. Impacts to topography and surface drainage during operation and maintenance of the project would be low.

Faults, Seismic Hazards, and Slope Stability.
The project would operate in an area with potential for earthquake events that are considered of low risk. Because the majority of the project would be located in upland areas where saturated soils are not typically present, liquefaction and lateral spreading do not pose significant risks to the project. Landslides in steeply sloped areas could be triggered during an earthquake due to ground shaking and could potentially impact the project facilities. However, the area is considered to have low to moderate potential for such events. No project facilities would be constructed on historical landslide locations; therefore, the impacts from these geologic hazards would be low.

Near-Surface Soils.
Operation and maintenance activities would take place on newly constructed roadways and other existing roads. New impervious areas (i.e., operation and maintenance buildings) may cause a slight increase in runoff water. Daily operational activities would not negatively affect soil erosion by wind or water. The wind turbines would not slow winds in the area or impact the natural soil erosion process caused by high winds.

Standard erosion control measures, as discussed in Section 3.10.4.2, would be implemented to prevent impacts from operation of the project. Roadways would be gravel, limiting the impact from water and wind erosion hazards. Stormwater would be collected and channeled to natural drainage paths to minimize its impact. Impacts to near-surface soils due to operational activities would be low.

Mitigation. All facilities would be designed to current seismic standards for the 1997 UBC seismic zone 2B. Slope stability hazards would be identified and incorporated into the facility design as necessary.

3.10.4.4 Decommissioning Impacts

Geologic Formations.
Decommissioning would consist of removing all facilities to a depth of 3 feet below grade with unsalvageable materials disposed of at authorized waste disposal sites. Reclamation procedures would be based on site-specific requirements and techniques commonly used at the time of decommissioning, and would likely include regrading, topsoiling, and revegetation of all disturbed areas. Road decommissioning would be completed according to the preference of the landowners. It is likely that most roads would be left in place. Therefore, the recovery of the majority, if not all, of the disturbed areas would result in a low impact to topography and surface drainage.

Faults, Seismic Hazards, and Slope Stability.
Decommissioning the project would reclaim the area to near its original state and no impacts would occur. The likelihood of a significant earthquake event occurring during decommissioning of project facilities is extremely remote.

Near-Surface Soils.
Impacts to near-surface soils during decommissioning activities would be low; impacts after decommissioning would be negligible. Soil erosion potential in the study area is typically moderate to high with the presence of existing vegetation. Due to steady, high wind speed, areas of project facility removal would expose soils to accelerated water and wind erosion until stabilized. Repeated equipment and haul truck traffic would cause negligible soil compaction.

3.10.5 Impacts of the No Action Alternative

Under the No Action Alternative, geology, seismicity, and near surface soil impacts would not occur. Other power generation facilities could be built in the region, most likely a gas-fired CT. Construction and operation of a gas-fired CT would have the potential for similar types of geology and soil impacts as the proposed project. The proposed project has the potential for greater soil erosion than a combustion turbine plant because of the number of roads required to develop the wind farm.

3.11 Socioeconomics and Public Services

3.11.1 Regulatory Framework

There is no regulatory framework for socioeconomic analyses except for environmental justice. In February 1994, Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low Income Populations, was released to federal agencies. This order directs federal agencies to incorporate environmental justice as part of their missions to the greatest extent practicable and permitted by law. As such, federal agencies are specifically directed to identify and address, as appropriate, disproportionately high and adverse human health effects of their programs, policies, and activities on minority and low-income populations.

Public services and utilities in the study area are regulated by ordinances and policies set forth by Yakima and Benton Counties.

3.11.2 Study Methodology

For general trends analysis, the study area includes all of Benton and Yakima Counties. For specific impacts, the study area includes those communities potentially affected by the project within a distance of 15 miles.

Information about socioeconomics and public services is based on review and analysis of a variety of demographic and other information from Yakima County, Benton County, Sunnyside, Grandview, and Prosser, and discussions with local agency staff. Information sources for this socioeconomic analysis include:

- U.S. Census Bureau Web site (http://www.census.gov)

- Washington State Labor Market and Economic Analysis Web site (http://www.wa.gov/esd/lmea/)
- Washington State Office of Financial Management Web site (http://www.ofm.wa.gov/)
- Yakima County Assessor's Office Web site (http://www.co.yakima.wa.us/assessor/assessor.htm)
- Harriet Mercer, Benton County Assessor's Office
- Kim Bolt, Prosser School District
- Grandview School District
- Ruben Carrera, Sunnyside School District
- Tri-City Industrial Development Council

3.11.3 Affected Environment

The proposed project would be located in a rural agricultural area with low population density. The population centers closest to the project site are the cities of Sunnyside, about 10 miles to the southwest, Grandview, about 10 miles to the south, and Prosser, about 15 miles to the south. Larger cities nearby and easily accessible by road are Yakima, about 50 miles to the west, and Richland, about 30 miles to the east.

3.11.3.1 Employment

Benton County's largest employment sectors are services, retail trade, government, public utilities and transportation, and agriculture. Yakima County's largest employment sectors are services, agriculture, government, retail trade, and manufacturing.

Between 1991 and 2000, employment in Benton County grew by 10,400 jobs, or 16.94 percent. The percentage of the labor force unemployed in 2000 was 6.4 percent. Between 1991 and 2000, employment in Yakima County grew by 7,100 jobs, or 6.99 percent. The percentage of the labor force unemployed in 2000 was 10.6 percent (Washington State Employment Security Department, 2001).

Continued employment growth is projected for the future. Between 1998 and 2008, a 14 percent increase in total non-farm employment is projected for Benton County (this percentage includes the Tri-Cities area, which covers other counties). Between 2001 and 2006, a 7.8 percent increase in total non-farm employment is projected for Yakima County.

3.11.3.2 Population

Population in Benton and Yakima Counties has increased steadily in the past 30 years. The total population of Benton County for 2000 was 142,475; the population of Yakima County was 222,581. Table 3.11-1 shows study area demographics with respect to race, ethnicity, and poverty status. Data are from the 2000 U.S. Census.

TABLE 3.11-1
Study Area and County Demographics (2000 U.S. Census Data)

Demographic Group	Benton County		Yakima County	
	Number[1]	Percent of Population	Number	Percent of Population
Households	52,866	NA	73,993	NA
Population	142,475	100%	222,581	100%
White	122,879	86.2%	146,005	65.6%
Black	1,319	0.9%	2,157	1.0%
American Indian, Eskimo, or Aleut	1,165	0.8%	9,966	4.5%
Asian or Pacific Islander	3,297	2.3%	2,327	1.1%
Other race	13,815	9.7%	62,126	27.9%
Hispanic origin [2]	17,806	12.5%	79,905	35.9%
1998 Median household income	$	44,219	$	31,522
Persons below 1997 poverty level[3]	12,859	9.3%	40,192	18.3%

Notes:
[1] The percent of population numbers may add up to more than the total population and the six percentages may add up to more than 100 percent because individuals may report more than one race.
[2] Hispanic origin is not a racial category. It may represent ancestry, national group, or country of birth. Persons of Hispanic origin may be of any race.
[3] U.S. Census Bureau, Housing and Household Economic Statistics Division, Small Area Estimates Branch.
NA = not applicable.

