5.9.5.6 Mitigation for Threatened, Endangered, and Sensitive Species

If federally listed species are present in the project vicinity, the wind energy project would also require informal consultation under Section 7 of the ESA. A Biological Assessment could be required, in addition to the assessment of impacts in the site-specific NEPA document for the project. Subsequently, formal consultation may be required that would result in a Biological Opinion issued by the USFWS. The Biological Opinion would specify reasonable and prudent measures and conservation recommendations to minimize impacts on the federally listed species at the site.

A variety of site-specific and species-specific measures may be required to mitigate potential impacts to special status species if present in the project area. Such measures may include:

- Field surveys should be conducted to verify the absence or presence of the species in the project area and especially within individual project footprints.

- Project facilities or lay-down areas should not be placed in areas documented to contain or provide important habitat for those species.

- Biota protected by state statutes should be relocated.

5.10 LAND USE

The construction and operation of a wind energy development project would have an impact on land use if there were:

- Conflict with existing environmental plans and community goals;

- Conflict with existing recreational, educational, religious, or scientific uses of the area; or

- A conversion of the existing commercial land use of the area (e.g., mineral extraction) (PBS&J 2002).

5.10.1 Potential Impacts to BLM-Administered Lands

Generally, all public lands unless otherwise classified, segregated, or withdrawn are available at the BLM's discretion for ROW authorization for wind energy development under the FLMPA. All lands that compose the BLM's NLCS would be excluded from consideration for authorization for wind energy development (Section 2.2.1). Similarly, ACECs would also be excluded from consideration (Section 2.2.1). ACECs are considered land use authorization avoidance areas because they are known to contain resource values that would pose special constraints for and possibly denial of applications for land uses that cannot be designed to be compatible with the management objectives and prescriptions for the ACEC (BLM 2003l). Adverse impacts to natural, cultural, and visual resources would be largely minimized by excluding the NLCS and ACEC areas from wind resource development authorization.

Site monitoring and testing would generally result in temporary, localized impacts to existing land uses associated with the meteorological towers and minimum-specification access roads (if required). Meteorological data would be collected for 1 to 3 years (Section 3.1.1). Up to 10 or more meteorological towers could be required to characterize the wind regime at a potential WRA. Since a meteorological tower would occupy only a few square feet, only a negligible impact to most existing land uses would be expected. However, the presence of the towers and possible access roads may impact more remote recreational experiences.

Construction activities would generally result in temporary impacts to existing land uses. For example, if the area was used for grazing, livestock might need to be removed from the areas where blasting or heavy equipment operations were taking place (EFSEC 2003). Permanent land use impacts are based on the amount of land that would be displaced by a proposed project and by the compatibility of the proposed use with existing, adjacent uses (PBS&J 2002). A significant permanent land use impact would occur from an uncompensated loss of the current productive use of the site or foreclosure of future land uses (FPL Energy North Dakota Wind, LLC 2003). However, permanently converted acreage would usually compose only a small portion of that available within a project area. For example, at the proposed Kittitas Valley Wind Power Project in Washington, a maximum of only 118 out of 7,000 acres (48 out of 2,833 ha) of rangeland within the project area, or only 118 out of 445,000 acres (48 out of 180,085 ha) of pasture or unimproved grazing lands within Kittitas County, would be permanently converted to energy production (EFSEC 2003). Given the overall footprints of wind turbine towers and ancillary structures, the amount of acreage required for most wind energy development projects should be a small fraction of the leased area.

Generally, wind turbines need to be separated by a distance equivalent to at least several tower heights in order to allow wind strength to reform and for the turbulence created by one rotor not to harm another turbine downwind. Therefore, only a small percentage of land area is taken out of use by the turbines, access roads, and other associated infrastructure. Depending on the location, size, and design of a wind energy development project, wind development is compatible with a wide variety of land uses and generally would not preclude recreational, wildlife habitat conservation, military, grazing, oil and gas leasing, or other activities that currently occur within the proposed project area. The opportunity may also exist for wind development on reclaimed mine lands. A review of existing land use plans, zoning designations, and policies would need to be conducted in order to provide appropriate, up-front guidance to developers on where and how to locate wind energy projects so that they would be as consistent as reasonably possible with existing land uses and the environment (NWCC 2002).

Overall, the establishment of a wind energy development project and its ancillary structures (e.g., transmission lines and access road) would modify the existing land cover), particularly if the wind energy development project was located within existing forests and shrublands.

Indirect land use impacts would not be expected, because it is anticipated that a wind energy development project would not substantially induce or reduce regional growth to the extent that it would change off-site land uses or use of off-site resource-based recreation areas (EFSEC 2003).

Upon decommissioning, land use impacts from facility construction and operation would be mostly reversible. No permanent land use impacts would occur from decommissioning (EFSEC 2003). The BLM could decide to continue the use of, and maintain, access roads.

5.10.2 Potential Impacts to Aviation

The FAA requires a notice of proposed construction for a project so that it can determine whether it would adversely affect commercial, military, or personal air navigation safety (FAA 2000). One of the triggering criteria is whether the project would be located within 20,000 ft (6,096 m) or less of an existing public or military airport (depending upon the type of airport or heliport, see Section 4.7.3). If the potential site for a wind energy development project is known, an Internet database can be searched online to obtain this information (AirNav.com 2004). Inputting the geographic coordinates allows identification of public, private, and military airports; balloon ports; glider ports; heliports; seaplane bases; short takeoff and landing airports (STOLports); and ultralight flight parks within a minimum radius of 6 mi (10 km) to a maximum of 200 mi (322 km). Another FAA criterion triggering the notice of proposed construction is any construction or alteration of more than 200 ft (61 m) in height above ground level. This criterion applies regardless of the distance from the proposed project to an airport (FAA 2000). Because a wind energy development project would have to meet appropriate FAA criteria, no adverse impacts to aviation would be expected.

5.10.3 Potential Impacts to Military Installations

A proposed WRA could be in conflict with existing or proposed military training operations. Military training exercises involve the use of aircraft, ground troops, and weapons testing (including guided missiles). Much of this training requires extensive areas of highly secured air space such as the 20,000 mi^2 (51,800 km^2) of restricted air space in south-central California that is used by Edwards Air Force Base, China Lake Naval Weapons Center, and Fort Irwin Military Reservation. Restricted air space allows for real-world maneuvering room for high-speed military aircraft, while providing large buffer zones surrounding the test ground to ensure public safety (Feiste 2003). However, military test ranges are being challenged by encroachments such as population growth, urban expansion, growing air space congestion, and, even as a result of the unintended consequences of environmental laws that reduce the flexibility of military training (Feiste 2003). The presence of turbines, permanent meteorological towers, and above-ground transmission lines associated with wind energy projects could add additional constraints to military training operations that may occur at low altitudes (e.g., helicopter low-altitude tactical navigation areas, military operations areas, and military training routes).

5.10.4 Potential Impacts to Recreational Areas

Impacts on recreational resources would be considered significant if they occurred in a high-density, concentrated, developed recreation site or facility, or included (1) noise impacts; (2) dust or air quality impacts; or (3) visual impacts, particularly if such impacts occurred in remote settings and landscapes (PBS&J 2002). During construction, noise, dust, traffic, and the presence of a construction force would temporarily affect the rural to primitive character of the area. People engaged in hiking, camping, birding, and hunting would be affected the most by construction activities. Some parks and campsites may experience increased use by transient workers who seek temporary accommodations during project construction. This could displace recreational users, particularly on weekdays. No significant adverse impacts on recreational users would be expected from operations as the operating workforce would be limited.

