4 Environmental Consequences

This chapter identifies the potential environmental consequences of implementing the Proposed Project, Wind Partners' proposed development and the proposed Federal actions (Western's proposed action is to consider whether to allow interconnection requests; RUS's proposed action is to consider whether to provide financial assistance for the Proposed Project. The EIS addresses the requirements of applicable laws and regulations including the requirements of NEPA, Section 102(2), the CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508), DOE NEPA Implementing Procedures (10 CFR Part 1021), RUS Environmental Policies and Procedures (7 CFR Part 1794), and the following statutes and Executive Orders:

- Agriculture Department Regulation (DR) 5600-2, Environmental Justice
- Agriculture DR 9500-3, Land Use Policy
- Agriculture DR 9500-4, Fish and Wildlife Policy
- Bald and Golden Eagle Protection Act
- USDA, Departmental Policy for the Enhancement, Protection and Management of the Cultural Environment
- Archeological Resources Protection Act
- Clean Air Act
- Clean Water Act
- Endangered Species Act
- Farmland Protection Policy Act
- Migratory Bird Treaty Act
- National Historic Preservation Act
- Native American Graves Protection and Repatriation Act
- Noxious Weed Act
- Presidential Executive Order 11988 (Floodplain Management)
- Presidential Executive Order 11990 (Wetlands Management)
- Presidential Executive Order 12088 (Federal Compliance With Pollution Control)
- Presidential Executive Order 12898 (Environmental Justice)
- Presidential Executive Order 13007 (Indian Sacred Sites)
- Presidential Executive Order 13112 (Invasive Weed Species)
- Presidential Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds)
- Presidential Executive Order 13045 (Protection of Children from Environmental Health Risks and Safety Risks)
- Safe Drinking Water Act
- Wild and Scenic Rivers Act

As described in **Chapter 3**, the affected environment or ROI is the physical area that bounds the environmental, sociological, economic, or cultural feature of interest that could be impacted by implementing the Proposed Project, Wind Partners' proposed development and the proposed Federal actions. The boundaries of the ROI may vary depending on the resource being analyzed.

Direct and indirect impacts for each of the alternatives are identified for each resource component. Direct effects are "caused by the action and occur at the same time and place." Indirect effects are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 CFR 1508.8).

Construction, operation and decommissioning of the Proposed Project, Wind Partners' proposed development and Western's system modifications at its existing substation were analyzed to determine potential impacts. The Wind Partners' proposed development would be constructed within the boundaries of the Crow Lake Alternative and share many of the components described for the Proposed Project. For the Crow Lake Alternative, the term "Proposed Project Components" includes the Wind Partners' proposed development. As identified in **Chapter 2**, the "Proposed Project Components" include:

- Wind Turbine Generators and Foundations
- O&M Building
- Underground Communication System and Electrical Collector Lines
- Collector Substation and Microwave Tower
- Overhead Transmission Line
- Temporary Equipment/Material Storage or Lay-down Areas
- Temporary Batch Plant
- Crane Walks
- New and/or Upgraded Service Roads to Access the Facilities

The significance criteria used for determining potential impacts for each environmental and socioeconomic resource were developed based on scientific information, statute, or in response to public concern. Criteria were only developed for potential impacts identified as issues during the EIS scoping process. For issues not identified during the EIS scoping process, potential impacts are addressed as described in the impact assessment sections for each resource. "Thresholds of significance" were used to determine the level of environmental impact for issues identified during the EIS scoping process. These thresholds of significance establish benchmarks for increasing levels of effects, the highest of which is significant impact. Significance can be viewed in two ways: 1) the effect is environmentally significant; and/or 2) the effect has policy significance. Thresholds of significance were determined by evaluating the expected impacts against the significance criteria for each of the alternatives.

The Applicants and Agencies have included BMPs and APMs for the Proposed Project, Wind Partners' proposed development and proposed Federal actions to minimize impacts associated with construction; these practices are described in **Chapter 2, Table 2.2** and **Table 2.3,** by resource area, as applicable. The Applicants and Agencies have committed to these included BMPs and APMs prior to the evaluation of environmental impacts. If impacts are determined to

be less than significant after application of the included BMPs and APMs, then no additional mitigation is proposed.

The impact analysis was conducted by evaluating potential impacts with BMPs and APMs in place, then weighing any residual impacts against the significance criteria and identifying additional mitigation measures, if necessary. The following thresholds of significance used for this analysis are listed in order of increasing level of impact:

- No Impact
- Less than Significant Impact
- Potentially Significant Impact with Proposed Mitigation

The original analysis in the DEIS was conservative and included the evaluation of 10 contingent turbines and associated facilities. At this time, seven of the contingent turbine locations for the Crow Lake Alternative represent the Wind Partners proposed development (see **Figure 1.3**, **Section 2.3.1 and Table 2.4**); therefore, the Wind Partners' proposed development does not represent a substantial change to the analysis conducted for the DEIS. As such, the Wind Partners' proposed development represents an increment of the impact described for the Crow Lake Alternative for all resources. Impacts specific to each resource have been described in their appropriate sections.

To enable the Agencies to make an informed decision on the proposed Federal actions, the current layout for the Proposed Project Components was updated from what was included in the DEIS. This layout was surveyed for cultural resources and wetlands (including jurisdictional and non-jurisdictional WUS, collectively termed "wetlands"). Wetland delineations were also completed for the layout presented in the DEIS. Wetland delineations, if not previously completed for the proposed layout, would be completed prior to construction. The layout is based on those survey results and other resource and engineering considerations. Additional resource surveys and engineering siting (see **Section 2.3.2 Pre-Construction Activities**) could occur that may further adjust the current locations to avoid or minimize resource impacts. The current locations of the Proposed Project Components have been analyzed and included in the EIS resource discussions below. As stated in **Section 2.8**, the Crow Lake Alternative is the preferred alternative.

4.1 GEOLOGY AND SOILS

4.1.1 METHODS

The ROI for geology and soils includes areas of immediate disturbance associated with development of the Proposed Project Components and proposed Federal actions. As presented in **Section 3.1**, geologic data has been obtained from the South Dakota Geological Survey (SDGS). Reports prepared for local exploration and expansion of community water supplies provided additional information. Geologic units and physiographic provinces have been cross-checked against GIS data and maps obtained from the USGS and EPA (USGS 2009). Soil characteristics have been obtained from the NRCS database (NRCS 2009). Data obtained from the combination

of these sources have been overlain on a GIS map of the Proposed Project Components in order to assess impacts.

4.1.2 SIGNIFICANCE CRITERIA

The principal measure of effect on soil resources is the amount and location of soils disturbed during construction and occupied during operations.

A significant impact to geology and soils would occur if:

- The Proposed Project Components and/or the proposed Federal actions would result in erosion, causing long-term impacts to other resources (*e.g.*, water quality)

4.1.3 IMPACT ASSESSMENT

For both alternatives, staging and construction activities would require sand and gravel resources. Sand and gravel resources are located in the vicinity of the site alternatives. South Dakota's annual production of sand and gravel is approximately 8,000,000 tons per year (Peterson Hammond 1992). For either site alternative, each turbine base would use approximately 320 cubic yards of concrete, encompassing approximately 33,000 cubic yards total, and would require approximately 46,200 tons of sand and gravel. This amount is less than half of one percent of the sand and gravel annually generated within South Dakota. There could also be potential for additional gravel to be used for road improvements. Use of these resources for the construction activities would not deplete the availability and supply of sand and gravel.

4.1.3.1 Crow Lake Alternative

Development of the Crow Lake Alternative would result in approximately 1,006 acres of temporary disturbance and approximately 190 acres of permanent impacts to soils.

Soils in the Crow Lake Alternative area are considered by NRCS to have a slight to moderate risk of erosion. During construction, existing vegetation would be removed in the areas associated with the Proposed Project Components, potentially increasing the risk of erosion. Once vegetation is removed in the vicinity of the construction areas, soils would be excavated to achieve necessary grades and put into stockpiles. Excavations would likely encounter the Quaternary sediments consisting of nonglacial alluvium, glacial deposits, loess, and colluvium, and near-surface or surface outcrops of Pierre Shale. Included BMPs and APMs (as listed in **Chapter 2, Table 2.2** and **Table 2.3**) and a SWPPP would be implemented for the construction, operation and decommissioning activities for the Proposed Project Components.

Further, geotechnical investigations would identify the stability of the soils and underlying geology to assist with turbine placement, design of foundations and specification of drainage controls. Grading would be designed to manage runoff and achieve long-term stabilization of restored temporary disturbance areas and areas with permanent installations. Foundation designs would consider compaction requirements for backfill, depth to the saturated zone, slope erosion potential and similar factors.

For the aforementioned reasons, implementing the Crow Lake Alternative would result in minimal erosion and would not cause long-term impacts to geology, soils, or water resources (see **Section 4.2**); thus, the impacts would be less than significant.

Development of the Western system modifications at the Wessington Springs Substation would result in less than significant impacts to geologic and soil resources since work would be short-term in duration and confined to a previously disturbed and graded area. Development of the Western system modifications at the Wessington Springs Substation would employ the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), and would adhere to a SWPPP.

4.1.3.2 Winner Alternative

Development of the Winner Alternative would result in approximately 3,188 acres of temporary disturbance and approximately 261 acres of permanent impacts to soils. In general, the impacts associated with the Winner Alternative would be similar to those identified for the Crow Lake Alternative.

Soils in the Winner Alternative area are considered by NRCS to have a slight risk of erosion. As described for the Crow Lake Alternative, included BMPs and APMs (as listed in **Chapter 2, Table 2.2** and **Table 2.3**) and a SWPPP would be implemented. Geotechnical investigations would identify the stability of the soils and underlying geology to assist with turbine placement, design of foundations and specification of drainage controls. Development of the Winner Alternative would result in less than significant impacts to geology, soils or water resources (see **Section 4.2**).