3.11.3.3 Housing

A variety of housing exists in the study area and there are numerous homes for rent and for sale. The median home price in Benton County as of September 2001 was $119,000 (Mercer, 2001). The median home price in Yakima County in 2000 was $112,904 (Wilbert, 2001). At present, temporary lodging in the study area includes 12 motels and bed and breakfasts.

3.11.3.4 Schools

Yakima County is divided into fifteen public school districts. Two districts, Sunnyside and Grandview, are located in the general project vicinity. Benton County is divided into seven public school districts, with Prosser being the closest to the project site. The approximate total school enrollment of the three districts is 10,970. Several private and parochial schools also are located within 15 miles of the project site.

Post-secondary schools in Yakima County include Yakima Valley Community College, which has campuses in Grandview, Yakima, and Goldendale. Post-secondary schools in Benton County include branch campuses of Washington State University and City University, which are both located in Richland.

3.11.3.5 Local Government Taxation and Revenue

A variety of taxes are collected by the various levels of government in Washington. Washington has no income tax and relies on consumer taxes, including the retail sales tax, for revenue. Property taxes are another source of revenue and are collected by each county for local jurisdictions with taxing authority. Property owners in the study area are assessed taxes for public services such as police and fire, roads, and schools.

3.11.3.6 Public Facilities and Services

The proposed project would be located in an unincorporated area. No accessible public facilities or infrastructure (with the exception of county roads) are located on the proposed project site. Utilities crossing the study area include BPA's 500-kV and 230-kV overhead transmission lines. There are no known gas pipelines or county water supply or wastewater treatment facilities on the project site. Some landowners may have private irrigation lines within the study area.

The nearest fire service to the western portion of the project site is provided by the Sunnyside Fire Department (Sunnyside Fire District #5), which would provide fire service to the portion of the project in Yakima County. The Benton County Fire Department in Prosser (Benton County Fire District #3) provides fire service to a small portion of the project site. The majority of the project site is not currently included in a county fire district. Private ambulance service is available from Yakima and Benton Counties. Police services are provided by the respective county Sheriffs' Departments.

3.11.4 Impacts of the Proposed Action

3.11.4.1 Evaluation Criteria

Socioeconomic impacts associated with the proposed project were assessed as **beneficial**, **adverse**, or **no impact**.

A **beneficial** socioeconomic impact would provide employment, increase tax revenues, increase property values, increase revenue from rents and home sales, or create other enhancing effects on the social and economic vitality of the nearby communities.

An impact on socioeconomics would be considered **adverse** if it resulted in:

- Population growth beyond the capacity of affected communities to provide adequate housing and public services or to otherwise adapt to growth-related social and economic changes
- More than a 10 percent decrease in a taxing district's annual tax revenue (for example, from changes in assessed property value or from adding or removing property from the tax rolls)
- Revenue flows and expenditures by local, county, or state governments that are inadequate to maintain public services and facilities at established levels
- Any permanent displacement of residents or users of affected areas
- Perceived detrimental changes in existing ways of life
- Substantial change in current or projected employment trends in the study area (such as a "boom and bust" cycle of employment) and related economic growth and decline
- Disproportionately high adverse effects to minority and low-income populations.

3.11.4.2 Construction Impacts

Employment.
Because the proposed project is located in two counties, it is likely local workers from both Benton and Yakima counties would be hired for construction jobs. Full project construction is anticipated to take about 9 months, with preconstruction activities beginning in summer 2002. During construction, an estimated average of 150 people would be employed at the site, with a maximum of 350 during peak periods. The average wage for construction workers would likely be from $15-$25 per hour. Most workers would be employees of construction and equipment manufacturing companies contracted by the project developer. For the purposes of analysis, it is assumed that approximately 50 percent of construction workers would be hired locally and the remainder would be from outside the area. This represents about 0.1 percent of total employment in the two counties. There would be a slight beneficial impact on employment if workers were hired locally. Local hiring would depend upon the availability of workers with appropriate skills.

Population.
Population in the study area would change little as a result of constructing the project. Assuming conservatively that only 50 percent of the 350 maximum construction workers would be local residents (Sunnyside, Grandview, Prosser, Tri-Cities, and Yakima), about 175 new workers would be temporary residents (in-migrants) of the project vicinity. This represents about 0.05 percent of the total population in the two counties. These residents would likely settle over a dispersed geographic area. No adverse impacts would be expected.

The proposed project has been evaluated for potential disproportionately high environmental effects on minority and low-income populations. There would not be human health or environmental impacts on minority and low-income populations from the proposed project because the project would be located on private property and not in the vicinity of any low-income or minority populations. Impacts associated with the proposed project would not have an adverse effect on minority or low-income segments of the population. These individuals could experience a beneficial impact from construction of the project if they became part of the workforce.

Housing.
Based on employment projections for the project, and assuming an average household of 2.0 workers during the peak construction period, up to 88 temporary housing units could be required. Because the project is located in two counties and there are a variety of housing types and locations available, it is not known where temporary construction employees would settle. Temporary workers frequently choose short-term housing options including campgrounds (where workers can park trailers or other mobile housing), motels and hotels, and other short-term rentals. These facilities are available in the general project vicinity. No adverse impacts on housing in nearby communities are anticipated from the proposed project.

Schools.
No impacts on schools are anticipated as a result of temporary residents associated with the project. Temporary workers would be employed primarily during the summer months when school is not in session. Given the number of schools available in the study area and

the small number of temporary residents, it is unlikely that any one school would receive more new students than could be accommodated. Impacts would be low.

Public Facilities and Services.
The need for firefighting, medical, and police services at the project site could increase during construction as a result of the number of vehicles and employees on the site. Medical and police services would not need to be expanded by adding additional personnel or equipment. In the event that medical or police services are needed on the project site prior to road construction, access for emergency and police vehicles could be difficult. An emergency response plan would be prepared and kept onsite and personnel would be trained in basic emergency procedures. No adverse impacts to public facilities and services are anticipated as a result of the project.