In the long-term, improved accessibility to the area could increase recreational opportunities; although at the same time, this could alter the experience for people wanting a backcountry setting. However, development of a wind energy project could modify the ROS class (Section 4.7.5) within which the proposed project would be located. For example, the area could be modified from either a semiprimitive nonmotorized or motorized class to a roaded natural or rural class. Most long-term effects would relate to visual disturbances and are discussed in Section 5.11.

In summary, development of a wind resource project would have both positive and negative effects on the opportunities for dispersed recreational activities in the project area. It is possible that at least some portions of the access road or transmission line ROW could be integrated with local trail and road systems and used for hiking, OHVs, and additional access to hunting and fishing areas. Therefore, the wind resource project could enhance public access to some previously difficult or inaccessible areas. Alternately, hunting and fishing pressures could increase in some areas, and some private landowners might experience an increased level of intrusion on their property. In addition, persons who may otherwise use the area for a remote and undisturbed recreational experience may decide to go elsewhere.

5.10.5 Mitigation Measures

The previous evaluations identified potential land use impacts that could be incurred during the construction, operation, and decommissioning of a wind energy facility. The nature, extent, and magnitude of these potential impacts would vary on a site-specific basis and on the specific phase of the project (e.g., construction, operation). The greatest potential for land use impacts would occur as a result of decisions made during the design and siting of the wind energy project. A variety of mitigation measures may be incorporated, as stipulations, into the design and development of the POD and design of a wind energy project to reduce potential land use impacts. These measures include:

- To the extent practicable, wind energy projects should be planned to mitigate or minimize impacts to other land uses;

- Federal and state agencies, property owners, and other stakeholders should be contacted as early as possible in the planning process to identify potentially sensitive land uses and issues, rules that govern wind energy development locally, and land use concepts specific to the region;

- The DoD should be consulted regarding the potential impact of a proposed wind energy project on military operations in order to identify and address any DoD concerns;

- The FAA-required notice of proposed construction should be made as early as possible to identify any air safety measures that would be required;

- When feasible, a wind energy project should be sited on already altered landscapes;

- To plan for efficient land use, necessary infrastructure requirements should be consolidated whenever possible, and current transmission and market access should be evaluated; and

- Restoration plans should be developed to ensure that all temporary use areas are restored.

5.11 VISUAL RESOURCES

In the simplest terms, adverse visual impacts can be defined as unwelcome visual intrusions — or the creation of visual contrasts — that affect the quality of a landscape. The perception of adverse visual impacts reflects the belief that the use and development of lands and waters should not significantly detract from recognized scenic resources and scenic views and the conviction that conditions should be imposed on development to control unreasonable or unnecessary adverse effects on scenic resources (Smardon and Karp 1993).

It is widely acknowledged that aesthetic impacts are among the most important impacts associated with wind energy development and operations. However, it is difficult to determine the relative significance of aesthetic impacts (Hau 2000; Bisbee 2003). Visual impacts are intangible, highly subjective, and dynamic, and because they cannot be completely avoided, they are one of the greatest sources of objection to wind energy development projects (Bisbee 2003). Because of the subjective and experiential nature of visual resources, the human response to those changes and the significance of the impacts cannot be quantified, even though the visual impact of a proposed development can be described specifically (Hankinson 1999). This raises the challenge of making widely accepted, collective decisions about the relative worth and disposition of individual visual resource "experiences" relative to competing resource demands. Fortunately, there is also some commonality in individual's experiences of visual resources. While it may not be possible to objectively assess subjective experience and values, it is possible to systematically examine and characterize visual values and to reach consensus about visual impacts and their trade-offs. VRM procedures provide the means to evaluate, mediate, and mitigate the subjective nature of relative impacts on visual resources, and they are a critical part of decision making to weigh any modification of the BLM landscapes for wind energy development.

Adverse visual impacts have in the past been referred to as "visual pollution." In a review of EISs considering visual quality, Smardon and Karp (1993) found three major types of adverse visual impacts: unnatural intrusions of man-made appearance or disfigurement; partial degradation, reduction, or impairment of the existing level of visual quality; and complete loss of the visual resource. The BLM's VRM system (a process for evaluating visual impacts and their mitigation) defines visual impact as the contrast perceived by observers between existing landscapes and proposed projects and activities (Section 4.8.1). The degree to which an activity intrudes on, degrades, or reduces the visual quality of a landscape depends on the amount of visual contrast it introduces. Visual changes or modifications that do not harmonize with landscapes often look out of place, and the resulting contrast may be unpleasant and undesirable. Environmental design concepts and techniques can be applied to minimize visual contrast, and thus visual impacts (see Section 5.11.6 regarding mitigation measures).

Visual contrasts are produced through a range of direct and indirect actions or activities. The BLM administers lands — and landscapes — that have valuable aesthetic or scenic qualities; these lands are also used for multiple activities that have the potential to disturb the surface of the landscape and impact scenic values. These activities, such as recreation, mining, timber harvest, grazing, road development, wind power, and others, may also interact or synergize in complex ways. These interactions among impacting activities may be contemporaneous or they may represent more incremental and cumulative changes occurring over longer, possibly historic periods of time (see Section 6.4.1.11 regarding cumulative impacts). The following presents potential impacts on visual resources during each phase of a wind energy development project. Several sources were consulted during development of this list of impacts (AusWEA 2002; EECA 1995; EFSEC 2003; Gipe 1998, 2002; NWCC 2002; PBS&J 2002; and WDFW 2003a).

5.11.1 Site Monitoring and Testing

Possible sources of impacts to visual resources during site monitoring and testing include occasional, short-duration road traffic and parking, and associated dust; the erection and presence of meteorological towers; the presence of solar panels, if used, and the possibility of associated reflections producing sun glint; and the presence of idle or dismantled equipment, if allowed to remain on the site.

5.11.2 Site Construction

During construction, there are several possible sources of visual impacts. Road development (new roads or expansion of existing roads) may introduce strong visual contrasts in the landscape, depending on the route relative to surface contours, and the width, length, and surface treatment of the roads. Conspicuous and frequent small-vehicle traffic for worker access and frequent large-equipment (trucks, graders, excavators, and cranes) traffic for road construction, site preparation, and turbine installation are expected. Both would produce visible activity and dust in dry soils. Suspension and visibility of dust would be influenced by vehicle speeds and road surface materials. Temporary parking for worker's vehicles would be needed within staging areas or on adjacent surfaces. Unplanned and unmonitored parking could likely expand these areas, producing visual contrast by suspended dust and loss of vegetation in portions of the site. Site development may be progressive, persisting over a significant period of time. It may also be intermittent, staged, or phased, giving the appearance that work starts and stops. Repeated visual experiences may provoke perceptions of lost benefit and productivity, like that alleged for idle equipment. Timing and duration concerns may result. There would be a temporary presence of large cranes or a self-erection apparatus to assemble and mount towers, nacelles, and rotors. Duration may be short, depending on the number of turbines. All such equipment would produce emissions while operational and may thus create visible exhaust plumes. There may also be a temporary presence of support facilities and fencing associated with the construction work site.