With the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), and adherence to a SWPPP, Western's system modifications proposed for the Winner Substation would result in less than significant impacts, similar to the Wessington Springs Substation proposed for the Crow Lake Alternative.

4.1.3.3 No Action Alternative

Under the No Action Alternative, Western would not approve an interconnection request(s) and RUS would not provide financial assistance for the Proposed Project. For the purpose of impact analysis and comparison in this EIS, it is assumed that the Applicants' Proposed Project (and Wind Partners' proposed development as it pertains to the Crow Lake Alternative) would not be built and the environmental impacts, both positive and negative, associated with construction and operation would not occur. There would be no geology and soils impacts associated with the No Action Alternative.

4.2 WATER RESOURCES

4.2.1 METHODS

The ROI for water resources encompasses those hydrologic systems that could be impacted by discharges, spills and/or stormwater runoff associated with implementing the Proposed Project

Components and proposed Federal actions. The water resources assessment includes consideration of the compilations of technical memorandums for both alternatives (Terracon 2009a and 2009b). Surface water flows, impaired waters, floodplains, groundwater resources and wetlands data have been cross-checked against data and reports from the DENR, USGS and GIS maps from the EPA, USFWS and USGS. Potential impacts have been identified based on the available resource information, consideration of the elements for evaluation, and in relation to the impact analysis area.

4.2.2 SIGNIFICANCE CRITERIA

A significant impact to water resources would occur if:

- The normal flow of a water body or normal drainage patterns and runoff would be substantially altered; or if the Proposed Project Components would be placed within a 100-year flood hazard area that would impede or redirect flood flows
- The quantity and quality of discharges within waters or watercourses would be modified by in-stream construction or accidental contamination to the extent that water use by established users is measurably reduced, or the water quality of already impaired waters is further degraded
- An activity would cause an increase in susceptibility to on-site or off-site flooding due to altered surface drainage patterns or stream channel morphology, per Presidential Executive Order 11988 Floodplain Management
- Surface drainage patterns or stream channel morphology would be altered to the extent that vegetation communities and habitats dependant on current hydrologic conditions are degraded
- An activity would cause a loss or degradation of jurisdictional or non-jurisdictional wetlands (including WUS) in violation of the terms and conditions of a USACE permit

4.2.3 IMPACT ASSESSMENT

Field investigations in 2008 and 2009 were conducted to verify NWI wetlands and map the actual location of wetlands. Wetlands that were field-verified (not NWI wetlands) were used in the impact analysis because 1) they were identified in the field as opposed to NWI wetlands that are identified on maps and not field-verified, and 2) field-verified wetlands accounted for a larger, more conservative, acreage than NWI wetlands. In addition, wetlands (including jurisdictional, non-jurisdictional and WUS, collectively termed “wetlands”) were delineated for the Crow Lake Alternative (WEST 2009a), but not for the Winner Alternative. Proposed Project Components in the Crow Lake Alternative have been adjusted based on engineering and resource issues in some areas since the survey was completed; therefore, additional wetland delineations would be completed within Proposed Project Component impact areas after final design such that all wetlands would be identified and avoided. Water resource factors which may affect the locations of individual turbines include, but are not limited to, a wetland delineation and other resource and engineering considerations. Under the included BMPs and APMs, further coordination would occur between the Applicants and the USACE if wetlands cannot be avoided, although the Applicants have committed to avoiding wetlands. As necessary, the

Applicants would obtain the necessary permit(s) under Section 404 of the CWA prior to construction; permits may not be acquired before the completion of the EIS. As currently designed, the project would have no temporary or permanent impacts; therefore, it is assumed for the following impact analyses that there would be no wetland impacts. Depending on final design and/or unforeseen circumstances during construction where wetlands impacts may be unavoidable, the Applicant would obtain permits and mitigate for impacts to USACE jurisdictional wetlands. Potential permanent impacts to wetlands would be less than significant, in accordance with USACE requirements for each of the alternatives.

4.2.3.1 Crow Lake Alternative

The majority of both temporary and permanent disturbances would be on land currently used for rangeland and agriculture and on soils with low representative slopes. However, the excavation and exposure of soil during construction of the Proposed Project Components could cause sediment runoff during rain events. Alteration of flow patterns is not anticipated and would be avoided wherever possible. Potential impacts in these areas that result from construction, operation and decommissioning activities would be minimized through implementing and adhering to regulations and permits governing storm water pollution prevention and sediment control, such as a General Construction Storm Water Permit, SWPPP, 404 permit, FEMA and county regulations. The SWPPP would outline BMPs for construction, operation and decommissioning of the site to protect water resources (including downstream impaired waters) and adjacent wetlands and minimize the potential for soil erosion and sediment transport. Implementation of the included BMPs and APMs (as listed in **Chapter 2, Table 2.2 and Table 2.3**) and permits would ensure that potential impacts to surface water flows, drainage patterns, quantity and quality are less than significant during construction, operation and decommissioning activities.

On-site or off-site flooding would not result from construction, operation or decommissioning of the Proposed Project Components. Flood hazard zones have not been identified in the Crow Lake Alternative; as needed, the final engineering design would evaluate site conditions and the BMPs and APMs would be implemented to address potential flooding. Thus, development of the Crow Lake Alternative would result in less than significant impacts to floodplains.

Additionally, excavations for foundation installations may have the potential to encounter shallow groundwater resources. If shallow groundwater is encountered during construction or decommissioning, the Applicants would obtain a Dewatering Permit from DENR. Water extraction during potential dewatering operations would be conducted in a manner to protect water quality, and would be of minimal volume. Potential effects on groundwater would be isolated and small-scale, resulting in short-term, localized water table depressions that would not remain following construction or decommissioning. Thus, development of the Proposed Project would result in less than significant impacts to water supplies.

Development of the Crow Lake Alternative would not result in temporary or permanent impacts to field-verified or delineated wetlands. Wetlands within USFWS easements on private property

are under USFWS jurisdiction. As included in the BMPs and APMs, the Applicants would site the Proposed Project Components to avoid wetlands and if wetlands cannot be avoided, the Applicants would work with the USFWS and/or USACE to obtain permits and minimize impacts to wetlands. Therefore, impacts to wetlands would be less than significant.

Development of the Western system modifications at the Wessington Springs Substation would not result in any impacts to water resources since drainage from the site is controlled by the site's SWPPP. Based on construction of the existing substation, groundwater is not expected to be encountered during foundation excavation activities. If groundwater is encountered, Western would address this in accordance with BMPs, APMs (**Chapter 2, Tables 2.2** and **2.3**), and other regulatory requirements.

4.2.3.2 Winner Alternative

The impacts associated with the Winner Alternative would be similar to those for the Crow Lake Alternative. Development of the Winner Alternative would not result in temporary or permanent impacts to field-verified or delineated wetlands. This would be applicable regardless of the transmission line option selected. Wetlands within USFWS easements on private property are under USFWS jurisdiction. Potential impacts to wetlands would be avoided. The Applicants have committed to avoiding wetlands. If wetlands cannot be avoided, the Applicants' would work with the USFWS and USACE to obtain permits and minimize unavoidable impacts; therefore, impacts to wetlands would be less than significant.

Western's system modifications at Winner Substation would result in impacts similar to the Wessington Springs Substation. Development of the Western system modifications would employ the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**).

4.2.3.3 No Action Alternative

Under the No Action Alternative, Western would not approve an interconnection request(s) and RUS would not provide financial assistance for the Proposed Project. For the purpose of impact analysis and comparison in this EIS, it is assumed that the Applicants' Proposed Project (and Wind Partners' proposed development as it pertains to the Crow Lake Alternative) would not be built and the environmental impacts, both positive and negative, associated with construction and operation would not occur. There would be no water resource impacts associated with the No Action Alternative.

4.3 CLIMATE CHANGE AND AIR QUALITY

4.3.1 METHODS

The ROI for climate change and air quality includes areas of immediate disturbance associated with the Proposed Project Components and the proposed Federal actions, in association with the regional conditions. This analysis evaluates environmental impacts to air resources as a result of the construction, operation and decommissioning of the Proposed Project Components and the

proposed Federal actions. DENR data have been researched to verify current State regulations regarding the guideline levels for criteria pollutants. In addition, South Dakota's Ambient Air Quality Standards (SDAAQS) have been identified under the SDCL, Chapter 34A-1. This public policy of the State serves to achieve and maintain reasonable levels of air quality as well as support local and regional air pollution control programs. Climate data has been obtained from the Chamberlain, South Dakota weather station. GHG and climate change information has been obtained from the interactive Green Power Equivalency Calculator available from the EPA for purposes of broader analysis and climate change analysis (EPA 2009a), see **Chapter 5 Section 5.4.1** for additional discussion).

4.3.2 SIGNIFICANCE CRITERIA

A significant impact to air quality would occur if:

- An activity would result in violation to any local, State, or Federal air quality standard due to increased fugitive dust emissions

4.3.3 IMPACT ASSESSMENT

4.3.3.1 Crow Lake Alternative

The Crow Lake Alternative is not in a non-attainment area for any criteria pollutant under any applicable air quality standard. Fugitive dust emissions from the Proposed Project Components would be within standards set forth by DENR and NAAQS. Increased fugitive dust emissions would be temporary and minor during construction or decommissioning of the Proposed Project Components, and would not exceed SDAAQS particulate standards.