Construction of the proposed project could increase the potential for fires due to typical construction activities such as installation of electrical equipment, increased traffic, and use of vehicles on the project site, especially in the summer when vegetation is dry. Because portions of the proposed project site are not located in a fire protection district, a fire emergency plan would be developed prior to project construction and submitted to Benton and Yakima County fire marshals for approval and shared with the Hanford Fire Department. Because firefighting services would be provided primarily by the project developer, there would be no impacts to local fire districts. Section 3.13, Public Health and Safety, provides additional information on fire safety.

3.11.4.3 Operation Impacts.

Employment.
Up to 15 full-time operation and maintenance staff would be permanently employed at the project site. Average wages for these long-term staff are estimated to range from $10-$25 per hour. Most of the staff would be hired locally, with the exception of one or two supervisors with experience at other wind generation facilities. Some specialized outside contractors may also be required on occasion. It is assumed that project operations would begin in winter 2002-2003 and would operate year-round for at least 20 years.

The number of new permanent full-time jobs created by the project would be less than 0.02 percent of total county employment for either Benton or Yakima County. Because the project and the jobs would be located in a rural area of the county, they would not affect the employment base of a specific city or town. The permanent jobs created through the project would result in very minor long-term benefits to overall county employment. No adverse impacts on county employment would be anticipated.

Population and Housing.
An estimated maximum of 15 permanent employees could be hired for operation and maintenance positions. Assuming conservatively that five (33 percent) of these employees would be in-migrants and an average household of 3.0 (higher than for temporary employees), as many as 15 new permanent residents could be added to the population. Given that the number of permanent employees would be very small compared to overall county population, no impacts on population are anticipated. The project would have a minor beneficial financial impact on the local economy through purchases of goods and services and increased property tax revenues.

The proposed project has been evaluated for potential disproportionately high environmental effects on minority and low-income populations. There would not be human health or environmental impacts on minority and low-income populations from the proposed project because the project would be located on private property and not in the vicinity of any low-income or minority populations. Impacts associated with the proposed project would not have an adverse effect on minority or low-income segments of the population. These individuals could experience a beneficial impact from operation of the project if they become part of the workforce.

Schools.
The addition of up to 15 new permanent residents would have a negligible impact on schools.

DNR would receive lease payments from the project developer for the portion of the project on DNR lands. This would result in a beneficial impact to local school districts because they would receive the income from the lease payments.

Local Government Taxation and Revenue.
Although specific information about the value and finances of the proposed project is confidential, wind generation typically costs from $800,000 to $1 million per MW energy capacity. The maximum build out of the 494-MW project would represent an investment of about $445 million. It is estimated that about 10 percent of that total project investment would be spent on goods and services locally. Thus, about $44 million would be added to the local economies of Benton and Yakima Counties in the form of goods and services purchased as part of project construction. This would be a beneficial impact. However, the purchase and installation of machinery and equipment for wind generation facilities are exempt from sales tax under Washington Administrative Rules (¶68-663 WAC 458-20-263). Therefore, no new sales taxes would be generated directly by the project.

All project facilities would be placed on property leased from landowners. The assessed value of affected properties would increase when project facilities are added. This would lead to an increased tax base for Yakima and Benton Counties based upon the assessed property values. Values would depend on market conditions, tax benefits, incentives, or similar programs that may apply to this type of project, and actual property tax revenues could vary but would likely have a beneficial impact to county revenues. Landowners would be compensated for the use of their property and for any increases in property taxes by the project developer.

Public Facilities and Services.
The slight population increase associated with the project would not require the construction or expansion of new community facilities or infrastructure in local communities. No adverse impacts would be anticipated.

The proposed project would require electricity, water, telephone, and sewer services, none of which are currently available on the project site. However, because these services are readily available in the project vicinity, there would be no impact to these service providers as a result of the project. Electricity would be provided by the project itself and/or the local utility district, Benton REA. Telephone service would be provided by various companies. There is sufficient water for the project as discussed in Section 3.8, Water Resources and

Wetlands. Sewage from the operations and maintenance buildings would be treated with an onsite septic system that would be developed according to Benton County requirements. Solid waste would be collected and disposed of in compliance with all applicable regulations. No adverse impacts to service providers are expected.

Impacts to fire, medical, and police services would be similar to those described for construction of the proposed project and would not be adverse.

3.11.4.4 Decommissioning Impacts

Upon decommissioning, up to 15 full-time jobs created as part of the project would be eliminated. It is assumed that persons employed in these jobs would seek employment from other sources and that this loss of employment would have an adverse impact on the individuals involved. However, the number of jobs eliminated would be extremely small compared to the number of jobs in Benton and Yakima Counties as a whole. Therefore, a very minor adverse impact to county employment would be anticipated as a result of the proposed project.

If the project were decommissioned (instead of being "repowered" with more modern equipment) and facilities removed from properties, 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 removal of most project facilities and reclamation of disturbed areas. These activities would result in beneficial but temporary construction employment similar to that projected for facility construction.

3.11.5 Impacts of the No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated. The counties would not benefit from the tax revenues and employment opportunities resulting from the proposed project.

If the proposed project were not constructed, the region's power needs could be delivered through development of other generation facilities, most likely gas-fired CTs. Although the impacts of a CT would depend on its location, the socioeconomic impacts would likely be of a similar magnitude to the proposed project. BPA's RPEIS shows that a CT generating about 150 aMW would employ about 27 people, almost double the projected operation employment for the proposed project.

3.12 Air Quality

3.12.1 Regulatory Framework

Both the federal government (through EPA) and the state government (through Ecology) regulate and permit sources of air emissions. In Benton County, the authority to regulate and permit sources of air emissions has been delegated to the Benton Clean Air Authority (BCAA) and in Yakima County to the Yakima Regional Clean Air Authority (YRCAA). EPA has established National Ambient Air Quality Standards (NAAQS) for certain pollutants, which 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 improve the air quality to the standards. Rules have been established by the various regulatory agencies previously mentioned for permitting of new sources in both attainment and nonattainment areas of the state. In general, if potential emissions from stationary sources exceed certain thresholds, approval from the local agency is required before beginning construction. The proposed project would not be required to go through the permitting process because wind turbines have no emissions and therefore do not exceed thresholds for regulated pollutants.

Mobile sources (for example, construction equipment and maintenance vehicles) are regulated separately under the federal Clean Air Act, such as through vehicle inspection and maintenance programs, and are not included when determining if a source requires permitting.

According to WAC 173-400-300, "fugitive" air emissions are those that "do not pass 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 generation plants.

Construction emissions are not included in permitting of stationary sources. Only emissions from operations are considered in the new source permitting program.

Regulation 3 of the YRCAA rules requires a construction dust control plan to be filed with, and approved by, the YRCAA. Additionally, in Regulation 3, reasonable precautions must be taken to prohibit the transport of dust. The BCAA does not require a construction dust control plan to be filed, unless it is specifically requested by another party.