Ground disturbance would result in visual impacts that produce contrasts of color, form, texture, and line. Excavating for turbine foundations and ancillary structures; trenching to bury electrical distribution systems; grading and surfacing roads; clearing and leveling staging areas; and stockpiling soil and spoils (if not removed) would (1) damage or remove vegetation, (2) expose bare soil, and (3) suspend dust. Destruction and removal of vegetation due to clearing, compaction, and dust are expected. Soil scars and exposed slope faces would result from excavation, leveling, and equipment movement. Invasive species may colonize disturbed and stockpiled soils and compacted areas. These species may be introduced naturally or in seeds, plants, or soils introduced for intermediate restoration, or by vehicles. The land area or "footprint" of installed equipment would be typically small, as little as 5 to 10% of the site, but could be susceptible to broader disturbance and alteration over longer periods of time. Site restoration activities would reduce many of these impacts.

5.11.3 Site Operation

Wind energy development projects on BLM-administered lands would be highly visible because of the introduction of turbines into typically rural or natural landscapes, many of which have few other comparable structures. Figures 5.11-1 through 5.11-3 show views of existing wind energy projects in Wyoming from different vantage points, distances, and perspectives. They illustrate the visual resource contrast elements from wind energy operations on the landscape. The artificial appearance of wind turbines may have visually incongruous "industrial" associations for some, particularly in a predominantly natural landscape. Because their visual evidence cannot be avoided, reduced, or concealed, owing to their size and exposed location, their impact would necessarily be significant and allow little effective mitigation (Gipe 2002).

Daily and seasonal low sunlight conditions striking ridgelines and towers would tend to make them more visible and more prominent. Given the typical pale color of turbines, their color contrast with surroundings would likely be the least in the winter season, with less greening and more snowcover. In regions with variable terrain, wind developments along ridgelines would be

FIGURE 5.11-1 View of the Wyoming Wind Project near Arlington, Wyoming (Source: NREL 2004d. Photo #06584. Photo credit: Tom Hall.)

FIGURE 5.11-2 View of a Wind Energy Development Project near Evanston, Wyoming

FIGURE 5.11-3 Another View of a Wind Energy Development Project near Evanston, Wyoming

most visible, particularly when viewed from other similar or lower elevations, owing partly to silhouetting against the sky. Much higher viewing points would reduce silhouetting. Valley alignment with wind energy projects may allow greater visibility (Burton 1997; EFSEC 2003; Owens 2003; and WDFW 2003a). Interposition of turbines between observers and the sun, particularly in the early and late hours of the day and during the winter season when sun angles are low, could produce a strobe-like effect from flickering shadows cast by the moving rotors onto the ground and objects. At its most severe, shadow flicker would be temporary and limited to daylight hours; it may be significant, however, because of its motion and frequency. A related but less severe effect would be a sun-dial-like effect, also increased at low sun angles, as the shadow of very tall turbines sweeps great distances over the landscape. Interposition of turbines between observers and the sun may also produce a strobe-like effect caused by the regular reflection of the sun off rotating turbine blades. Unlike shadow flicker, perception of blade glint would depend on the orientation of the nacelle, angle of the rotor, and the location of the observer relative to the position of the sun. Blade glint would also be influenced by the color, reflectivity, and age of the blades. This effect may be noticeable at distances of about 6.2 to 9.3 mi (10 to 15 km) and may be especially pronounced when aligned with roadways or other viewing corridors.

All aboveground ancillary structures (including fences around substations) would potentially produce visual contrasts by virtue of their design attributes (form, color, line, and texture) and by virtue of the reflectivity of their surfaces and resulting glare. If security and safety lighting is used, even if it is downwardly focused, it would increase visibility of the site, particularly in dark nighttime sky conditions typical of rural areas. It would also contribute to sky glow resulting from ambient artificial lighting. Any degree of lighting would produce off-site “light trespass”; it would be most abbreviated, however, if the lighting was limited to just the substation and controlled by motion sensors.

FAA rules would require lights mounted on nacelles that flash white during the day and twilight (20,000 candela) and red at night (2,000 candela). White lights would be less obtrusive in daylight, but red lights would likely be conspicuous at great distances against dark skies (Gipe 2002). Typically, the FAA requires warning lights on the first and last turbines in a string and every 1,000 to 1,400 ft (305 to 427 m) in between. Although these beacons would concentrate light in the horizontal plane, they would increase visibility of the turbines, particularly in dark nighttime sky conditions typical of rural areas. Beacons would likely not contribute (because of intermittent operation) to sky glow resulting from artificial lighting. The emission of light to off-site areas could be considerable.

Towers, nacelles, and rotors may need to be upgraded or replaced, thereby repeating initial visual impacts of construction and assembly. Opportunity and pressures to break uniformity between turbines and among components (different sizes, styles, and mixes) may be greater than during initial construction, thus potentially increasing visual contrast and visual “clutter.” Additional construction and installation of monitoring equipment may be required to optimize measurements (change locations) or to replace or upgrade equipment. Repeated visual evidence of disturbance would result. Infrequent outages, disassembly, and repair of equipment may occur. These may produce the appearance of idle or missing rotors, “headless” towers (when nacelles are removed), and lowered towers. Negative visual perceptions of “lost benefits” (e.g., loss of wind power) and “bone yards” (for storage) may result.

Similar to other phases of development, occasional small-vehicle traffic for testing, commissioning, monitoring, maintenance, and repair, and infrequent large-equipment traffic for turbine replacements and upgrades can be expected. Both would produce apparent activity and dust in dry soils. Suspension and visibility of dust would be influenced by vehicle speeds and road surface materials.

5.11.4 Site Decommissioning

During decommissioning, impacts on visual resources would be similar to those encountered during construction. These impacts are related to road redevelopment, temporary fencing of the work site, intermittent or phased activity persisting over extended periods of time, removal of buried structures and equipment, and the presence of idle or dismantled equipment, if allowed to remain on site. Visual deconstruction impacts of heavy equipment, support facilities, and lighting would be substantially the same as those in the construction phase. Restoring a decommissioned site to preproject conditions would entail recontouring, grading, scarifying, seeding and planting, and perhaps stabilizing disturbed surfaces. Newly disturbed soils would create a visual contrast that would persist at least several seasons before revegetation would begin to disguise past activity. Restoration to preproject conditions may take much longer. Invasive species may colonize newly and recently reclaimed areas. These species may be introduced naturally or in seeds, plants, or soils introduced for intermediate restoration, or by vehicles. Nonnative plants that are not locally adapted would likely produce contrasts of color, form, texture, and line.

5.11.5 Synergistic Effects

The subjective quality of aesthetic impacts, including visual and auditory impacts, introduces the opportunity for multisensory responses to wind energy development and for the interaction of impacts in the perception of those exposed. Because soundscape and landscape are terms that may describe two simultaneous and overlapping qualities of the same environment, visual and aural signals may also interact in complex ways within the subjective experience of those who are viewing and listening.

Research finds that visual perception (in landscapes) is not neutral but is influenced by auditory impressions (Viollon 2003). More specifically, research specific to combined sensory reactions to wind turbines documents that noise annoyance is correlated to visual factors, such as a respondent's opinion of wind turbines' (visual) impact on the landscape (Pedersen and Waye 2003). Shadows, or "light shade," of turbines and their vanes in rotation are beginning to be investigated in relation to visual judgment of landscapes to better understand interactions between noise annoyance and visual disturbance (Pedersen and Waye 2003; Maffei and Lembo 2003). That visual and audible factors may be related, and that their impacts can interact, are accepted. An example may be seen in the finding that auditory "expectations" may be induced by visual "information" (Viollon 2003). Much research is now beginning to focus on how such synergisms work.