Further, operation of the Proposed Project and Wind Partners' proposed development would offset emission sources when compared to similarly-sized electric generating facilities using carbon-based fuel sources. Wind-generating stations do not emit CO_2 (which is a GHG that contributes to climate change); it is estimated that the Proposed Project and Wind Partners' proposed development would avoid 726,600 metric tons of CO_2 emissions per year (EPA 2009b) compared to the average emissions of fossil fueled generating stations employed in South Dakota. This amount avoided is equal to the annual carbon dioxide emissions of approximately 130,000 average passenger cars (EPA 2009b). The greatest advantage of wind power is electricity generation without air emissions, including CO_2. Some emissions would be generated from construction and maintenance activities, primarily from vehicle exhaust.

Impacts would be restricted to short periods during construction or decommissioning at small, individual sites. Included BMPs and APMs (as listed in **Chapter 2, Table 2.2 and Table 2.3**) would be employed during ground disturbing activities. Therefore, development of the Crow Lake Alternative would not result in a violation to any local, State, or Federal air quality standard and therefore would result in less than significant impacts.

Western's Wessington Springs Substation currently has SF_6 gas-filled circuit breakers, and Western would install additional SF_6 breakers to interconnect the Proposed Project. During operation of the new substation additions, authorized Western personnel would conduct periodic inspections and service equipment as needed. Properly trained maintenance personnel would monitor and manage the use, storage and replacement of SF_6 to minimize any releases to the environment. SF_6 gas used in substation circuit breakers is contained in sealed units that are factory-certified not to leak. During inspections, equipment would be monitored for detection of leaks, and repairs would be made as appropriate. Western's system modifications at Wessington Springs Substation would incorporate BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**); therefore, impacts to air quality from fugitive dust would be less than significant.

4.3.3.2 Winner Alternative

Impacts of the Winner Alternative would be similar to those identified for the Crow Lake Alternative; therefore, impacts to air quality would be less than significant.

SF_6 breakers would be installed at the Winner Substation to accommodate the interconnection, and the same practices proposed for Wessington Springs would be employed at Winner Substation. Western's system modifications at Winner Substation would incorporate BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**); therefore, impacts to air quality from fugitive dust would be less than significant.

4.3.3.3 No Action Alternative

Under the No Action Alternative, Western would not approve an interconnection request(s) and RUS would not provide financial assistance for the Proposed Project. For the purpose of impact analysis and comparison in this EIS, it is assumed that the Applicants' Proposed Project (and Wind Partners' proposed development as it pertains to the Crow Lake Alternative) would not be built and the environmental impacts, both positive and negative, associated with construction and operation would not occur. There would be no climate change and air quality impacts associated with the No Action Alternative.

4.4 BIOLOGICAL RESOURCES

4.4.1 METHODS

The impact assessment for biological resources was conducted by evaluating impacts to vegetation communities, suitable or occupied habitats and/or known species occurrences within the Crow Lake and Winner alternatives. If suitable or occupied habitats would be impacted by development of either alternative, the level of impact was determined and significance criteria (described in **Section 4.4.2**) were applied to each community, habitat or species.

4.4.2 SIGNIFICANCE CRITERIA

Significance criteria for biological resources are different for vegetation, common wildlife and special-status species. These criteria are used to disclose whether biological resources would be

impacted by the Proposed Project and Wind Partners' proposed development to assist the Agencies with their final determinations.

Vegetation

A significant impact to vegetation resources would occur if:

- An activity resulted in the long-term loss of riparian or grassland vegetation
- An activity resulted in uncontrolled expansion of noxious weeds (Presidential Executive Order 13112 – Invasive Weed Species)

Wildlife

A significant impact to wildlife resources would occur if:

- An activity affected the biological viability of a local, regional or national population of wildlife species
- An activity violated Federal or State wildlife conservation policy or law and affected the biological viability of a local, regional or national population of wildlife species. For birds not Federally-listed, the applicable policy is the MBTA or BGEPA

Special Status Species: Endangered, Threatened, Proposed, Candidate and Other Sensitive Species

A significant impact to endangered, threatened, proposed, candidate and other sensitive species would occur if:

- An activity resulted in take of a protected species beyond that authorized by permit
- An activity affected the biological viability of a local, regional or national population of a State-listed wildlife species or one of concern/interest resulting in the increase in severity of listing status (*e.g.*, from threatened to endangered)
- An activity violated Federal or State wildlife law (SDCL 34A-8) and affected the biological viability of a local, regional or national population of a species of State-listed wildlife species or one of concern/interest resulting in the increase in severity of listing status. For birds not Federally-listed, the applicable law is the MBTA and/or BGEPA. For listed species, the applicable law is ESA.

A BA was prepared under Section 7 of the ESA for Federally-listed species (**Appendix G**). Findings of the BA are summarized in this EIS. While SDCL 34A-8 does not require agency consultation for State-listed threatened and endangered species, SDGFP has been active in the preparation of this EIS.

4.4.3 IMPACT ASSESSMENT

4.4.3.1 Crow Lake Alternative

Vegetation

Construction of the Proposed Project Components would result in temporary and permanent impacts to existing vegetation within the Crow Lake Alternative. The majority of these impacts would be in the mixed-grass prairie and cropland vegetation communities. Any damage to field crops on cultivated lands during construction would be compensated by the Applicants. Within non-cultivated lands, mixed-grass prairie (mostly rangeland and pasture) and wetlands are the vegetation communities most sensitive to disturbance. Areas of direct and indirect impacts within each vegetation class are based on vegetation community mapping for the Proposed Project Components (Tierra EC 2009), as presented in **Table 4.4-1**.

The Proposed Project Components would result in the temporary disturbance of approximately 691 acres of mixed-grass prairie, 306 acres of cropland, and 3 acres of shelterbelts. The Proposed Project Components would result in the permanent disturbance of approximately 141 acres of mixed-grass prairie, 46acres of cropland, and 1 acre of shelterbelts. No wetlands would be temporarily or permanently disturbed. Mixed-grass prairie is principally rangeland and pasture. Impacts that would occur to cultivated lands are not considered biologically significant because these lands are frequently disturbed by tilling, planting and harvesting activities associated with crop production.

The Crow Lake Alternative would permanently remove approximately 141 acres of mixed-grass prairie. These losses would be widely dispersed across the Crow Lake Alternative which has approximately 23,016 acres of mixed-grass prairie, amounting to a very small percentage of the total area (0.8 percent). Access roads would increase fragmentation of native rangeland, in some cases resulting in smaller patches of the remaining grassland types (**Figure 3.4-1**).

The Crow Lake Alternative would result in the temporary disturbance of 68 acres and the permanent disturbance of 15 acres within USFWS grassland easements. It would also result in the temporary disturbance of 120 acres and the permanent disturbance of 22 acres within USFWS wetland easements. These acreages are included within, not in addition to, the total areas cited in the previous paragraph. As currently proposed, location of turbines in grassland easements would comply with the permit conditions for those easements. Within areas proposed for easements, turbines would be placed at low densities so as not to substantially alter habitat quality.

Table 4.4-1 Summary of Disturbance Areas within Vegetation Communities in the Crow Lake Alternative

Vegetation Type	Total Temporary Disturbance (acres)	Total Permanent Disturbance (acres)
Mixed-grass prairie	691	141
Cropland	306	46
Wetlands	0	0
Farmstead	2	1
Shelterbelt	3	1
Deciduous forest	2	1
Total area	1,006	190

Note: Discrepancy in total values is due to exclusion of mine/quarry land use and rounding.

Permanent vegetation loss would result from removal of vegetation at turbines, collector and interconnection substations, the O&M building, underground and overhead collection lines and access roads. Temporary disturbance would result from turbine work areas, crane walks, temporary lay down areas, the underground and overhead collection system, the temporary batch plant, and areas along the access roads. Permanent loss of vegetation would be minimized by limiting the area of physical ground disturbance through the use of existing roads and by reseeding all temporarily disturbed areas with native mixtures of grasses upon completion of construction activities. Impacts in these areas that occur as a result of construction, operation and decommissioning activities would not substantially increase disturbance levels compared with existing, non-project-related disturbances such as roads and agriculture. Impacts to temporarily disturbed rangeland and pasture would be short-term, and the disturbed areas would revegetate quickly after re-seeding.

Physical ground disturbance and construction vehicles, and possibly increased public access, could facilitate the establishment and spread of noxious weeds. Noxious weeds compromise native biodiversity and create financial burdens. South Dakota has 27 documented noxious weed species, 11 of which occur in Aurora, Brule and Jerauld counties (see **Table 3.4-2**). The establishment of noxious/invasive vegetation could be limited by early detection and eradication. State law requires that listed weeds be controlled by the landowner, and the Applicants would comply with local and State requirements for noxious weed control during construction of the Proposed Project Components.

To prevent the possible introduction of noxious weed seed, heavy equipment from other geographic regions used during construction would be washed prior to departure from the equipment storage facility. Washing equipment prior to transport from one work site to another is not recommended. On-site equipment washing increases the chance of weed seed dispersal by drainage of water off the site, across an area greater than the size of the work site. Instead, accumulations of mud would be “knocked off”. This method promotes containment of weed seeds on the work site.

Follow-up monitoring of the presence, distribution and density of noxious weeds would be conducted for three years post-construction by the Applicants to ensure the success of control measures. Surveys would be conducted as early in the year as feasible to control noxious weeds before they produce seed. Control methods would be based on the available technology and the

weed species present. Methods used to control weeds may include mowing or handpulling; in extreme cases of noxious weed infestation, an approved herbicide may be applied.