3.12.2 Study Methodology

The study area for air quality consists of Benton and Yakima Counties, Washington. The analysis of air quality impacts consisted of a review of applicable regulations and information on existing attainment areas, followed by a qualitative review of project impacts.

3.12.3 Affected Environment

The study area is classified as attainment for all pollutants. This means that the ambient air quality standards, as established by EPA, are met in the study area.

Dust storms are a problem in the project vicinity. Agricultural development in the area, particularly crops not requiring irrigation, has contributed to the dust storms. EPA issued a policy for air pollution from natural events in June 1996, which states that natural events would not cause an area to be designated nonattainment, provided a plan is in place to respond to public health effects from human-made sources of particulate matter (such as plowed fields) (EPA, 1996).

3.12.4 Impacts of the Proposed Action

3.12.4.1 Evaluation Criteria

- Air quality impacts would be considered **high** (and significant) if the proposed project created noticeable or measurable air emissions that exceeded NAAQS.
- Air quality impacts would be considered **moderate** if the proposed project created noticeable or measurable air emissions that did not exceed NAAQS, and which could be partially mitigated with standard control practices.
- Air quality impacts would be considered **low** if the proposed project created small amounts of noticeable or measurable air emissions that did not exceed NAAQS, which could be substantially mitigated with standard control practices.

3.12.4.2 Construction Impacts

The air quality impacts from construction of the project would be temporary and low, and would be limited to vehicle emissions and fugitive dust emissions. Vehicle emissions would occur from construction vehicles, such as trucks, bulldozers, and portable cement mixers. Fugitive dust emissions would be caused by disturbing the land for construction of project facilities. As long as reasonable precautions are taken to minimize fugitive dust emissions, EPA considers windblown dust to be a natural event that does not contribute to the nonattainment status of an area.

Mitigation. Prior to construction, a dust control plan would be submitted for approval by the YRCAA and the BCAA, in accordance with their regulations. The plan would be implemented to reduce the impact of construction dust, including watering gravel roads to suppress nuisance levels of dust, as appropriate.

3.12.4.3 Operation Impacts

The generation of electricity with wind turbines does not produce air emissions. During operation of the project, limited amounts of fugitive dust emissions would be caused by traveling on the gravel access roads. However, the number of vehicle trips associated with ongoing operations and maintenance would be limited and it is unlikely that the resulting dust would reach nuisance levels.

Operation of the proposed project would not result in emissions that exceed the significant emission rates and would not contribute to violations of the NAAQS. Impacts to air quality from operation of the project would be low.

3.12.4.4 Decommissioning Impacts

Impacts during decommissioning of the project would be similar to those described for construction. However, access roads may be left in place so impacts would likely be lower. Mitigation in use at the time of decommissioning would be implemented and would likely be similar to that recommended for construction.

3.12.5 Impacts of the No Action Alternative

Under the No Action Alternative, the project would not be built and temporary dust from construction and operation activities would not occur.

The most likely resources to be built in the region would be combined cycle CTs. BPA's RPEIS estimated emission rates of CTs on a per aMW per year basis at 5.81 tons of nitrogen oxides and 3,904 tons of carbon dioxide. Although improvements in air emission control technology and the increasing stringency of air quality permit requirements by state agencies have led to lower emission rates, CTs still remain a significant source of air emissions.

Nitrogen oxides contribute to ozone generation in the lower atmosphere and carbon dioxide is considered a greenhouse gas. In addition to the emissions from generation itself, a gas turbine generation facility also would have emissions of sulfur oxides, nitrogen oxides, and particulates associated with the extraction of natural gas and transportation by pipeline.

3.13 Public Health and Safety

3.13.1 Regulatory Framework

A variety of federal and state safety regulations and guidelines would apply to project design and construction. Federal safety regulations are issued under the authority of the Occupational Safety and Health Act. State safety regulations are issued under the Washington Industrial Safety and Health Act. In addition, the National Electrical Manufacturers Association and the Institute of Electrical and Electronics Engineers issue standards for the design of electrical equipment and controls. The Yakima County Building Code, Title 13 Buildings and Construction, provides standards for life, health, property, and general public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, placement, repair, and maintenance of all buildings and structures within Yakima County. The Benton County Building Code, Title 3, Building and Construction also provides safety standards for building and construction in Benton County.

The federal regulation governing the handling of hazardous materials that would potentially be applicable to the project is 40 CFR 112 (Spill Prevention Control and Countermeasures). Whether this regulation applies to the project would depend on the exact quantities and type of hazardous materials stored on the site. Regulations would be enforced by Ecology. Materials that potentially would be considered hazardous are batteries used in the substations, mineral oil used as a coolant in substation transformers, fuel for vehicles, cleaning solvents, and lubrication fluids. New transformers do not contain polychlorinated biphenyls (PCBs). In addition, development of a Hazardous Materials Management Plan in accordance with the *Uniform Fire Code* would be required by the local fire districts.

The FAA establishes requirements for towers and other tall structures that could potentially interfere with aircraft safety. The FAA generally regulates structures 200 feet and higher and may require that they be lighted for aircraft safety. The FAA requires a Notice of Proposed Construction or Alteration be filed for this project.

This section discusses potential health and safety risks associated with construction, operation, and decommissioning of the project. Health and safety risks consist of those that could be experienced by construction and O&M personnel at the facility, as well as by the general public.

3.13.2 Study Methodology

The study area relevant to health and safety includes the project site and the roads in the surrounding area that would be used to access the site for construction and operation.

The primary sources of information for this section are published information and discussions with individuals experienced with general construction and the types of health and safety risks related to major wind energy construction projects.

3.13.3 Affected Environment

The project site is located in a sparsely populated rural agricultural area consisting of rangeland and wheat farms, with some relatively steep hillsides. Potential hazards on the site include the fire hazard presented by dry crops and grasses (especially in the summer months), steep hills, and utility crossings.

3.13.4 Impacts of the Proposed Action

Potential health and safety risks associated with construction and operation of the proposed project could include personal injury, electrical shock, fires, hazardous materials spills, and general worker safety. Two conditions must exist to create a health or safety risk: a potential hazard (such as an open ditch or flammable materials) and exposure of an individual to the hazard in such a way as to result in a health effect.

3.13.4.1 Evaluation Criteria

- Impacts to health and safety from the proposed project would be considered **high** (and significant) if exposure to a site-related hazard resulted in a substantial increased risk to human health and safety for site personnel or the general public, assuming those exposed were following site safety procedures and obeying applicable laws (for example not trespassing).
- Impacts to health and safety from the proposed project would be considered **moderate** if exposure to a site-related hazard resulted in some risk to human health and safety for site personnel or the general public (assuming those exposed were following site safety procedures and obeying applicable laws).
- Impacts to health and safety from the proposed project would be considered **low** if exposure to a site-related hazard resulted in a minor risk to human health and safety for site personnel or the general public (assuming those exposed were following site safety procedures and obeying applicable laws).