5.11.6 Mitigation Measures

Mitigation measures are a means of reducing visual impacts on public aesthetic resources. The BLM and USFS have established mitigation measures pertaining to visual impacts of energy production on federal lands of the western United States (BLM 1984, 1986a,b, 2004a-d; RMRCC 1989).

Additional mitigation measures have been derived from experiences with wind power on several continents, particularly North America, Europe, and Australia. Useful lessons drawn from less-than-best practices in early California wind power developments have enriched mitigation practices on other continents. North American experience in Texas and mountainous areas of the Appalachian region play a lesser role, although limited experience in Vermont, with its strong landscape protection tradition, offers informed perspective on visual impacts and mitigation. Europe offers the longest and most pervasive experience with contemporary (and ancient) wind power development, especially with recent development in highly populated areas and with intensive social and aesthetic impacts. Australia might offer the best analog to development in the rural/remote, arid, range, and mountain lands of the western United States, but its literature does not yet provide sufficient information. Many sources were consulted in developing the following list of recommended mitigation measures for addressing visual impacts on BLM-administered lands (NWCC 2002; AusWEA 2002; Gipe 1998, 2002).

- Existing mitigation measures developed by the BLM regarding VRM should be followed.

- The public should be involved and informed about the visual site design elements of the proposed wind energy projects. Possible approaches include conducting public forums for disseminating information regarding wind energy development, such as design, operations, and productivity; offering organized tours of operating wind energy development projects (Gipe 2002); using computer simulation and visualization techniques in public presentations; and conducting surveys regarding public perceptions and attitudes about wind energy development.

- Turbine arrays and the turbine design should be integrated with the surrounding landscape. To accomplish this integration, several elements of design need to be incorporated.

  – The operator should provide visual order and unity among clusters of turbines (visual units) to avoid visual disruptions and perceived “disorder, disarray, or clutter” (Gipe 2002).

  – To the extent possible given the terrain of a site, the operator should create clusters or groupings of wind turbines when placed in large numbers; avoid a cluttering effect by separating otherwise overly long lines of turbines, or large arrays; and insert breaks or open zones to create distinct visual units or groups of turbines.

  – The operator should create visual uniformity in the shape, color, and size of rotor blades, nacelles, and towers (Gipe 1998).

  – The use of tubular towers is recommended. Truss or lattice-style wind turbine towers with lacework, pyramidal, or prism shapes should be avoided. Tubular towers present a simpler profile and less complex surface characteristics and reflectance/shading properties.

  – Components should be in proper proportion to one another. Nacelles and towers should be planned to form an aesthetic unit and should be combined with particular sizes and shapes in mind to achieve an aesthetic balance between the rotor, nacelle, and tower (Gipe 1998).

  – Color selections for turbines should be made to reduce visual impact (Gipe 2002) and should be applied uniformly to tower, nacelle, and rotor, unless gradient or other patterned color schemes are used.

- The operator should use nonreflective paints and coatings to reduce reflection and glare. Turbines, visible accessory structures, and other equipment should be painted before or immediately after installation. Uncoated galvanized metallic surfaces should be avoided because they would create a stronger visual contrast, particularly as they oxidize and darken.

- Commercial messages on turbines and towers should be prohibited (Gipe 2002).

• The site design should be integrated with the surrounding landscape.

- The operator should avoid placement of ancillary structures on high land features and along "skylines." The presence of these structures should be concealed or made less conspicuous. Conspicuous structures should be designed and constructed to harmonize with desirable or acceptable characteristics of the surrounding environment (Gipe 2002).

- The operator should bury power collection cables or lines on the site.

- Commercial symbols (such as logos), trademarks, and messages should not appear on sites or ancillary structures of wind energy projects. Similarly, billboards and advertising messages should also be prohibited (Gipe 1998, 2002).

- Site design should be accomplished to make security lights nonessential. Such lights significantly increase the contrast between a wind energy project and the night sky, especially in rural/remote environments, where turbines would typically be installed. Where they are necessary, security lights should be extinguished except when activated by motion detectors (e.g., only around the substation) (Gipe 1998).

• Operators should minimize disturbance and control erosion by avoiding steep slopes (Gipe 1998) and by minimizing the amount of construction and ground clearing needed for roads, staging areas, and crane pads. Dust suppression techniques should be employed in arid environments to minimize impacts of vehicular and pedestrian traffic, construction, and wind on exposed surface soils. Disturbed surfaces should be restored as closely as possible to their original contour and revegetated immediately after, or contemporaneously with construction. Action should be prompt to limit erosion and to accelerate restoring the preconstruction color and texture of the landscape.

• The wind development site should be maintained during operation. Inoperative or incomplete turbines cause the misperception in viewers that "wind power does not work" or that it is unreliable. To avoid such misperceptions, inoperative, unrepairable, or incomplete turbines should be completely removed or immediately replaced. Nacelle covers and rotor nose cones should always be in place and undamaged (Gipe 1998). Wind energy projects should evidence environmental care, which would also reinforce the expectation and impression of good management for benign or clean power. Nacelles and towers should also be cleaned regularly (yearly, at minimum) to remove spilled or leaking fluids and the dirt and dust that would accumulate, especially in seeping lubricants. Facilities and off-site surrounding areas should be kept clean of debris, “fugitive” trash or waste, and graffiti. Scrap heaps and materials dumps should be prohibited and prevented. Materials storage yards, even if thought to be orderly, should be kept to an absolute minimum. Surplus, broken, disused materials and equipment of any size should not be allowed to accumulate (Gipe 2002).

5.12 CULTURAL RESOURCES

While impacts to cultural resources are determined on a site-specific basis, certain activities associated with wind energy development have a greater potential for adversely affecting cultural resources than others, assuming such resources are present in the project area. Earthmoving activities (e.g., grading, digging) have the highest potential for disturbing or destroying significant cultural resources; however, pedestrian and vehicular traffic and indirect impacts of earthmoving activities, such as soil erosion, may also have an effect. Visual impacts on significant cultural resources, such as sacred landscapes, historic trails, and viewsheds from other types of historic properties (e.g., homes, bridges) may also occur. In this section, the activities that could potentially affect cultural resources are described for each stage of wind energy development, and relevant mitigation measures are presented.

5.12.1 Site Monitoring and Testing

The potential exists for impacts on cultural resources to occur during site monitoring and testing; however, the causes of possible impacts would be limited to minor ground-disturbing activities and activities that result in the potential for unauthorized collection of artifacts and acts of vandalism. Typically, excavation activities and road construction to provide access to the project area would be very limited. Some clearing or grading might be needed in order to install monitoring towers and equipment enclosures. If more extensive excavation or road construction was needed during this phase, more extensive impacts would be possible (see Section 5.12.2 for a discussion of impacts during construction).

Vehicular traffic and ground clearing (such as the removal of vegetative cover) might directly affect cultural resources if they are present in the project area by compacting soils, potentially crushing artifacts, disturbing historic features (e.g., trails), and displacing cultural material from its original context. These activities might also impact areas of interest to Native Americans, such as sacred areas or areas used for harvesting traditional resources, such as medicinal plants. Indirect effects on cultural resources might occur through an increased potential for soil erosion as a result of these activities. The collection of artifacts by workers or amateur collectors accessing areas that may have been previously inaccessible to the public would be another possible impact. Increased access might also increase the potential for vandalism. Although the activities that occur during the monitoring and testing phase are characterized as temporary actions, cultural resources are mostly nonrenewable and, once impacted (i.e., removed or damaged), are not likely to be recovered or returned to their proper context.