Fugitive dust generated during clearing, grading and vehicle travel could adversely affect vegetation, but any effects would be short-term and localized to the immediate area of construction. Control measures would be implemented to minimize fugitive dust emissions from construction-related traffic and ground disturbance (see **Chapter 2, Tables 2.2 and 2.3**). Access road construction could result in increased public access depending on the amount of access permitted by the landowners. If public access is increased, there could be an increase in wildfires ignited by catalytic converters and careless cigarette use. The risk for wildfires would be greatest in summer and autumn when native grasses have gone dormant and fuel loads are at their peak. To limit new or improved access into the area, all new access roads not required for maintenance would be closed. Due to the private ownership of the leased lands, the majority of roads would be gated, further limiting public access and thus minimizing noxious weed spread and wildfire ignition.

These impacts would not affect the biological viability of any local, regional or national plant species. Because the footprint of the Proposed Project Components is relatively small compared with the overall size of the Crow Lake Alternative and habitats present, and 33 percent of the area is tilled annually for agricultural production, direct impacts to vegetation would be minimal.

As included in the BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), the Applicants and Wind Partners would locate the Proposed Project Components to avoid wetlands; if wetlands cannot be avoided, the Applicants and Wind Partners would work with the USFWS and/or USACE to obtain permits and minimize impacts. Therefore, impacts to wetlands would be less than significant. As currently designed, the project would have no temporary or permanent impacts; therefore, it is assumed that there would be no wetland impacts. Depending on final design and/or unforeseen circumstances during construction where wetlands impacts may be unavoidable, the Applicant and Wind Partners would comply with USACE mitigation requirements.

Based on the minimal impacts to vegetation resources described above, impacts to Vegetation Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded, and impacts to vegetation resources due to construction, operation and decommissioning of the Proposed Project Components would be less than significant.

Wildlife

Mammals (excluding bats)

Most impacts to mammal species would be temporary and associated with the construction phases. Development of the Proposed Project Components would temporarily and permanently remove habitat. The Crow Lake Alternative would result in the temporary disturbance of 1,006 acres of habitat, while 190 acres would become permanently unavailable. The areas of temporary disturbance would be reclaimed and reseeded with an approved native seed mix. It would likely take two growing seasons before these areas would be restored to the pre-construction condition. The area of habitat permanently lost represents a relatively small amount of habitat available regionally (less than 1 percent). This small loss (less than 0.4 percent) of moderate quality

habitat (grasslands are currently grazed) would not disrupt breeding, rearing or wintering behavior and would not influence the viability of local populations.

Noise, excavation and other forms of disturbance during construction would likely temporarily displace wildlife species within or adjacent to the disturbed areas for a short period. Upon completion of construction, wildlife species would become accustomed to operation and maintenance activities and would be expected to resume use of the Crow Lake Alternative, although some areas may be avoided permanently. Mammal movement within and through the wind facility would not be impeded once the project is constructed because most facilities would not be fenced. Given the small amount of habitat loss and low level of human activity during the operation and maintenance of the project, avoidance impacts are not expected to affect the biological viability of a local, regional or national population of wildlife species, leading to a less than significant impact. Permanent vegetation loss could destroy small mammal habitat, but population level effects are not expected because less than 0.4 percent of the area would be permanently disturbed.

The risk for direct mortality of species resulting from construction activities or vehicle collision is limited. Adults are typically mobile and would be able to avoid construction equipment or vehicles (unless they were traveling at high rates of speed). Operation of the wind facility would not result in excessive increases in traffic or human presence and are not anticipated to significantly impact mammals.

Based on the minimal impacts to mammals described above, Wildlife Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded, and impacts to mammals would be less than significant.

Bats

Construction of the Proposed Project Components could affect bats through direct mortality, habitat loss and fragmentation and disturbance effects (SDBWG and SDGFP 2009). Bat surveys for the Crow Lake Alternative were completed in October, 2009 (Derby *et al.* 2010a). There are no known roosts within or adjacent to the area. The probability of construction-related bat mortality is low given their mobility and the absence of any roosts. Habitat loss and fragmentation effects to bats are also expected to be minimal, mainly because roosting habitat (trees) loss would be minimal and existing fragmentation of these habitats would not be increased. The permanent loss of approximately 141acres of mixed-grass prairie foraging habitat would not represent an adverse effect to bats given the large adjacent tracts of similar habitat. No wetland shrub or forested riparian habitats or other areas of concentrated bat use would be affected. A total of 1.18 acres of shelterbelt representing less than 0.2 percent of potential daytime roosting habitat may be permanently removed. Construction would generally occur during daylight hours and would not disturb these nocturnal animals.

Operation and maintenance impacts to bats include disturbance and displacement, habitat fragmentation and direct mortality. As noted above, general disturbance and displacement effects would be minimal given the small percentage of potential daytime roost tree removal within or adjacent to the Crow Lake Alternative. Maintenance activities would be conducted during

daylight hours when bats are not active, and noise associated with operating turbines are not likely to affect bats. Wind turbines and access roads could fragment foraging habitat for bats.

The level of bat activity documented at the Crow Lake Alternative was similar to bat activity at facilities in Minnesota and Wyoming, where bat mortality was low (0.76 to 10.27 fatalities/MW/year). Assuming that a relationship between bat activity and bat mortality exists, relatively low levels of bat mortality would be expected to occur in the Crow Lake Alternative; most likely during August. Based on fatality rates at wind-energy facilities in the Midwest, the bat use observed at this site, and habitat of the site, it is expected that the potential risk to bats from turbine operations would be low compared to the rates observed at other Midwest facilities (Derby *et al.* 2010a).

Assessing the potential impacts of wind energy development to bats at the Crow Lake Alternative is complicated because the proximate and ultimate causes of bat fatalities at turbines are poorly understood (Kunz *et al.* 2007, Baerwald *et al.* 2008, Cryan and Barclay 2009 [in Derby *et al.* 2010a]) and because monitoring elusive, night-flying animals is inherently difficult (O'Shea *et al.* 2003 [in Derby *et al.* 2010a]). While construction of wind facilities has increased rapidly in recent years, the availability of publically available bat information from existing projects lags behind (Kunz *et al.* 2007). To date, monitoring studies of wind projects suggest that:

a) bat mortality shows a rough positive correlation with bat use
b) the majority of fatalities occur during the post-breeding or fall migration season (roughly August and September)
c) migratory tree-roosting species (eastern red, hoary, and silver-haired bats) account for almost 75 percent of reported bats killed, and
d) the highest reported fatalities occur at wind-energy facilities located along forested ridge tops in the eastern and northeastern US. However, recent studies in agricultural regions of Iowa and Alberta, Canada, report relatively high fatalities as well

Based on these patterns, current guidance to estimate potential mortality levels at proposed wind projects involves evaluation of the on-site bat acoustic data in terms of activity levels, seasonal variation, and species composition (Kunz *et al.* 2007), as well as comparison to regional fatality patterns.

Collision-related bat mortality has been documented at most wind farms in the western U.S. (Erickson *et al.* 2002). Annual bat mortality rates have ranged between 0.74 and 2.3 fatalities per turbine at wind farms in Wyoming, Oregon and Minnesota (Young *et al.* 2003a). Researchers have concluded that observed mortality rates do not have population-level effects, and no significant difference has been noted in mortality rates at lit and unlit turbines (Johnson *et al.* 2003). However, bat populations in the northeastern United States have been experiencing recent declines due to a fungus (white-nose syndrome) that is found in caves. If bat populations living in caves in South Dakota that migrate through the Crow Lake Alternative have been infected with this fungus, wind turbine mortalities could have a more cumulative impact on these populations. However, little is known about bat populations in South Dakota. Most mortality has involved migrant or dispersing bats rather than residents (Johnson 2005; Johnson *et al.* 2003; Keeley 2001). Bat mortality from collisions with turbines at the Crow Lake Alternative would

likely occur. Bat fatality monitoring is ongoing at the adjacent Wessington Springs wind facility; however, data from these studies were not available at the time of publication of this FEIS.

Bat use recorded by ground detectors within the Crow Lake Alternative during the fall was similar to activity recorded at wind facilities in Minnesota and Wyoming, where fatality rates were relatively low (0.76 to 10.27 fatalities/MW/year). Thus, based on the expected relationship between pre-construction bat use and post-construction fatalities, bat mortality rates at the Crow Lake Alternative would be expected to be similar to the 2.4 bat fatalities/MW/year reported at Buffalo Ridge Minnesota (Derby *et al.* 2010a).

Bat mortality studies at wind-energy facilities across North America show a vast range of bat mortality rates, ranging from zero to 39.70 bat fatalities/MW/year. In general, fatality rates are highest in the Northeast and lowest in the Northwest, although a high degree of variation in fatality rates is present for most regions. To date, no fatality data have been made public for the Southwest or Southeast regions. Based on the results of fatality surveys elsewhere in the Midwest region, fatalities at the Crow Lake Alternative would range between 0.76 and 10.27 bat fatalities/MW/year (Derby *et al.* 2010a). It should be noted that these are only estimates based on the number of bat calls recorded during bat surveys with acoustical equipment. Population data are difficult to obtain, and the available literature does not provide population data at wind facilities. The Crow Lake Alternative was sited in an area that is likely to minimize impacts to bats.

Based on the expected impacts to bats described above, Wildlife Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded, and impacts to bats would be less than significant.

Reptiles/Amphibians

Impacts to reptiles and amphibians would be similar to those described for mammals (**Section 4.4.3.1** Wildlife, Mammals), although they are not as mobile as many mammals. Activities associated with construction, operation and decommissioning could result in the direct mortality of reptiles and amphibians if they are not able to move away from equipment and other vehicles. These impacts would be less than significant based on the small amount of habitat that would be temporarily and permanently removed and the low likelihood for direct mortality of individuals. Wildlife Significance Criteria 1 and 2 would not be exceeded, and impacts to reptiles/amphibians would be less than significant.