3.13.4.2 Construction Impacts

Potential health and safety risks to workers during project construction include risk of electric shock from electrical equipment and power lines; fire hazards; hazardous materials spills (for example, fuel tanks); and injury associated with the use of heavy equipment and installation of elevated structures. Implementation of a health and safety plan and fire prevention plan would ensure that impacts would be low.

Construction of the proposed project could increase the potential for brush fires, particularly in the summer months, due to typical construction activities such as installation of electrical

equipment, increased traffic and use of vehicles on the project site, and the addition of up to 350 employees accessing the site during construction. This would be considered a low to moderate impact.

Potential health and safety risks to landowners and the general public could occur during construction. However, access by the general public would be considered trespassing on private property. Assuming observance of private property, no health and safety impacts to landowners or the general public would be anticipated as a result of construction activities.

Mitigation.
To reduce the potential for health and safety risks, the project developer would require that all onsite construction contractors prepare a site health and safety plan before initiating construction activities. The plan would inform employees and others on site what to do in case of emergencies. The plan would include the locations of fire extinguishers and nearby hospitals, important telephone numbers, and first aid techniques. The plan would be maintained during the life of the project. Accidental injury would be minimized by:

- Maintaining fencing and access gates around dangerous equipment or portions of the site as feasible
- Posting warning signs near high-voltage equipment
- Offering specific job-related training to employees, including cardiopulmonary resuscitation, first aid, tower climbing, rescue techniques, and safety equipment inspection
- Requiring each worker to be familiar with site safety
- Assigning safety officers to monitor construction activities and methods during each work shift
- Ensuring that workers on each shift are certified in first aid
- Ensuring that a well-stocked first-aid supply kit is accessible on site at all times and that each worker knows its location
- Conducting periodic safety meetings for construction and maintenance staff.

If indicated, additional prevention measures such as briefings with local hospitals and emergency service providers, identification of an emergency helicopter or aircraft landing area, and coordination with local fire officials, could be included.

Because a significant portion of the proposed project site is not currently located within a county fire protection district, a fire emergency plan would be developed prior to project construction and submitted to Benton and Yakima County fire marshals for approval. It would also be shared with the Hanford Fire Department. This plan would outline onsite fire prevention and suppression methods that would be used during the construction period. The plan would require onsite water tanks containing sufficient water to fight grass fires (as determined by the fire districts). The plan would require that workers be instructed in basic fire suppression techniques, vehicle traffic be limited to access roads and gravel areas, and smoking be permitted only inside vehicles. With implementation of these

measures and approval of the fire emergency plan by local fire agencies, the risk of fire-related impacts would be low.

Potential risks to landowners would be minimized by coordinating construction activities with access needs and landowner schedules. Unauthorized visitors would be discouraged during construction hours by the presence of construction workers, warning signs, and gates.

3.13.4.3 Operation Impacts

Potential health and safety risks to workers during operation and maintenance of the project include the potential for electric shock from working in the vicinity of electrical equipment and power lines; the potential for injury related to maintenance of elevated structures such as transmission towers that are accessed with ladders or cranes; and the potential for fire resulting from maintenance activities. Impacts would be considered low to moderate.

Potential health and safety risks to landowners would be minimized by coordinating maintenance activities with access needs and schedules of the landowners. Because the project site is primarily on private property and is remotely located, there is little potential for unauthorized access. Onsite maintenance personnel would discourage unauthorized access to and use of the site; however, public access to the site would be possible in the event of trespass. Although a variety of health and safety risks could be experienced by trespassers on the property, contact with electrical equipment would be avoided through facility compliance with building codes. To prevent access to the turbines, turbine tower doors would be locked and there would be no outside ladders on the towers. The substations would be fenced and locked. Prevention of accidental grass or crop fires during operation of the project would include avoiding idling vehicles in grassy areas, and keeping welding machines and similar equipment away from grass. Health and safety impacts to landowners or to the general public from project operation and maintenance would be low.

Similar to the plan prepared for construction, a fire emergency plan for operation of the proposed project would be submitted to Benton and Yakima County fire marshals for approval and would be shared with the Hanford Fire Department. Implementation of this plan would reduce potential fire impacts to a low level.

Hazardous Materials and Wastes.

Small amounts of fuels (diesel and/or gasoline), lubricating or other oils, and possibly small amounts of solvents likely would be stored onsite during operation of the project for use in refueling and maintaining vehicles as well as for maintaining wind turbines. Activities at the site would comply with all applicable local, state, and federal environmental laws and regulations in a manner that would be protective of human health and the environment.

In the event of an accidental hazardous materials release, possible impacts to soils, surface and groundwater resources, and wildlife could result. Because project operations would comply with relevant federal and state laws and because only relatively small amounts of such materials would be stored onsite, impacts would be low.

Air Traffic Safety.

The maximum height of the wind turbines, including one blade in the vertical position, could be as high as 390 feet. Because this height exceeds 200 feet, the FAA requires that a

Notice of Proposed Construction or Alteration (Form 7460-1) be filed for the project. The FAA review process would determine whether the wind turbines could be permitted as airspace obstructions. Lighting of the facilities likely would be required by the FAA for aircraft safety.

Preliminary coordination with FAA staff indicates that there are no high-use public, private, or military airports in the study area (Johnson, 2001). However, some military training flight routes from the Yakima Training Center and the Naval Air Station at Whidbey Island do use the general area. The FAA may notify the responsible military branch and request that the routes be adjusted. Impacts to air traffic safety as a result of the proposed project would be low.

Electric and Magnetic Fields.
Electric and magnetic fields (EMF) are associated with electric transmission and distribution lines. BPA completed an extensive review of EMF in its *Electrical and Biological Effects of Transmission Lines: A Review* in December 1996. Although the study focused on high-voltage transmission lines, it also reviewed related research on distribution lines. In general, reviews of the epidemiological and biological research on EMF consistently conclude that no causal link has been established between EMF and adverse human health effects. However, since most of the studies acknowledge there are still unanswered questions, steps to prevent or reduce exposures are recommended.

The strength of electric and magnetic fields diminishes rapidly as the distance from the source increases. During project operation, the overhead power lines connecting the turbine strings, the proposed 4-mile transmission line, and the two substations would produce EMF in the immediate vicinity of these facilities. No residences are located near the proposed substations or the proposed transmission line. Proposed wind turbines would be sited to comply with noise mitigation to achieve no more than a 10 dBA increase in noise at nearby residences (see Section 3.7, Noise). Because this mitigation would likely require setbacks of about 3,300 feet from all residences if 900-kW turbines are used, underground or overhead power lines would also likely be about 3,300 feet from any residence. At this distance, any fields generated by these low voltage lines would diminish to background levels at nearby residences. The power generated by the project would not raise the background EMF to levels that would be substantially different from existing levels. As a result, there would be no EMF exposure to residences and no significant increase in background levels of exposure to the general public; therefore, no impacts would result.