5.12.2 Site Construction

The construction of the infrastructure necessary for wind energy development has the greatest potential to impact cultural resources because of the increased ground disturbance during this phase. The amount of area disturbed could be considerable and would destroy cultural resources if they were present in that area. An indirect effect of this ground disturbance would be soil erosion, which could also impact cultural resources outside the construction footprint.

The development of a wind energy project and its associated access roads would provide access to areas that might have been previously inaccessible. Any increase in the presence of humans in an uncontrolled and unmonitored environment containing significant cultural resources increases the potential for adverse impacts caused by looting (unauthorized collection of artifacts), vandalism, and inadvertent destruction to unrecognized resources.

In addition, visual impacts on cultural resources could occur during the construction phase (see also Section 5.11). Large areas of exposed ground surface, increases in dust, and the presence of large-scale machinery, equipment, and vehicles could contribute to an adverse impact on cultural resources (e.g., those with a landscape component that contributes to their significance, such as a historic trail or sacred landscape).

5.12.3 Site Operation

Fewer impacts on cultural resources are likely from the operation of a wind development project than from its construction. Impacts associated with operation are possible, however, because of the improved access to the area and the presence of workers and the public. As stated above, human presence potentially increases the likelihood of unauthorized collection of artifacts and vandalism, as well as inadvertent destruction of unrecognized resources. In addition, there may be visual impacts on the resource (Section 5.11), since the visible wind turbines may be perceived as an intrusion on a sacred or historical landscape. If the development site would need to be expanded during operation, the impacts would be similar to those associated with construction.

5.12.4 Site Decommissioning

Very few impacts on cultural resources would be expected from decommissioning. Ground disturbance during decommissioning would be confined primarily to areas that were originally disturbed during construction. Most cultural resources are nonrenewable and would either have been removed professionally prior to construction or would have been already disturbed or destroyed by prior activities. However, visual impacts on cultural resources would be mostly removed after decommissioning, as long as the site was restored to its preconstruction state. Despite the physical removal of equipment and the institution of site restoration practices, the impact of a scarred environment in an area sacred to Native Americans would likely remain. If access roads were left in place, the potential for looting and vandalism would also remain and might even increase, since the area would no longer be periodically monitored by the operator. If additional work areas were needed beyond those disturbed during construction, there would be the potential for new impacts similar to those that would occur during construction.

5.12.5 Mitigation Measures

- The BLM should consult with Native American governments early in the planning process to identify issues and areas of concern regarding the proposed wind energy development. Aside from the fact that consultation is required under the NHPA, consultation is necessary to establish whether the project is likely to disturb traditional cultural properties, affect access rights to particular locations, disrupt traditional cultural practices, and/or visually impact areas important to the Tribe(s). Under the conditions of the nationwide BLM PA, the state BLM offices should already have established a relationship with local Tribal governments. A list of the federally recognized Tribes for the 11-state region is available in Chapter 7.

- The presence of archaeological sites and historic properties in the area of potential effect should be determined on the basis of a records search of recorded sites and properties in the area and/or an archaeological survey. The SHPO is the primary repository for cultural resource information, and most BLM Field Offices also maintain this information for lands under their jurisdiction.

- Archaeological sites and historic properties present in the area of potential effect should be reviewed to determine whether they meet the criteria of eligibility for listing on the NRHP. Cultural resources listed on or eligible for listing on the NRHP are considered “significant” resources.

- If cultural resources are present at the site, or if areas with a high potential to contain cultural material have been identified, a CRMP should be developed. This plan should address mitigation activities to be implemented for cultural resources found at the site. Mitigation options include avoidance of the area, archaeological survey and excavation (as warranted), and monitoring. If an area exhibits a high potential, but no artifacts are observed during an archaeological survey, monitoring by a qualified archaeologist could be required during all excavation and earthmoving in the high-potential area. A report needs to be prepared documenting these activities. The CRMP also should (1) establish a monitoring program, (2) identify measures to prevent potential looting/vandalism or erosion impacts, and (3) address the education of workers and the public to make them aware of the consequences of unauthorized collection of artifacts and destruction of property on public land.

- Periodic monitoring of significant cultural resources in the vicinity of development projects may help curtail potential looting/vandalism and erosion impacts. If impacts are recognized early, additional actions can be taken before the resource is destroyed.

5.13 ECONOMICS

The economic impact of wind energy development projects on BLM-administered lands was assessed at the state level for each of the 11 western states. Impacts were measured in terms of employment, income, GSP and tax revenues (sales, and state income), and ROW rental receipts to the federal government. The impact of wind energy development projects on property values was also assessed.

To calculate impacts, representative data from a range of recent wind energy development projects in the western United States were used (PBS&J 2002; Cox 2004; ECONorthwest 2002; Northwest Economic Associates 2003; NREL 2004e). These data include material and labor costs and employment for project construction and operation, and fiscal data used to estimate sales and income tax revenues. These data were used to calculate the direct economic and fiscal impacts of a representative wind energy development project. IMPLAN economic data were then used to calculate the indirect impacts associated with wind energy development project wage and salary spending, material procurement spending, and expenditures of tax revenues (Minnesota IMPLAN Group 2004).

Impact estimates were based on projections of potential wind development on BLM-administered land taken from the WinDS model calculations generated by NREL (see Table 5.13-1 and Appendix B). The WinDS model takes into account project location, power generation capital costs, fossil fuel prices, and transmission system issues in determining maximum market potential for wind power for each state. As discussed in Appendix B and reflected in Table 5.13-1, the WinDS model was used to calculate total potential wind energy supply over the next 20 years in each state of the study area; additional analyses were conducted to estimate which portion of that state total would be located on BLM-administered lands. The WinDS model relies heavily on the assumptions and results from the reference case of *Annual Energy Outlook 2004* (DOE 2004a), as developed by the DOE Energy Information Administration, for input data on electricity demand, fossil fuel prices, generator costs, and other driving factors. While this reference case is a reasonable projection of the future U.S. energy situation, it is always possible that unforeseen factors might change those projected economic circumstances. For example, a major recession in the United States could dampen future electricity demand; or natural gas resources might prove to be more plentiful, which would

TABLE 5.13-1 Projected Wind Power Development by State, Landholding, and Year (MW)[a,b]

State	Landholding	2005	2015	2025
Arizona	Non-BLM	19	37	192
	BLM	1	2	31
	Total	20	40	223
California	Non-BLM	2,830	5,395	7,651
	BLM	784	1,323	1,462
	Total	3,614	6,718	9,113
Colorado	Non-BLM	225	622	1,848
	BLM	33	67	85
	Total	258	688	1,933
Idaho	Non-BLM	75	156	916
	BLM	52	105	185
	Total	127	261	1,101
Montana	Non-BLM	121	397	1,287
	BLM	10	27	37
	Total	131	424	1,325
Nevada	Non-BLM	417	545	604
	BLM	388	574	701
	Total	805	1,119	1,305
New Mexico	Non-BLM	476	952	1,344
	BLM	54	108	199
	Total	530	1,060	1,543
Oregon	Non-BLM	452	743	1,562
	BLM	92	144	196
	Total	543	887	1,758
Utah	Non-BLM	162	467	485
	BLM	89	248	256
	Total	251	716	741
Washington	Non-BLM	246	630	1,314
	BLM	3	6	12
	Total	249	636	1,326
Wyoming	Non-BLM	105	211	357
	BLM	12	24	75
	Total	117	234	433
Total	Non-BLM	5,128	10,154	17,561
	BLM	1,517	2,628	3,240
	Total	6,645	12,782	20,801

[a] Totals may be off due to rounding. Projections include additional new capacity on private and BLM-administered lands; existing capacity is excluded.