Birds

The 2008 PII study (**Appendix G**) evaluated possible impacts to biological resources in accordance with USFWS guidelines. A reference site was chosen (Lake Andes National Wildlife Refuge) in an area with good habitat values for birds for comparison purposes. High scores indicate good general habitat value, and that biological resource impacts would be more likely if the area was to be disturbed. The Crow Lake Alternative PII score of 239 is considerably lower than that of the Lake Andes reference area (PII of 331). The high score at the reference site can be attributed to the presence of more, and probably higher quality, wetland and grassland areas. The results of ongoing migratory and breeding bird surveys at the Crow Lake Alternative have been incorporated into this assessment of possible impacts to avian species.

Construction impacts common to all avian species include direct mortality, habitat alteration (fragmentation) or loss, disturbance related to noise, the presence of large structures on the landscape and increased human presence resulting in displacement of individual birds. Mortality is associated with destruction of eggs or abandonment of active nests due to disturbance. Migratory and breeding bird surveys in 2009 indicate that the Crow Lake Alternative supports populations of grassland birds, including a number of species protected under the MBTA and included in the USFWS list of BCC (Derby *et al.* 2010c).

Construction would not last longer than one nesting season, but could occur during the nesting period for many bird species. Ground nesting species such as ferruginous hawk, northern harrier, greater prairie chicken, and sharp-tailed grouse along with low vegetation nesting songbirds would be at higher risk for impacts from disturbance. Although construction activities may result in some level of egg loss and nest abandonment, measures would be implemented to minimize these impacts. The Applicants would attempt to do as much grading and other ground disturbance as possible before the start of the breeding season. If construction is to take place during the migratory bird breeding or nesting season, avian nest surveys, including grouse lek surveys, would be conducted within all non-cropland areas subject to temporary or permanent disturbance immediately prior to construction in that area (refer to **Table 2.3**). All active nests and leks would be marked as avoidance areas. A prairie grouse survey and monitoring plan has been designed and approved in consultation with SDGFP to evaluate potential impacts to leks (WEST 2010a). While the design and application of the included BMPs, APMs, OMP (WEST 2010b), and habitat offsets (Plank 2010) (as listed in **Chapter 2, Table 2.2 and Table 2.3**) would further reduce fatalities related to nest abandonment, avian mortality would occur. Wildlife Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded. The MBTA would be violated if nest abandonment occurs; however, based on the anticipated low level of mortality and short term of construction, impacts to birds would be less than significant.

The Proposed Project Components would result in the permanent loss of approximately 181 acres of mixed-grass prairie habitat (**Table 4.4-1**), which represents a small proportion of this habitat (0.7 percent). The spacing of turbines and access roads could contribute to habitat fragmentation in the Crow Lake Alternative at a small scale, although much of the site area and adjacent areas are currently highly fragmented by roads, farmsteads, and agricultural lands. The Crow Lake Alternative is not expected to increase fragmentation to a larger scale than currently exists because only 0.4 percent of the existing mixed-grass prairie habitat would be permanently disturbed, habitat patch size would remain essentially the same, and traffic would not be substantially increased. Permanent access roads would be 16-feet wide and existing roads would be used where possible (30-40 miles of new road; 25-35 miles of existing road) and turbine pads would be 37-feet in diameter. It is anticipated that, even with this small amount of fragmentation of this habitat type, it would still provide the greatest amount of grassland bird habitat in the vicinity of the Crow Lake Alternative.

Construction noise and associated human activity could temporarily disturb or displace individual birds and may interfere with migration, foraging, breeding and nesting. Studies have suggested that noise from construction and human activities disturb upland bird species, displacing birds from traditional habitats, reducing use of leks and causing nest abandonment (Young *et al.* 2003a). Disturbance would be limited to the duration of construction activities. Construction-related disturbance would be limited to a single migratory (both spring and fall)

and breeding-nesting season; however, survival and reproductive success would be temporally reduced. Impacts would be less than significant, because Wildlife Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded.

The types of impacts associated with operation and maintenance of the Proposed Project Components are different than those described for construction activities. Bird fatalities resulting from collisions with turbines have been documented at most operational wind farms and have involved a variety of bird species, including passerines, raptors, waterfowl and shorebirds (Erickson *et al.* 2003). Data indicate bird vulnerability to collisions with turbines is species-specific, habitat-specific and facility-specific (Erickson *et al.* 2001), with mortality rates being most highly correlated with the number of turbines (EFSEC 2003). Other factors that influence avian mortality include the arrangement of turbines (*i.e.*, end turbines have higher collision rates), proximity to migration corridors and rim edges, structure type (*e.g.*, lattice structures provide perches within the Rotor Sweep Area [RSA]), tower height (*i.e.*, blades are closer to the ground on shorter turbines), conditions that reduce visibility (*i.e.* fog), and attractants such as abundant prey resources and certain FAA marker lights (Johnson *et al.* 2003; NWCC 2003; Gehring and Kerlinger 2007).

U.S. wind farm facilities average 2.19 avian fatalities per turbine per year (Erickson *et al.* 2001). The average is reduced to 1.83 fatalities per turbine per year if the Altamont Pass wind farm in California is excluded from calculations (Altamont Pass has experienced high mortality rates due to facility design and siting factors). Passerines make up more than 80 percent of all bird fatalities at wind farms (Erickson *et al.* 2001), and mortality rates at wind farms have not created population-level effects for any species (Young and Erickson 2003). Waterfowl and shorebird mortality at wind farms has been minimal (Erickson *et al.* 2003; Koford 2005). Avian use studies showed level of use based on habitat type to be similar to other wind facilities (Derby *et al.* 2010c); therefore, avian fatalities are expected to be around 198 per year at the Crow Lake Alternative. This is a relatively low number when compared to the 7,785 individual birds observed during the 2009 avian surveys. Based on these data, population impacts at the local level are not anticipated. Avian fatality monitoring is ongoing at the adjacent Wessington Springs wind facility; however, data from these studies were not available at the time of publication of this FEIS.

Average raptor mortality rates are 0.03 raptor per turbine per year overall, and 0.006 raptors per turbine per year excluding Altamont Pass (Erickson *et al.* 2001). Raptor mortality has been absent to very low at most newer generation wind facilities (NWCC 2003). Based on the results from other wind farms, a ranking of seasonal mean raptor use was developed. Mean raptor use in the Crow Lake Alternative during spring, summer, and fall of 2009 was low (0.38, 0.13, and 0.43 raptors/plot/20-minute survey, respectively), ranking thirty-first relative to 44 other wind resource areas with spring data, forty-first relative to 41 other wind resource areas with summer data, and twenty-third relative to 38 other wind resource areas with fall data (Derby *et al.* 2010c); therefore, raptor mortalities are expected to be relatively low (0.006 raptors per turbine per year). If raptor mortalities occur at this rate, it is estimated that 0.65 raptor mortalities per year may occur at the Crow Lake Alternative. Based on these data, population impacts at the local level are not anticipated.

Mean raptor use is determined by dividing the total number of raptors observed by the total number of 800-meter plots and the total number of surveys. Based upon these data, raptor use of the Crow Lake area is not greater than that observed at most existing and proposed wind farms (Derby *et al.* 2010c). Higher raptor concentrations are known along the Missouri River corridor 30 miles west of the Crow Lake area (South Dakota Birds 2009).

As part of the Proposed Project Components, BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**) have been included to reduce avian mortality associated with turbine operation. Tubular structures and newer generation turbines (GE 1.5sle; see **Section 2.3.1**) would eliminate the creation of perching sites within the area and decrease the risk of avian collisions (Erickson *et al.* 2002). A post-construction monitoring program to assess avian mortality was designed and would be implemented in coordination with the USFWS, Western, RUS and SDGFP (WEST 2010b). Additionally, the Applicants' would provide funding for habitat offsets for migratory birds (Plank 2010). Data obtained through baseline avian use surveys and local habitat characterization suggest that avian mortality rates are likely to be similar to or lower than those experienced at other wind farms. While the design and application of the included BMPs, APMs, OMP (WEST 2010b), and habitat offsets (Plank 2010) (as listed in **Chapter 2, Table 2.2 and Table 2.3**) would further reduce fatalities, avian mortality would occur. Wildlife Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded. The MBTA would be violated; however, based on the anticipated low level of mortality, impacts to birds would be less than significant. This reasoning is based on the fact that all wind facilities result in bird fatalities and therefore violate the MBTA; however, fatality rates differ at all facilities and some are higher than others. Based on existing avian use data from the Crow Lake Alternative, bird fatalities are expected to be low compared with other wind facilities around the United States and are therefore not expected to affect the viability of local, regional, or national populations.

Noise and human activities associated with operation and maintenance of the Proposed Project Components would result in temporary disturbance similar to those discussed for construction, but at reduced intensity. Regional roads may experience increased traffic due to interest in seeing the operational turbines, although traffic would generally be restricted to public roads, thereby minimizing potential impacts. New roads would be constructed for access to the turbines, but the majority of these roads would be gated and located on private land, minimizing or eliminating increased public access.