Mitigation. Operation and maintenance workers would have a detailed safety manual and frequent safety meetings which would reduce health and safety risks to a low level for personnel. Contact with electrical equipment would be avoided through facility compliance with building codes.

To prevent unauthorized access to the turbines, turbine tower doors would be locked and there would be no outside ladders on the towers. The substations would be fenced and locked.

To prevent accidental grass or crop fires during operation of the project, workers would avoiding idling vehicles in grassy areas and keep welding machines and similar equipment away from grass. Similar to the plan prepared for construction, a fire emergency plan

specifically for operation of the proposed project would be developed and submitted to Benton and Yakima County fire marshals for approval. It would also be shared with the Hanford Fire Department.

Any spills or releases of hazardous materials would be cleaned up, and disposed of or treated according to applicable regulations. Accidental releases of hazardous materials to the environment would be prevented or minimized through the proper containment of oil and fuel in storage areas and by locating these facilities away from drainages or sensitive resources.

The project developer would submit to the FAA a Notice of Proposed Construction or Alteration (Form 7460-1) to determine whether the wind turbines could be permitted as airspace obstructions. Lighting of the facilities likely would be required by the FAA for aircraft safety. The FAA may notify responsible military branches and request that routes be adjusted.

3.13.4.4 Decommissioning Impacts

If the project were decommissioned, potential health and safety risks would be similar to those described for project construction. Mitigation measures in use at the time of decommissioning would be implemented and would likely be similar to those recommended for construction.

3.13.5 Impacts of the No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated and existing health and safety risks associated with ongoing agricultural activities and with existing transmission lines in the study area would continue. If the project were not constructed, the region's power needs could be addressed through development of a gas-fired CT. Potential health and safety risks of a gas fired combustion turbine would depend on the location in which it was constructed.

3.14 Relationship Between Short-Term Uses of the Environment vs. the Maintenance and Enhancement of Long-Term Productivity

The proposed action under consideration does not pose short-term impacts that would significantly alter the long-term productivity of the affected environment. The turbines and associated facilities would take 251 acres of agricultural land out of production, and the remainder of the land could still be used for agricultural purposes. After decommissioning of the project, all of the land could revert to previous uses. Little change in the long-term environmental productivity of the land would have been caused.

3.15 Irreversible or Irretrievable Commitments of Resources

The proposed project would include the use of steel, gravel, and other nonrenewable material to construct the wind turbines, access roads, electrical power lines, O&M buildings, and substations. Materials would come from outside sources and onsite quarries.

Petroleum-based fuels for vehicles and equipment would also be required. Development of the proposed project would result in the irretrievable commitment of a small amount of agricultural land. These commitments are irretrievable rather than irreversible because the project would likely be decommissioned in the future and previous land uses could be restored. In addition, many materials used to construct and operate the project could be recycled upon decommissioning.

3.16 Unavoidable Adverse Impacts

Unavoidable adverse impacts are the environmental consequences of the proposed project that would occur even with implementation of mitigation measures. For the proposed wind project, unavoidable adverse impacts include:

3.16.1 Land Use and Recreation

Approximately 251 acres would be permanently converted from agriculture to energy production, including less than 100 acres of CRP land. In addition, about 1063 acres would be temporarily impacted by project construction activities.

Scoping comments raised a concern about a potential adverse impact to operations at the LIGO and BGRO facilities from project-generated vibration, and that this impact could be significant. Such an impact is not expected due to the expected low levels of vibration that would be generated by the project and the distance between the project and these facilities. However, further studies will be conducted in consultation with the facilities to determine whether operation of the proposed project would disrupt the research facilities, and the results of these studies will be discussed in the Final EIS.

3.16.2 Vegetation

Approximately 57.5 acres of priority shrub-steppe habitat would be permanently displaced by project facilities and 174.4 acres would be temporarily impacted by project construction activities. Approximately 12.2 acres of priority lithosol habitat would be permanently impacted and 50.9 acres temporarily impacted by project facilities. Several special status plant species would be directly impacted, including Columbia milkvetch, a federal species of concern and state threatened species.

Noxious weed seeds could be transported to the project site by construction equipment and vehicles. This could be a significant impact if weeds are not controlled adequately.

3.16.3 Wildlife

Birds and bats may collide with wind turbines or meteorological tower guy wires. Annual passerine mortality is estimated at between 360 and 1565, and raptor mortality is estimated at 0-9 raptors per year. Bat mortality is estimated at about 400 bats per year.

Several special status wildlife species could be directly and indirectly impacted by the project, including bald eagle, ferruginous hawk, peregrine falcon, loggerhead shrike, sage thrasher, sage sparrow, golden eagle, and merlin. Because of the proximity of a ferruginous hawk nest to a proposed turbine string, the project could result in about one ferruginous

hawk death per year. This potential impact to ferruginous hawk would be considered a significant impact.

Other impacts could occur through disruption to ground- and shrub-nesting avian species, habitat destruction, and displacement.

3.16.4 Visual Resources

Development of the proposed project would result in a substantial alteration to the existing visual character and quality of the study area during the day and at night. The wind turbines would be visible to residents, agricultural workers, recreationists, and highway travelers in the project vicinity. This impact would be considered significant.

3.16.5 Cultural Resources

There are 54 cultural resource features and several isolated finds identified in the study area that could potentially be affected by project construction. Traditional cultural properties may also be present in the project vicinity.

3.16.6 Noise

Increased noise levels would be experienced by some area residents during construction, operation, and decommissioning.

3.16.7 Water Resources and Wetlands

The proposed project could create minor alterations to natural drainage patterns, increase erosion potential in the study area, and disturb about 0.004 acre of wetland. Up to 18 million gallons of water may be needed for construction of the project, and a maximum of 5,000 gallons per day (about 1.8 million gallons per year) for operation and maintenance building use.

3.16.8 Transportation and Traffic

Minor delays and interruptions in local traffic could occur during construction and decommissioning.

3.16.9 Geology, Seismicity, and Near-Surface Soils

Construction of the project would alter the landscape with cuts-and-fills for roads, installation of underground power lines, leveling for turbine foundations, and development of a quarry. Soil erosion and compaction could occur

3.16.10 Socioeconomics and Public Services

Construction activities could increase the potential for fires, and the need for fire-fighting services. Decommissioning of the project would result in the loss of up to 15 full-time jobs and a decrease in property tax revenues.