[b] According to AWEA (2004), one megawatt (1 MW) of wind-generated power creates enough electricity to supply about 240 to 300 households per year.

Source: WinDS Model (Appendix B).

decrease gas prices and increase the demand for gas-fired generation. Wind supply projections from the WinDS model that form the basis of the economic impact analysis for this PEIS include the PTC but exclude renewable energy portfolio standards.

5.13.1 Summary of Economic Impacts

Except in California and Nevada, the WinDS model predicts only relatively small amounts of wind energy development during the period 2005 to 2015. By 2025, all states would have wind energy development, but the majority would be concentrated in California, Nevada, and Utah (Figure 5.13.1-1).

The economic impacts of construction and operation activities associated with wind energy development projects on BLM-administered lands as projected by the WinDS model are shown in Tables 5.13.1-1 through 5.13.1-3 for the three years 2005, 2015, and 2025. Impacts include both the direct and indirect effects of project construction and operation. Direct impacts would include the creation of new jobs for workers at wind energy development projects and the associated income and taxes paid. Indirect impacts are those impacts that would occur as a result of the new economic development and would include things such as new jobs at businesses that support the expanded workforce or that provide project materials, and associated income and

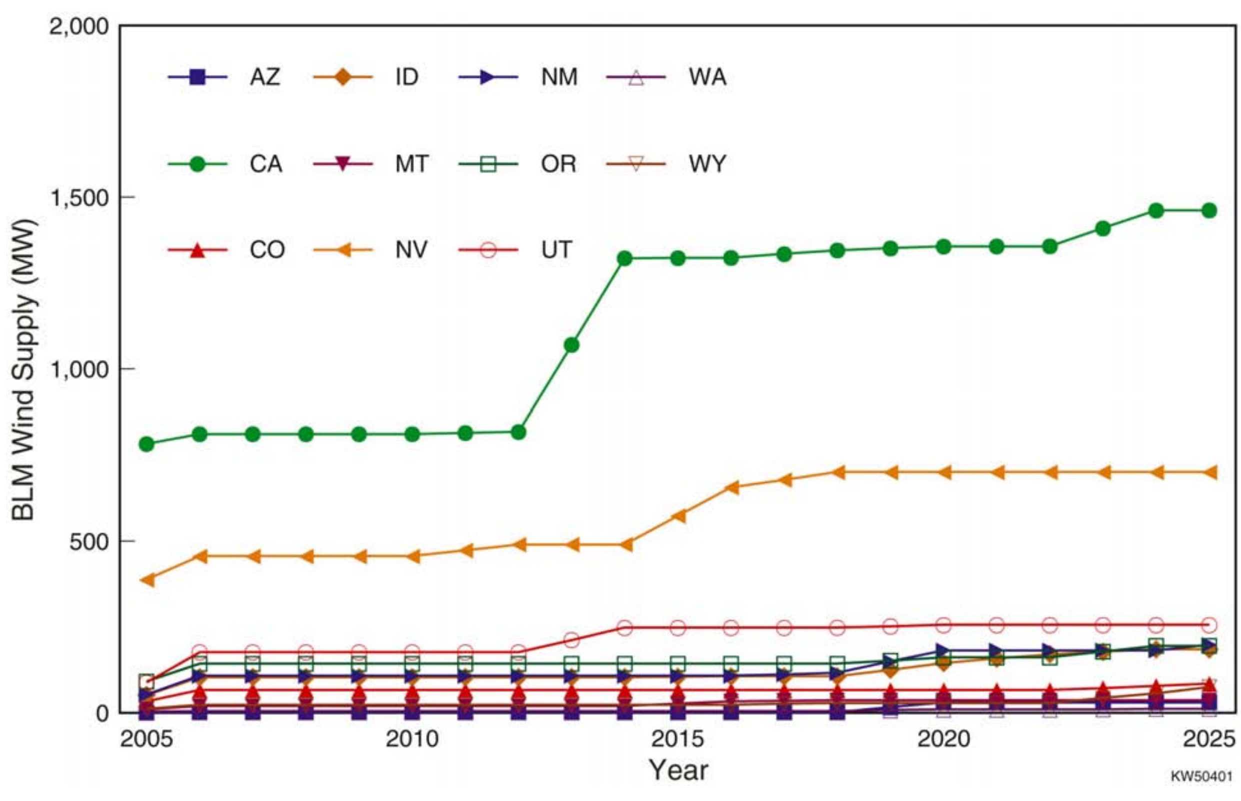

FIGURE 5.13.1-1 Projected Wind Power Development on BLM-Administered Lands by State and Year

TABLE 5.13.1-1 Economic Impacts of Projected Wind Power Development on BLM-Administered Lands in 2005 ($ millions 2003, except employment)[a]

Economic Indicator	Arizona	California	Colorado	Idaho	Montana	Nevada	New Mexico	Oregon	Utah	Washington	Wyoming
Construction											
Employment											
Direct	0	560	20	40	10	280	40	70	60	0	10
Total	0	1,590	70	110	20	700	130	90	210	10	20
Income											
Direct	0	18.2	0.8	1.2	0.2	9.0	1.3	2.1	2.1	0.1	0.3
Total	0.1	71.4	3.0	4.0	0.7	29.3	4.4	7.3	7.4	0.2	0.8
Gross state product	0.3	252.0	10.7	15.5	2.9	111.8	17.0	27.7	28.0	0.9	3.5
Taxes											
Sales	0	17.3	0.7	1.1	0.2	7.9	1.2	1.9	1.9	0.1	0.2
Income	0	4.5	0.2	0.3	0	0.0	0.3	0.5	0.5	0	0.0
Operations											
Employment											
Direct	0	210	10	10	0	110	20	30	20	0	0
Total	0	270	10	20	0	120	20	40	40	0	10
Income											
Direct	0	6.0	0.3	0.4	0.1	3.0	0.4	0.7	0.7	0	0.1
Total	0	10.7	0.4	0.6	0.1	4.5	0.6	1.2	1.1	0	0.1
Gross state product	0	25.1	1.0	1.5	0.3	10.8	1.6	2.8	2.8	0.1	0.3
Taxes											
Sales	0	2.6	0.1	0.2	0	1.2	0.2	0.3	0.3	0	0
Income	0	4.6	0.2	0.3	0	0.0	0.3	0.5	0.5	0	0.0
ROW rental receipts[b]	0	1.9	0.1	0.1	0	0.9	0.1	0.2	0.2	0	0

[a] Employment = number of jobs. Impacts are the result of projected, new capacity on private and BLM-administered lands; impacts from existing capacity are excluded.

[b] ROW rental receipts to the federal government include annual minimum rent only, as based on installed capacity (in MW). The BLM may also charge additional production rents, depending on electricity production. These additional rents are not included since the projected electricity output from wind development is uncertain.