The presence of turbines and operation and maintenance activities could result in longer-term effects, including avoidance and abandonment of habitats in proximity to the Proposed Project Components. Research has indicated that displacement effects associated with wind turbines are specific to the project location and individual bird species. Studies have identified reduced avian use in habitats within 164 to 656 feet of turbines for certain species and no avoidance by other species (Johnson *et al.* 2000; Erickson *et al.* 2007; Shaffer and Johnson 2009), and grassland species specifically decreased use of habitats near turbines (Erickson *et al.* 2007, Leddy *et al.* 1999). Displacement could result in reduced breeding success, productivity and survival. Baseline surveys were conducted to assess pre-construction avian abundance and habitat use in the Crow Lake Alternative. Reference sites have been established outside of potential impact areas within the Crow Lake Alternative boundary for comparison. Post-construction monitoring would continue surveys for a minimum of three years to evaluate species-specific changes in abundance, habitat use and displacement effects associated with operation of the Proposed

Project Components compared to general avian communities (**Chapter 2, Tables 2.2 and 2.3**). In addition, whooping crane and sandhill crane monitoring would occur concurrently for a minimum of three years. Both of these studies would improve the understanding of species-specific disturbance and displacement effects associated with development of the Proposed Project Components. Based on very limited data, displacement effects may be in the range of 1.9 acres to 31 acres per turbine (although this may vary by species and does not represent a 100 percent exclusion), or 205 to 3,348 acres in the Crow Lake Alternative (out of 23,016 acres of grassland habitat) (Johnson *et al.* 2000; Erickson *et al.* 2007; Shaffer and Johnson 2009). The Applicants have committed to habitat offsets (Plank 2010) that would be used to purchase and protect in-kind habitats to offset potential impacts. Based on the small acreage that may be impacted by displacement effects and proposed habitat offsets, impacts would be less than significant, and Wildlife Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded.

Operation and maintenance activities and the presence of turbines could also fragment habitat for grassland species. The Crow Lake Alternative mixed-grass prairie ecosystem is relatively fragmented, mainly due to the presence of cropland, roads, and farmsteads. Human activity, turbines and access roads could further fragment habitats for avian species; however, the amount of fragmentation expected from the Crow Lake Alternative would be small and may only slightly increase the current level of fragmentation. The actual fragmentation effects are difficult to quantify, but would likely be species-specific and could disrupt movement between seasonal habitats. In the worst case, these effects would lead to some reduction of breeding success, productivity and survival. The post-construction monitoring program would help determine fragmentation effects (**Chapter 2, Tables 2.2 and 2.3**).

Based on the localized impacts to birds described above and implementation of the included BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), OMP (WEST 2010b), and habitat offsets (Plank 2010), Wildlife Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded. The MBTA would be violated; however, based on the anticipated low level of mortality, impacts to birds would be less than significant. This reasoning is based on the fact that all wind facilities result in bird fatalities and therefore violate the MBTA; however, fatality rates differ at all facilities and some are higher than others. Based on existing avian use data from the Crow Lake Alternative, bird fatalities are expected to be low compared with other wind facilities around the United States and are therefore not expected to affect the viability of local, regional, or national populations.

Special Status Species

Federal-Listed Species

Whooping Crane: Suitable habitat for the whooping crane in the Crow Lake Alternative includes stopover, roosting and foraging habitats. The Crow Lake Alternative is within the Aransas-Wood Buffalo Population migration corridor. Previous sightings in the region, large numbers of sandhill cranes (a surrogate species of the whooping crane), and the presence of suitable habitat make it possible that whooping cranes occasionally fly over and land in the Crow Lake Alternative during seasonal migrations, and operating turbines could pose a threat. Whooping crane occurrence increases closer to the Missouri River, the approximate centerline of the migration corridor, 30 miles west of the Crow Lake Alternative. Suitable habitat is present

throughout the migration corridor and the Crow Lake Alternative, and use of the entire corridor is likely during any migratory cycle. Inclement weather, predation and human disturbance may cause whooping cranes to stray considerable distances from the centerline of the corridor. Structures, such as wind turbines and transmission lines, pose a collision risk for whooping cranes due to poor visibility during inclement weather and poor flying agility of cranes. To date, there are no documented occurrences of whooping crane collisions with wind turbines; however, it is theoretically foreseeable. The entire length of the new transmission line would be marked and maintained in perpetuity with line marking devices according to manufacturer specifications and the Applicant's engineering specifications to reduce the risk to whooping cranes.

Direct Effects

Examples of direct effects to whooping cranes include permanent and temporary loss of habitat and mortality associated with collisions. This section considers both the temporary and permanent impacts to various land cover types and the risk of mortality from turbine blade strikes and transmission line strikes.

Permanent and Temporary Impacts to Land Cover

If construction were to occur during the migration season, the disturbance would likely result in avoidance of the site area by whooping cranes and a temporary reduction in available migration habitat. During placement of the turbines and construction of associated infrastructure, approximately 1,006 acres of suitable habitat would be temporarily disturbed (**Table 4.4-1**), the majority occurring on mixed-grass prairie and cropland (99 percent). **Table 4.4-1** indicates that no wetlands would be temporarily impacted; roads would be routed around wetlands and collector lines would be directionally drilled to avoid wetland impacts. Additionally, there would be no direct disturbance to or permanent loss of wetland areas. Habitats that are temporarily disturbed would be reclaimed and are expected to return to their former condition. The amount of land lost permanently would be substantially less than the land temporarily disturbed; approximately 141acres of mixed-grass prairie, 46 acres of cropland, and minimal amounts of other cover types would be lost (**Table 4.4-1**).

Many landowners have easements on their properties. All of the easements within the Crow Lake Alternative area are administered by the USFWS, and include wetland and grassland easements. There are approximately 2,718 acres of wetland easements and 2,130 acres of grassland easements in the site area (**Figure 3.4-2**). Construction of the turbines and associated infrastructure would impact these areas both temporarily and permanently. **Table 4.4-1** shows the disturbance to easements and other areas. The NRCS administers CRP easements but does not disclose locations of CRP land, therefore, these acreages are not included in **Table 4.4-1**.

Direct Mortality

In their 2004 review, the National Wind Coordinating Committee (NWCC) did not find wind facility-related mortalities of any crane species from publicly available data (NWCC 2004). Specifically, collision mortality with turbines has not been documented for the whooping crane; however, the species is considered vulnerable (Langston and Pullan 2003). If whooping cranes utilize habitat within or near the site area after the construction of the wind facility, it is

presumed that they would be vulnerable to collision mortality due to their large size, low maneuverability, and known vulnerability to other structures on the landscape, such as power lines. A number of factors may affect that vulnerability. Age/experience of individual birds may play a role as may weather conditions, light levels, locations of feeding and roosting areas relative to the turbines and transmission lines, locations of updraft areas relative to the turbines and transmission lines, operation of the turbines when cranes are present, and other possible unidentified factors. It is anticipated that the level of direct collision mortality, if it occurs, is likely to be extremely low. The reason for this is that whooping cranes do not travel in large flocks, but rather individually or in small family groups and they generally fly at altitudes higher than turbines. Also, if they avoid the wind facility altogether direct mortality would not occur. Monitoring during and after construction would result in immediate reporting in the unlikely event of crane mortality, and curtailment of turbine operations when whooping cranes are observed in the project area or within 2 miles of operating turbines until the cranes leave the area (**Appendix G**).

Indirect Effects

The primary indirect effect is the potential for complete avoidance by whooping cranes of the stopover habitat located within the area of the proposed facilities (turbines, transmission lines, access roads, substations, O&M building). It is currently unknown whether the presence of turbines would deter cranes from utilizing the area. It has been suggested that, based on anecdotal observations, sandhill cranes appear to avoid wind project areas. Birds observed in the past using habitat that is now occupied by wind farms appear to be using other suitable sites away from the wind farms; however, that could also be due to annual changes in habitat conditions. It is uncertain whether whooping cranes would react to wind farms similarly to sandhill cranes (USFWS 2008b). There are 76 wetlands (295 acres) within a half-mile of turbines in the Crow Lake Alternative. Based on the anecdotal observations that sandhill cranes appear to avoid wind project areas, whooping cranes may also avoid these 76 wetlands.

Loss of migration habitat is a growing concern regarding the AWBP. As previously discussed, the indirect effects of the Crow Lake Alternative could reduce the amount of available stopover habitat in the site area, and also present the threat of increased energy expenditure required while birds search for suitable stopover habitat, or increase the exposure to hazards as birds are required to fly low for longer distances in search of suitable habitat. The possibility exists for this disturbance to affect the physical condition of the birds, placing energy demands and stressors on individuals at a critical point in their life cycle (migration). The increased disturbance could also place the cranes at greater risk of exposure to other hazards encountered during migration such as power lines, hunters, disease, and predation.

Based on current information and the possibility for avoidance of the Crow Lake Alternative by the species during migration, it is unlikely, although possible, that the proposal would result in the direct mortality of a whooping crane. There would be a relatively small permanent loss of suitable stopover habitat. Avoidance of the Crow Lake Alternative area by whooping cranes could result in indirect effects as described above. The entire length of the new 11-mile transmission line would be marked as a voluntary conservation measure. The Applicant would also provide funding for the purchase and permanent protection of stopover habitat (habitat offsets) (Plank 2010), and implement the OMP described in the BA (**Appendix G**). With the

proposed avoidance, minimization, and voluntary conservation measures in place, Special Status Species Criteria 1, 2, and 3 would not be exceeded and potential impacts to the whooping crane would be less than significant, provided no take occurs. Western and RUS would also follow USFWS conditions provided in the BO.

Topeka Shiner: Direct effects to the Topeka shiner would not occur; no stream crossings are proposed to tributaries to West Branch Firesteel Creek. Further, there would be no water withdrawals from this watershed for construction, operation or maintenance activities. Indirect impacts, such as sedimentation, would be precluded through the implementation of the BMPs and APMs (**Chapter 2, Tables 2.2. and 2.3**).

Implementation of the Crow Lake Alternative would result in a less than significant impact because Special Status Species Criteria 1, 2, and 3 would not be exceeded.

Piping Plover: It is possible, although highly unlikely, that piping plovers could collide with turbines or overhead lines. Such collisions would be highly unlikely due to the lack of suitable habitat in the area and low potential that this species would migrate through the area. Nesting activities occur along the Missouri River and alkaline shores; therefore, it is unlikely that piping plover occur in the Crow Lake Alternative.