3.16.11 Air Quality

Low levels of combustion pollutant and dust emissions could occur during construction, operation or decommissioning of the project.

3.16.12 Public Health and Safety

Accidental fire, release of hazardous materials, or injury could occur during construction, operation, or decommissioning of the project. Wind turbines could potentially interfere with military training flight routes from the Yakima Training Center and the Naval Air Station at Whidbey Island.

3.17 Cumulative Impacts

NEPA regulations define a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." Cumulative impacts can also result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). Previous sections of this chapter have addressed the environmental effects of past actions (described in the "Affected Environment" sections), as well as the potential effects of the proposed project.

The proposed project is the only known wind energy development planned in the Rattlesnake Hills area. Expansion of wind facilities in the Rattlesnake Hills beyond the 494 MW covered in this EIS is not likely in the near future, if at all, considering that full build-out of the Maiden Wind Farm would cover the primary wind resource areas available. No other developments, projects, or changes of any type are planned or foreseen in the immediate vicinity of the Rattlesnake Hills area that would affect any aspect of the physical and biological environment. No cumulative impacts are anticipated from a local resource perspective.

A list of present and reasonably anticipated future projects that would be expected to produce related or cumulative impacts within a reasonable distance of the Rattlesnake Hills is presented in Table 3.18-1. The information in this table was gathered from Benton and Yakima Counties' planning departments and BPA's public documents.

TABLE 3.17-1
Current, Approved, or Proposed Projects with Potential Contributions to Cumulative Impacts

Project/Status	Location	Description
Nine Canyon Wind Project: Conditional Use Permit granted	Benton County, south of the Finley area	48 MW, 37 turbine wind project on about 50 acres of agricultural land.
Horse Heaven Wind Project: Conditional Use Permit Application submitted, EIS underway	Benton County, approximately 10 miles north of the Plymouth area	Up to 225 MW, using up to 250 wind turbines, on about 200 acres of agricultural land. Also would include about 12 miles of transmission line.
Zintel Canyon Wind Project In planning stages	Benton County, south of Kennewick	50 MW, 38 turbine wind project on about 50 acres of agricultural land.
Black Rock Reservoir: Being studied. An EIS has not yet been initiated.	Yakima County, about 30 miles east of Yakima and 18 miles north of Sunnyside	Proposed reservoir would cover about 10 square miles (6700 acres) of shrub-steppe habitat and provide up to 1.7 million acre-feet of water to the Yakima Basin's total storage capacity.

TABLE 3.17-1
Current, Approved, or Proposed Projects with Potential Contributions to Cumulative Impacts

Project/Status	Location	Description
Badger Mt. Golf and Country Club Planned Development: Housing development preliminary Plat Approval granted	Benton County, adjacent to the Cities of Richland and Kennewick	867 units of housing to be located on 1,707 acres of agricultural land.
The Vineyards development: Hearing on the Conditional Use Permit held, no decision yet	Yakima County near Moxee	500 dwelling units, hotel, and golf course on 360 acres of shrub-steppe.
Plymouth CT: Conditional Use Permit application submitted, EIS underway	Near Plymouth in Benton County	305 MW natural gas fired combined cycle combustion turbine on about 45 acres of agricultural land.
Mercer Ranch CT: Washington State EFSEC application submitted	Southwest Benton County, east of Alderdale	850 MW natural gas fired combined cycle combustion turbine on about 40 acres of agricultural land.
Schultz-Hanford Transmission Line: EIS underway	From the Schultz Substation, north of Ellensburg, to a proposed substation just south of Hwy 24 in Benton County, near the Yakima County border	The preferred alternative for this 500-kV line would be about 63 miles long and would require clearing approximately 580 acres of shrub-steppe and grass-land vegetation.
McNary-John Day Transmission Line: EIS underway	Benton and Klickitat Counties along the Columbia River	79 mile, 500-kV transmission line, mostly in existing right-of-way paralleling existing transmission lines.

These projects are far enough away from the proposed Maiden Wind Farm to have relatively minor cumulative impacts to land use and recreation, geology, fish, water resources, cultural resources, transportation, air quality, noise, and public health and safety. However, potentially significant cumulative impacts might occur to socioeconomic, visual, vegetation, and wildlife resources.

3.17.1 Land Use and Recreation

The proposed project would remove approximately 250 acres of agricultural land from production, including less than 100 acres of CRP land. Combined with the wind projects and the transmission line projects, cumulative impacts on land use would be low because these projects would be located mainly on agricultural land and agricultural activities could continue up to the edge of the project facilities. The wind and transmission projects would take a very small proportion of agricultural land out of production without changing the overall agricultural usefulness of the land. The proposed development projects and reservoir would permanently take large areas of agricultural land use and convert them to other uses. All of the projects together would result in the conversion of over 2,350 acres of agricultural land, resulting in a potentially significant cumulative land use impact.

The proposed Maiden Wind Farm would have minor (if any) impacts on recreation. It is unknown to what extent the various project areas are currently used for recreation (presumably mostly hunting), but it is expected that the cumulative effects to recreation would be low. However, construction of the Black Rock Reservoir would significantly enhance water recreation in the region.

3.17.2 Vegetation

Implementation of the proposed project and other proposed and planned projects would impact vegetation in the area. Cumulative impacts to vegetation would result from loss of vegetation through clearing and ground disturbance, or, in the case of the Black Rock reservoir, through inundation with water. All of the projects combined would result in about 10,000 acres of vegetation disturbance. The Maiden Wind Farm would result in the conversion of 128 acres of native habitat to project facilities, which is approximately 0.016 percent of the total acreage of disturbance to native habitats from all of the proposed or planned projects (approximately 7,768 acres). At this level, the proposed project would not contribute significantly to the cumulative loss of native vegetation, particularly in light of the proposed mitigation in Section 3.3, Vegetation.

Historically, 10.7 million acres of Eastern Washington was covered in shrub-steppe vegetation; today, about 60 percent of that area has been converted to agricultural, industrial, residential, and other uses (Larson, 2002). While the proposed and planned projects result in only about 0.002 percent of shrub steppe conversion (out of approximately 4.3 million acres), the overall impact to shrub steppe habitat could be considered cumulatively significant for Benton and Yakima Counties.

Much of the remaining shrub-steppe habitat in Eastern Washington is subject to intense grazing, recurrent fire, or other non-historic land uses. It is generally recognized that preserving large, unbroken tracts of high quality shrub-steppe vegetation is important for maintaining populations of shrub-steppe dependent species such as sage grouse, sage sparrow, Washington ground squirrel and others (Johnson and O'Neil, 2001).