TABLE 5.13.1-2 Economic Impacts of Projected Wind Power Development on BLM-Administered Lands in 2015 ($ millions 2003, except employment)[a]

Economic Indicator	Arizona	California	Colorado	Idaho	Montana	Nevada	New Mexico	Oregon	Utah	Washington	Wyoming
Construction											
Employment											
Direct	0	940	50	80	20	410	80	100	180	0	20
Total	10	2,690	140	230	60	1,040	260	300	590	10	50
Income											
Direct	0.1	30.8	1.5	2.4	0.6	13.3	2.5	3.3	5.8	0.1	0.6
Total	0.2	120.6	6.0	8.0	1.9	43.4	8.8	11.5	20.9	0.5	1.7
Gross state product	0.7	425.5	21.4	31.3	7.9	165.4	34.0	43.4	78.7	1.8	6.9
Taxes											
Sales	0	29.2	1.5	2.2	0.6	11.7	2.3	3.0	5.4	0.1	0.5
Income	0	7.6	0.4	0.5	0.1	0.0	0.6	0.7	1.3	0	0.0
Operations											
Employment											
Direct	0	360	20	30	10	160	30	40	70	0	10
Total	0	450	20	50	10	170	40	60	110	0	10
Income											
Direct	0	10.1	0.5	0.8	0.2	4.4	0.8	1.1	1.9	0	0.2
Total	0	18.1	0.9	1.2	0.3	6.7	1.3	1.9	3.2	0.1	0.3
Gross state product	0.1	42.5	2.1	3.1	0.8	16.0	3.2	4.4	7.8	0.2	0.6
Taxes											
Sales	0	4.3	0.2	0.3	0.1	1.8	0.3	0.5	0.8	0	0.1
Income	0	7.8	0.4	0.6	0.2	0.0	0.6	0.8	1.4	0	0.0
ROW rental receipts[b]	0	3.1	0.2	0.2	0.1	1.4	0.3	0.3	0.6	0	0.1

[a] Employment = number of jobs. Impacts are the result of projected, new capacity on private and BLM-administered lands; impacts from existing capacity are excluded.

[b] ROW rental receipts to the federal government include annual minimum rent only, as based on installed capacity (in MW). The BLM may also charge additional production rents, depending on electricity production. These additional rents are not included since the projected electricity output from wind development is uncertain.

TABLE 5.13.1-3 Economic Impacts of Projected Wind Power Development on BLM-Administered Lands in 2025 ($ millions 2003, except employment)[a]

Economic Indicator	Arizona	California	Colorado	Idaho	Montana	Nevada	New Mexico	Oregon	Utah	Washington	Wyoming
Construction											
Employment											
Direct	20	1,040	60	130	30	500	140	140	180	10	50
Total	60	2,980	180	400	80	1,270	480	410	610	20	160
Income											
Direct	0.7	34.0	2.0	4.3	0.9	16.3	4.6	4.6	6.0	0.3	1.8
Total	2.6	133.3	7.6	14.1	2.7	53.0	16.2	15.7	21.5	0.9	5.3
Gross state product	9.6	470.2	27.4	55.1	10.9	202.1	62.6	59.3	81.2	3.6	22.1
Taxes											
Sales	0.6	32.3	1.9	3.9	0.8	14.3	4.3	4.1	5.6	0.3	1.6
Income	0.2	8.4	0.5	0.9	0.2	0.0	1.0	1.0	1.4	0.0	0.0
Operations											
Employment											
Direct	10	400	20	50	10	190	50	50	70	0	20
Total	10	500	30	80	20	210	80	80	110	0	30
Income											
Direct	0.2	11.2	0.7	1.4	0.3	5.4	1.5	1.5	2.0	0.1	0.6
Total	0.4	20.0	1.1	2.2	0.4	8.1	2.4	2.5	3.3	0.2	0.8
Gross state product	0.9	46.9	2.6	5.4	1.0	19.5	5.8	6.0	8.1	0.4	2.0
Taxes											
Sales	0.1	4.8	0.3	0.6	0.1	2.2	0.6	0.6	0.8	0.0	0.2
Income	0.2	8.6	0.5	1.1	0.2	0.0	1.1	1.1	1.5	0.0	0.0
ROW rental receipts[b]	0.1	3.5	0.2	0.4	0.1	1.7	0.5	0.5	0.6	0.1	0.2

[a] Employment = number of jobs. Impacts are the result of projected, new capacity on private and BLM-administered lands; impacts from existing capacity are excluded.

[b] ROW rental receipts to the federal government include annual minimum rent only, as based on installed capacity (in MW). The BLM may also charge additional production rents, depending on electricity production. These additional rents are not included since the projected electricity output from wind development is uncertain.

taxes. Impacts of construction presented in the three tables represent the total impacts of all wind power projects on BLM-administered land for each year, rather than the impacts of new power projects completed in each year. Impacts of operation correspond to the annual impact of operating wind developments in each year.

The WinDS model predicts that all states in the study area would have wind energy development on BLM-administered lands by 2005. In Arizona and Washington, the level of development on BLM-administered lands would be very low (i.e., less than 5 MW), and most of the development would be in California (784 MW) and Nevada (388 MW). Construction activities associated with these projects would generate 560 direct and 1,590 overall jobs in California, $71 million in income, and $252 million in GSP (Table 5.13.1-1). The state would collect $17 million in sales taxes, and $4.5 million in income taxes would be generated. Impacts in Nevada in 2005 would be slightly smaller than those in California, with 280 direct and 700 total jobs created, $29 million in income, and $112 million in GSP generated. The State of Nevada would collect $7.9 million in sales taxes.

Operational activities on BLM-administered lands by 2005 would generate 210 direct and 270 total jobs in California, $11 million in income, $25 million in GSP, $2.6 million in sales taxes, and $4.6 million in income taxes (Table 5.13.1-1). Under the rental rates defined in the current BLM Interim Wind Energy Policy (BLM 2002a) (Appendix A), wind energy operations in California would also produce $1.9 million in ROW rental receipts to the federal government. In Nevada, wind energy project operation would create 110 direct and 120 total jobs, $4.5 million in income, and $11 million in GSP. Sales taxes generated would amount to $1.2 million. ROW rental receipts in Nevada would amount to $0.9 million.

By 2015, wind energy development on BLM-administered lands would have increased in all states, although production in Arizona and Washington would still be quite low (2 MW and 6 MW, respectively), and continuing development in California (1,323 MW) and Nevada (574 MW) would still be greatest. In California, construction activities would produce 2,690 jobs, $121 million in income, and $426 million in GSP. Sales taxes and income taxes generated would amount to $29 million and $7.6 million, respectively (Table 5.13.1-2). Smaller impacts would occur in Nevada, with 1,040 jobs created, $43 million in income, and $165 million in GSP. The state would collect $12 million in sales taxes. Jobs would also be created in Utah (590), Oregon (300), New Mexico (260), Idaho (230), and Colorado (140).

By 2015, wind power operations on BLM-administered lands in California would produce 450 jobs, $18 million in income, and $43 million in GSP (Table 5.13.1-2). Sales taxes and income taxes generated would amount to $4.3 million and $7.8 million, respectively. Wind power operations in California would also produce $3.1 million in ROW rental receipts to the federal government. Smaller impacts would occur in Nevada, with 170 jobs created, $6.7 million in income, and $16 million in GSP. Sales taxes generated would amount to $1.8 million. Wind power operations in Nevada would also generate $1.4 million in ROW rental receipts to the federal government. Jobs would also be created in Utah (110), Oregon (60), Idaho (50), and New Mexico (40).

By 2025, wind energy development on BLM-administered land would have increased in all states, although production in Washington would remain around 12 MW. While continuing development would still be greatest in California (1,462 MW) and Nevada (701 MW), development in Utah (256 MW), Oregon (196 MW), New Mexico (199 MW), and Idaho (185 MW) would reach appreciable levels. In California, construction activities would produce 2,980 jobs, $133 million in income, and $470 million in GSP (Table 5.13.1-3). Sales taxes and income taxes generated would amount to $32 million and $8.4 million, respectively. Smaller impacts would occur in Nevada, with 1,270 jobs created, $53 million in income, and $202 million in GSP; $14 million in sales taxes would also be generated. Jobs would also be created in Utah (610), New Mexico (480), Idaho (410), Oregon (400), and the other five states.