Implementation of the Crow Lake Alternative would be less than significant because Special Status Species Criteria 1, 2, and 3 would not be exceeded. Please refer to the BA in **Appendix G** for a more detailed analysis.

State-Listed Species

Bald Eagle: The bald eagle may occur in the Crow Lake Alternative during winter months as a transient resident, although it is not likely that they use the area regularly. The Proposed Project Components could affect the bald eagle as a result of temporary disturbance or displacement associated with construction, operation and decommissioning activities, minor losses of foraging habitat, and mortality of individuals via collision with turbines and transmission lines. Traffic, noise and human presence during construction, operation and decommissioning could displace individual Bald Eagles foraging in the vicinity. However, the Crow Lake Alternative contains a limited amount of suitable foraging habitat, so construction, operation and decommissioning activities would have minimal effect on bald eagles. The included BMPs and APMs (as listed in **Chapter 2, Tables 2.2 and 2.3**), including the OMP, would be implemented as part of the Proposed Project Components to minimize disturbance and displacement effects. Construction activities would be modified or curtailed when bald eagles are present to reduce disturbance. Also, construction crews would be instructed to avoid disturbing or harassing wildlife (including bald eagles) and to report any bald eagle sightings to the appropriate agencies as dictated by the project-specific OMP.

The Proposed Project Components are not likely to result in bald eagle mortality. Raptor mortality has been relatively low at wind farms and, prior to 2010, there were no reported bald eagle fatalities at any wind facilities in the western U.S. (Erickson *et al.* 2002; Johnson *et al.* 2000; Young *et al.* 2003). One bald eagle was recently killed at a wind facility in Wyoming where the nest was close to the facility (Gates 2010). The probability of bald eagle mortality would be further minimized because there are very few roosting trees and no known nests in the

Crow Lake Alternative. The collection system would be underground, eliminating the risk of collision and electrocution from those lines. Overhead transmission lines would be constructed using Avian Power Line Interaction Committee (APLIC) guidelines to reduce the potential for collision or electrocution (APLIC 2006). As included in the BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), the new transmission line would be marked with line marking devices. Impacts would be less than significant, because Special Status Species Significance Criteria 1, 2, and 3 (**Section 4.4.2**) would not be exceeded. If an eagle take occurs, the BGEPA and MBTA would be violated. In that case, consultation and mitigation of take with the USFWS would be required; however, impacts to bald eagle would be less than significant based on the anticipated low level of mortality. This reasoning is based on the fact that all wind facilities result in bird fatalities and therefore violate the BGEPA and MBTA; however, fatality rates differ at all facilities and some are higher than others. Based on existing avian use data from the Crow Lake Alternative, bald eagle fatalities are not expected or would be low compared with other wind facilities around the United States and are therefore not expected to affect the viability of local, regional, or national populations.

State and Federal Species of Concern

Greater Prairie Chicken and Sharp-tailed Grouse: As discussed above, suitable habitat for greater prairie chickens and sharp-tailed grouse is present in the Crow Lake Alternative.

Construction effects would be similar to those previously described for grassland species. To minimize effects upon Greater Prairie Chickens and Sharp-tailed Grouse, no construction activities would be permitted within a pre-determined radius of a known active lek between March 1 and May 1. Impacts would be less than significant, because Special Status Species Significance Criteria 1, 2, and 3 (**Section 4.4.2**) would not be exceeded.

Possible operation and maintenance impacts for prairie chickens and sharp-tailed grouse are similar to those described for grassland species, although collision-related mortality of prairie chickens and sharp-tailed grouse has been relatively rare at wind farms (Erickson *et al.* 2002). Grouse and greater prairie chickens could fly within the turbine's RSA, which puts them at risk for collision with turbine blades. While the chance for collision-related mortality of Greater prairie chicken and sharp-tailed grouse is low, post-construction monitoring of avian mortality would help to evaluate fatalities and identify turbines causing disproportionate mortality rates (**Chapter 2, Tables 2.2 and 2.3**). The turbine design would prevent the creation of raptor perches that can result in increased predation upon sharp-tailed grouse and greater prairie chickens. If increased predation does occur and the cause is identifiable, onsite mitigation (*i.e.* raptor or raven deterrent devices) would be developed to correct the issue. Impacts would be less than significant, because Special Status Species Significance Criteria 1, 2 and 3(**Section 4.4.2**) would not be exceeded.

Noise and human activities associated with operation and maintenance would result in temporary disturbances to sharp-tailed grouse and greater prairie chickens similar to those previously discussed for construction, although to a lesser extent. Although no studies have been conducted to evaluate the effects of turbine presence on greater prairie chickens and sharp-tailed grouse, there is anecdotal evidence that these species exhibit avoidance of tall structures (Braun 1998; Bidwell *et al.* 2004). For example, lesser prairie chickens avoid even high-quality habitat within

656 feet of a single oil or gas well pump, within 1,968 feet of an improved road and within 3,280 feet of a transmission line (Bidwell *et al.* 2004). Greater prairie chickens in Oklahoma have been shown to avoid areas within 1,600 feet of transmission lines (Pruett *et al.* 2009). Accordingly, the presence of turbines and transmission lines could displace greater prairie chickens and Sharp-tailed Grouse from habitats in the vicinity of these facilities. Turbines could also fragment Greater Prairie Chicken and Sharp-tailed Grouse habitat by disrupting movement between seasonal habitats. While difficult to quantify, it is likely that the Proposed Project Components would result in the effective loss of a small portion of suitable Greater Prairie Chicken and Sharp-tailed Grouse habitat and could adversely affect individual reproduction and survival, although population level impacts are not anticipated. As included in the BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), pre- and post-construction avian use surveys would help document habitat effects associated with the presence of turbines, and habitat offsets for protection of grassland habitat (Plank 2010). The Applicant prepared a Grouse Survey and Monitoring Protocol and OMP (WEST 2010a) that was approved by SDGFP and includes up to 10 years post-construction monitoring of prairie grouse at the Crow Lake Alternative. Impacts would be less than significant, because Special Status Species Significance Criteria 1, 2, and 3 (**Section 4.4.2**) would not be exceeded.

Grassland Bird Species (Le Conte's sparrow, chestnut-collared longspur, grasshopper sparrow, western meadowlark, upland sandpiper, marbled godwit, long-billed curlew, lark bunting, red-headed woodpecker, McCown's longspur, dickcissel, loggerhead shrike): Grassland species of concern occur in the Crow Lake Alternative as migratory and/or breeding residents, and several were observed during spring and summer surveys. Adverse impacts associated with construction, operation and decommissioning would be similar to those described in **Section 4.4.3.1, Wildlife, *Birds*** and would be reduced through implementation of the included BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), OMP (WEST 2010b), and habitat offsets for protection of grassland habitat (Plank 2010). Impacts would be less than significant because Special Status Species Significance Criteria 1, 2 and 3 (**Section 4.4.2**) would not be exceeded. The MBTA would be violated; however, based on the anticipated low level of mortality, impacts to grassland birds would be less than significant. This reasoning is based on the fact that all wind facilities result in bird fatalities and therefore violate the MBTA; however, fatality rates differ at all facilities and some are higher than others. Based on existing avian use data from the Crow Lake Alternative, bird fatalities are expected to be low compared with other wind facilities around the United States and are therefore not expected to affect the viability of local, regional, or national populations.

Wetland Bird Species (American bittern, Wilson's phalarope, black-crowned night heron, black tern, American white pelican): Wetland bird species may occur in the Crow Lake Alternative as summer residents since suitable breeding habitat is present. Black-crowned night herons were observed during spring or summer surveys; the other three species were not observed. Pre-construction nest surveys would identify nesting species and nest disturbance would be avoided.

Construction activities could temporarily disturb wetland species in the vicinity, although direct impacts to wetland habitats would be avoided completely. Operation may result in collisions with turbines, causing injury or death or result in displacement if turbines are constructed near wetlands. Adverse impacts would be reduced through implementation of the included BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), OMP (WEST 2010b), and habitat offsets for protection

of grassland habitat (Plank 2010). Impacts would be less than significant, because Special Status Species Significance Criteria 1, 2, and 3 (**Section 4.4.2**) would not be exceeded. The MBTA would be violated; however, based on the anticipated low level of mortality, impacts to wetland birds would be less than significant. This reasoning is based on the fact that all wind facilities result in bird fatalities and therefore violate the MBTA; however, fatality rates differ at all facilities and some are higher than others. Based on existing avian use data from the Crow Lake Alternative, bird fatalities are expected to be low compared with other wind facilities around the United States and are therefore not expected to affect the viability of local, regional, or national populations.

Raptor Species (Northern Harrier, Ferruginous Hawk, Swainson's Hawk, Burrowing Owl, Prairie Falcon): Raptor species may occur in the Crow Lake Alternative as summer residents, and suitable breeding habitat is present (Derby et al. 2010c). Adverse impacts associated with construction, operation and decommissioning of the Proposed Project Components would be the same as those described in **Section 4.4.3.1, Wildlife, *Birds***. Pre-construction nest surveys would identify nesting raptors and nest disturbance would be avoided. Adverse impacts would be reduced through implementation of the included BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), OMP (WEST 2010b), and habitat offsets for protection of grassland habitat (Plank 2010). Impacts would be less than significant, because Special Status Species Significance Criteria 1, 2, and 3 (**Section 4.4.2**) would not be exceeded. The MBTA would be violated; however, based on the anticipated low level of mortality, impacts to raptors would be less than significant. This reasoning is based on the fact that all wind facilities result in bird fatalities and therefore violate the MBTA; however, fatality rates differ at all facilities and some are higher than others. Based on existing avian use data from the Crow Lake Alternative, raptor fatalities are expected to be low compared with other wind facilities around the United States and are therefore not expected to affect the viability of local, regional, or national populations..