Construction of the Maiden Wind Farm, the proposed transmission lines, and the Black Rock Reservoir in shrub-steppe habitat would increase the existing levels of habitat fragmentation and reduce the amount of shrub-steppe 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 areas with native vegetation difficult, and generally leads to a long-term reduction in quality wildlife habitat. Invasion by weeds is considered one of the biggest threats to biodiversity in the region (The Nature Conservancy, 1999).

Special status plant species on private lands receive little to no protection under federal and state rare and endangered species legislation. Special status species may be impacted by a variety of land uses typical of private lands, including farming, grazing, and development. However, all of the proposed and planned projects discussed in this section would likely have some impact mitigation required by NEPA, SEPA, or the county permitting process which would minimize individual as well as cumulative impacts to vegetation.

Impacts to special status plant species from the proposed or planned projects would depend on the location of the projects and applied mitigation measures, and could potentially be cumulatively significant.

3.17.3 Wildlife

Implementation of the proposed project, combined with the other proposed or planned projects, could result in cumulative impacts to wildlife habitat and special status wildlife species from loss of habitat through vegetation clearing and ground disturbance. In addition, the proposed project, combined with the other wind projects, and the transmission lines, would impact avian and bat species likely to collide with wind turbines, meteorological towers, and transmission towers and conductors. It can be assumed that cumulative bird and bat mortality would occur, and an undetermined number of mortalities would be migrants that could possibly pass through more than one wind project or transmission line area during migration.

While it is speculative to provide mortality projections for these projects without additional information on habitat, bird and bat utilization, and species composition of the project sites, there are several wind projects in the country that have completed one or more years of mortality studies, which can be useful in predicting mortality at new wind projects. The average bird fatalities from Vansycle (Oregon), Buffalo Ridge (Minnesota), and Foote Creek Rim (Wyoming) wind plants equal 1.74 birds/turbine/year (Johnson et al., 2000; Young et al., 2001). The combined wind projects would use a maximum of 819 wind turbines, depending on turbine models chosen for Maiden and Horse Heaven and the ultimate size of the projects. Using the average of 1.74 birds/turbine/year, these four wind projects could result in the cumulative loss of approximately 1425 birds per year in Benton County. While the significance of this level of mortality is unknown, other sources of avian mortality in Benton County include collision with communications towers, windows, vehicles, and powerlines. In addition, domestic/feral cats and pesticides are other substantial sources of avian mortality that undoubtedly occur in Benton County. Erickson et al. (2001) provide estimates of avian mortality for these other collision sources. While it is hard to predict numbers of bird deaths for Benton County from other sources, it is safe to say that it would be substantially higher than 1425, based on the amount of powerlines, roads, communications towers, and agriculture in the county.

3.17.4 Visual Resources

Construction of the proposed project, combined with the other proposed or planned projects, would contribute to a cumulative change in the existing visual character of the region by adding more development. However, the overall cumulative visual impact from all projects would likely be low to moderate due to the abundance of open, undeveloped areas in the region.

Other wind projects in the area, combined with the Maiden project, could create a moderate to high impact to views of the various ranges and hillsides in the region. It is likely that Nine Canyon, Zintel Canyon, and Horse Heaven wind projects would be within view of each other. To many viewers, wind farms are a visual attraction. However, if they were to become more commonplace on the landscape, the novelty would likely diminish.

3.17.5 Cultural Resources

The proposed project, in conjunction with the other proposed or planned projects, would result in ground disturbance that could potentially impact identified and unidentified prehistoric and/or historic sites, as well as cause impacts to traditional cultural properties.

Cultural resource surveys and coordination with affected Tribes, as required prior to construction of all projects under NEPA and SEPA, would identify the locations of these resources so they could be avoided to the extent possible. While impacts to cultural resources from all projects could result in a net cumulative loss of cultural resource values in the region, implementation of mitigation programs would help reduce cumulative impacts to the extent possible.

3.17.6 Noise

All the proposed or planned projects are sufficiently distant from each other so that cumulative impacts from noise are not expected.

3.17.7 Water Resources and Wetlands

Impacts to water resources and wetlands from the proposed project would be very low. It is likely that impacts from the other wind projects and transmission line projects would also be low, due to the similar designs of these linear projects. Impacts to water use from the housing developments and combustion turbines would likely be moderate to high; while the proposed reservoir would significantly increase the amount of water available in the Yakima Valley. Impacts to streams and wetlands would depend on the final designs of the proposed or planned projects.

3.17.8 Transportation and Traffic

A cumulative impact could potentially occur if several of the projects were to be constructed at the same time. If this were to happen, truck traffic could noticeably increase on the highways, but it is unlikely that levels of service or safety on any highways would be measurably affected. Local roads around the individual projects would not experience cumulative impacts.

3.17.9 Geology, Seismicity, and Near-Surface Soils

Since the proposed project would not alter the geology or seismicity of the project site, no contribution to cumulative change is likely. Ground disturbance of near-surface soils would occur from all of the projects, primarily from construction activities. The intensity of impacts to near-surface soils would depend on the location, construction practices employed, and mitigation measures required, but would likely be low to moderate due to standard construction practices and erosion measures implemented for these types of projects.

3.17.10 Socioeconomics and Public Services

The proposed project and the other proposed and planned projects could contribute to increases in temporary and permanent job opportunities and populations within the region. Temporary population increases could result from the construction work forces for the proposed and planned projects. These temporary increases would be spread over a wide geographic area and would not be cumulative if construction periods for each project occurred at different times. Existing housing in each project area is expected to be sufficient to accommodate any influx of population for construction or operations jobs related to the proposed and planned projects.

The proposed and planned projects would increase demands on schools, police, fire protection, emergency services, water supply, sanitary sewer, solid waste, or public utility systems. Demand for public services would generally be on a temporary basis, and would be dispersed throughout the region, which would minimize the potential for a significant cumulative effect to these services. The permanent demand for these services by the permanent employees and residents of the projects would be expected to be accommodated without adversely affecting the capacities and performance of the public service systems.

The proposed and planned projects would likely have a cumulatively beneficial economic effect to the local economy. The projects would generate tax revenues, royalties, employee salaries, and some increase in retail sales. Cumulative tax revenues and royalties would be paid to the federal, state, or local governments. Further, the projects could have a positive cumulative effect on total regional employment.

3.17.11 Air Quality

Construction of the proposed project would result in temporary dust emissions, as is likely with all of the proposed or planned projects. Whether these impacts would be cumulatively significant would depend on construction timing, the effectiveness of dust mitigation measures employed, and the distance between the projects. Operation of the proposed project would not impact air quality and therefore would not contribute to cumulative impacts to air quality in the region.

3.17.12 Public Health and Safety

All of the proposed and planned projects could potentially affect public health and safety, especially during construction activities. However, these effects would not result in significant cumulative effects as the potential impacts would be localized within close proximity to each projects.