By 2025, wind power operations on BLM-administered lands in California would generate 500 jobs, $20 million in income, and $47 million in GSP (Table 5.13.1-3); $4.8 million in sales taxes and $8.6 million in income taxes would also be generated. Wind power operations in California would also produce $3.5 million in ROW rental receipts to the federal government. Smaller impacts would occur in Nevada, with 210 jobs created, $8.1 million in income, and $19.5 million in GSP; $2.2 million in sales taxes would also be generated. Wind power operations in Nevada would also produce $1.7 million in ROW rental receipts to the federal government. Smaller impacts would occur in Utah (110 jobs created), Idaho (80 jobs), New Mexico (80 jobs), Oregon (80 jobs), and the other five states.

5.13.2 Property Value Impacts

The potential impact of wind development projects on residential property values has often been a concern in the vicinity of locations selected for wind power. Although this PEIS does not directly assess the potential impacts of wind power on property values, a review of two studies that examined potential property value impacts of wind power facilities suggests that there would not be any measurable negative impacts.

ECONorthwest (2002) interviewed county tax assessors in 13 locations that had recently experienced multiple-turbine wind energy developments. While not all the locations chosen had wind turbines that were visible from residential areas, and some development projects had been constructed too recently for their full impact to be properly assessed, the study found no evidence that wind turbines decreased property values. Indeed, in one area examined, it was found that designation of land parcels for wind development actually increased property values.

Sterzinger et al. (2003) analyzed the effects of 10 wind energy development projects built during the period 1998 to 2001 on housing sale prices. The study used a hedonic statistical framework that attempted to account for all influences on changes in property value; its data came from sales of 25,000 properties, both within view of recent wind energy developments and in a comparable region with no wind energy projects, before and after project construction. The results of the study indicate that there were no negative impacts on property values. For the majority of the wind energy projects considered, property values actually increased within the viewshed of each project, with property values also tending to increase faster in areas with a view of the wind turbines than in areas with no wind projects.

5.14 ENVIRONMENTAL JUSTICE

The analysis of environmental justice issues associated with the development of wind energy projects on BLM-administered lands considered impacts at the state level in 11 western states. Site monitoring and testing, construction, operation, and decommissioning of wind energy development projects on BLM-administered lands in the 11 western states could impact environmental justice if any adverse health and environmental impacts resulting from any phase of wind development were significantly high, and if these impacts would disproportionately affect minority and low-income populations. If the analysis determined that health and environmental impacts would not be significant, there would not be any disproportionate impacts to minority and low-income populations. In the event that impacts were significant, disproportionality would be determined by comparing the proximity of high and adverse impacts to the location of low-income and minority populations.

Section 4.11 describes the distribution of low-income and minority populations in the 11-state study area. Data presented at the state level only provide a general indication of the potential for environmental justice concerns on BLM-administered lands in each state. The analysis undertaken for specific wind energy development projects would need to consider the potential impact on environmental justice at a more local level, where the relative concentration of minority and low-income populations could be significantly different from that at the state level.

5.14.1 Site Monitoring and Testing

Activities associated with site monitoring and testing activities would be relatively limited and typically would result in little change to the landscape. Unless extensive access road construction is involved, it is unlikely that there would be any significantly high adverse impacts associated with this phase of wind energy development on BLM-administered lands. Therefore, it is unlikely that there would be an environmental justice issue associated with these activities.

5.14.2 Site Construction

Noise and dust impacts during construction of wind towers and related transmission and other facilities would likely be minimal given the small amount of land typically disturbed and the relative remoteness of sites usually chosen for wind energy development projects. Mitigation can be applied to keep dust impacts to a minimum. A more significant issue may be impacts from access roads required during construction for the delivery of equipment and materials to wind energy development project sites. Associated visual impacts also could be a concern. Depending on the terrain across which these roads would be constructed, access road length, the length of time they would be used for construction traffic, the volume of traffic, and the proximity to minority and low-income populations, there could be environmental justice issues associated with wind energy project construction on BLM-administered lands.

5.14.3 Site Operation

A major potential environmental justice impact of wind energy development project operation on BLM-administered lands could be the visual impact of wind towers and associated transmission infrastructure. Although the MPDS and BLM's policies exclude development on BLM-administered lands that are designated as being of scenic quality or interest, wind energy development projects could potentially alter the scenic quality in areas of traditional or cultural significance to minority and low-income populations.

Impacts from project operation could also create an environmental justice issue if noise impacts from wind turbine operation are significant. The extent to which noise is an issue would depend on the number of towers in any specific wind energy development project, and the proximity to minority and low-income populations. Additional potential areas of environmental justice concern during operations would be electromagnetic exposure and shadow flicker. Although a range of mitigation measures could be implemented to ensure that the risk to the human population would be minimal (Section 5.8), there may be some health and safety risks with respect to these hazards. The extent to which these hazards create an environmental justice concern would depend on the precise location of low-income and minority populations in relation to specific wind energy development projects. Full analysis of the potential impacts of specific projects on low-income and minority populations would be undertaken as part of site-specific NEPA reviews of each proposed wind energy development site.

5.14.4 Site Decommissioning

Activities occurring during decommissioning would be largely the same as those that occur during construction, only in reverse. As a result, the potential for significantly high adverse impacts to disproportionately affect minority and low-income populations should be about the same during both phases, assuming population demographics remain stable over the life of the wind energy development project.

5.15 EVALUATION AND IDENTIFICATION OF PROGRAMMATIC BMPs

The PEIS analysis of the potential impacts of wind energy development and relevant mitigation measures presented in Sections 5.1 through 5.14 was used to identify the programmatic BMPs to be included in the proposed Wind Energy Development Program (Section 2.2.3.2). The process for evaluating and identifying the programmatic BMPs is discussed below. An assessment of the effectiveness of the programmatic BMPs at mitigating potential impacts, along with an assessment of other aspects of the proposed Wind Energy Development Program, is presented in Chapter 6. The management alternatives to the proposed action also are assessed in Chapter 6.

One objective of the proposed program is to establish programmatic BMPs that would be applicable to all wind energy development projects on BLM-administered lands. As a result, the mitigation measures discussed in this chapter were reviewed to determine whether they are applicable to all wind energy development projects**.** Certain mitigation measures address issues that are likely to occur in a limited number of locations (e.g., efforts needed to minimize impacts to the movement and safe passage of fish) or only for specific species (e.g., mitigations for impacts to sage-grouse or golden eagles). These mitigation measures would be relevant to wind energy development on BLM-administered lands at specific locations and, in accordance with a policy included in the proposed Wind Energy Development Program, they would be incorporated into the project-specific POD and the ROW grant stipulations, as needed, to address site-specific and species-specific issues. However, because these types of mitigation measures are not applicable to all projects, they are not included in the proposed programmatic BMPs.

Additional mitigation measures presented in Sections 5.1 through 5.14 are not included in the programmatic BMPs because they provide relatively detailed guidance regarding issues that are common to a variety of activities other than wind energy development on BLM-administered lands (e.g., road construction and maintenance, wildlife management, hazardous materials and waste management, cultural resource management, pesticide use, integrated pest management). The proposed Wind Energy Development Program includes a policy stating that the requirements of other, existing and relevant BLM mitigation guidance will be incorporated into project PODs, as appropriate.