Regal Fritillary Butterfly: Regal fritillary butterflies may occur in the area and suitable habitat is assumed to be present. Adverse impacts associated with construction include habitat loss and mortality. Habitat loss would be directly proportional to the amount of ground disturbance and would be minimal when compared to suitable habitat in the region. Regal fritillary butterflies were not observed during spring or summer avian use surveys, but there has been no survey specifically designed to determine the presence or absence of this species. No studies have evaluated the effects of wind farms on regal fritillary butterflies, and it is difficult to predict the disturbance and displacement effects. General studies of butterfly mortality attributed to turbine strikes indicate that it is likely low due to wind currents generated from turbine rotation (Grealey and Stephenson 2007). Construction activities would temporarily disturb regal fritillary butterflies in the vicinity and could result in habitat loss. Operation could result in collisions with turbines, resulting in injury or death. These impacts would be less than significant because Special Status Species Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded.

Western's Proposed Federal Action

Development of the Western system modifications at its Wessington Springs Substation would not cause the loss of habitat for wildlife species since any changes would be confined to a previously disturbed and graded area. Construction, operation and decommissioning activities could result in the direct mortality of wildlife species if they are not able to move away from

equipment and vehicles traveling to the substation. There is a potential for wildlife-electrical equipment interactions during the operation of the proposed substation additions, but it is expected that the frequency of these interactions would be low. The substation additions would be designed in accordance with the latest APLIC guidelines (APLIC 2006), and would employ the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**). The effects of any interactions would be less than significant.

4.4.3.2 Winner Alternative

Vegetation

Construction of the Proposed Project Components would result in temporary and permanent impacts to existing vegetation within the Winner Alternative. The majority of these impacts would be in the mixed-grass prairie and cropland vegetation communities. The area of direct and indirect impacts within each vegetation class based on vegetation community mapping for the Proposed Project Components (Tierra EC 2009) is presented in **Table 4.4-2.** Additionally, the Winner Alternative would not result in temporary or permanent disturbance within USFWS grassland easements.

The Winner Alternative would result in the temporary disturbance of approximately 2,330 acres of mixed-grass prairie, 741 acres of cropland, 0 acres of wetlands, 63 acres of farmstead and already disturbed areas, 31 acres of shelterbelts, and 22 acres of deciduous forest. Construction at the Winner Alternative would result in the permanent disturbance of approximately 185.8 acres of mixed-grass prairie, 62 acres of cropland, 0 acres of wetlands, 8.2 acres of farmstead and already disturbed areas, 3.6 acres of shelterbelts and 0.9 acres of deciduous forest. Mixed-grass prairie is principally rangeland and pasture. Impacts that would occur to cultivated lands are not considered biologically significant because these lands are frequently disturbed by tilling, planting and harvesting activities associated with crop production.

The Winner Alternative would permanently remove approximately 185.8 acres of mixed-grass prairie (rangeland and pasture). These losses would be widely dispersed across the area which has 53,925 acres of mixed-grass prairie, amounting to a very small percentage of the total area (0.3 percent). Access roads would increase fragmentation of native rangeland, in some cases resulting in smaller patches of the remaining grassland types, although the Winner Alternative is currently a mosaic of mixed-grass prairie and cropland (**Figure 3.4-3),** more so than the Crow Lake Alternative.

Table 4.4-2 Summary of Disturbance Areas within Vegetation Communities in the Winner Alternative

Vegetation Type	Total Temporary Disturbance (acres)	Total Permanent Disturbance (acres)
Mixed-grass prairie	2,330	185.8
Cropland	741	62
Wetlands	0	0
Farmstead	63	8.2
Shelterbelt	31	3.6
Deciduous forest	22	0.9
Total area	3,187	261

Note: Discrepancies may exist in total values due to rounding.

The types of permanent and temporary loss of vegetation would be similar to those described in **Section 4.4.3.1, Vegetation**, although temporary and permanent disturbance areas would be more than double that for the Crow Lake Alternative, mainly due to the need for more access roads, longer underground collection lines and more crane walks.

Physical ground disturbance, construction vehicles and possibly increased public access could facilitate the establishment and spread of noxious weeds. South Dakota has 27 documented noxious weed species, 12 of which occur in Tripp County (see **Table 3.4-4**). The types of impacts would be similar to those described in **Section 4.4.3.1, Vegetation** for noxious weeds, although impacts may be higher at the Winner Alternative because more than twice the area would be disturbed.

Fugitive dust impacts would be similar to those described in **Section 4.4.3.1, Vegetation**, although more fugitive dust would be generated during construction, operation and decommissioning activities due to the larger temporary and permanent disturbance areas at the Winner Alternative.

The construction of more access roads could result in a greater increase in public access than that described in **Section 4.4.3.1, Vegetation**, although most new roads would be on private land and access would be limited.

These impacts would not affect the biological viability of any local, regional or national plant populations. Because the footprint of the Proposed Project Components is relatively small compared with the overall size of the Winner Alternative and much of the area is tilled annually for agricultural production, direct impacts to vegetation would be minimal.

Wetland delineations were not completed because this alternative was not chosen as the preferred alternative; however, delineations would be completed after final design if the alternative is selected. Wetland impacts would be avoided. If the Applicants cannot avoid wetland impacts, a Section 404 permit under the Clean Water Act would be obtained through the USACE.

Based on the minimal impacts to vegetation resources described above, impacts to Vegetation Significance Criteria 1 and 2 (**Section 4.4.2**) would not occur, and impacts to vegetation

resources due to construction and operation of the Proposed Project Components would be less than significant.

Wildlife

Mammals (excluding bats)

The types of impacts to mammal species would be similar to those described in **Section 4.4.3.1, Wildlife, *Mammals,*** although the impacts would occur on a larger scale. The Winner Alternative would result in the temporary disturbance of 3,188 acres of habitat, while 261 acres would become permanently unavailable. The area permanently disturbed represents a relatively small amount (0.3 percent) of habitat available regionally. This small loss of habitat would not disrupt breeding, rearing or wintering behavior and would not influence the viability of local populations.

Noise, excavation and other forms of disturbance during construction could potentially temporarily displace more wildlife species than at the Crow Lake Alternative within or adjacent to the disturbed areas. Upon completion of construction, wildlife species would become accustomed to operation and maintenance activities and would be expected to resume utilization of the area. Permanent vegetation loss could destroy small mammal habitat, but population level effects would be negligible because only 0.3 percent of the area would be permanently disturbed.

The probability for direct mortality of species resulting from construction activities or vehicle collision is low at the Winner Alternative, although it is higher than at the Crow Lake Alternative. Based on the minimal impacts to mammals described above, Wildlife Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded, and impacts to mammals would be less than significant.

Bats

Construction could affect bats through direct mortality, habitat loss and fragmentation and disturbance effects (SDBWG and SDGFP 2009). Bat use surveys for the Winner Alternative are ongoing. There are no known roosts within or adjacent to the area. The probability of construction-related bat mortality is extremely low given their mobility and the absence of any roosts. Habitat loss and fragmentation effects to bats are also expected to be minimal. The permanent loss of approximately 184 acres of mixed-grass prairie foraging habitat would not represent an adverse effect to bats given the large adjacent tracts of similar habitat. No shrub or forested riparian habitats or other areas of concentrated bat use would be affected. A total of 3.6 acres of shelterbelt and 0.9 acres of deciduous forest, representing less than 0.2 percent of potential daytime roosting habitat, may be permanently removed. Construction would generally occur during daylight hours and would not result in any disturbance effects for these nocturnal animals.

Operation and maintenance impacts to bats would be similar to those described in **Section 4.4.3.1, Wildlife, *Bats***, although the increase in access roads could further fragment foraging habitat for bats.

Collision-related bat mortality would be similar to that described in **Section 4.4.3.1, Wildlife, *Bats***. However, bat call studies in 2009 indicate lower bat activity in the Winner Alternative area so the frequency of collisions may be low.

The level of bat activity documented at the Winner Alternative was similar to bat activity at facilities in Minnesota and Wyoming, where bat mortality was low. Assuming that a relationship between bat activity and bat mortality exists, relatively low levels of bat mortality would be expected to occur in the Winner Alternative; most likely during August and September given that there appears to be some migration through the region. Based on fatality rates at wind-energy facilities in the Midwest, the bat use observed at this site, and habitat of the site, it is expected that the potential risk to bats from turbine operations would be similar to the rates observed at other Midwest facilities (Derby *et al.* 2010b).

Collision-related bat mortality has been documented at most wind farms in the western U.S. (Erickson *et al.* 2002). Annual bat mortality rates have ranged between 0.74 and 2.3 fatalities per turbine at wind farms in Wyoming, Oregon and Minnesota (Young *et al.* 2003a). Researchers have concluded that observed mortality rates do not have population-level effects, and no significant difference has been noted in mortality rates at lit and unlit turbines (Johnson *et al.* 2003). However, bat populations in the northeastern United States have been experiencing recent declines due to a fungus (white-nose syndrome) that is found in caves. If bat populations living in caves in South Dakota that migrate through the Winner Alternative have been infected with this fungus, wind turbine mortalities could have a more significant cumulative impact on these populations. However, little is known about bat populations in South Dakota. Most mortality has involved migrant or dispersing bats rather than residents (Johnson 2005; Johnson *et al.* 2003; Keeley 2001). Bat mortality from collisions with turbines at the Winner Alternative would likely occur.

Bat use recorded by ground detectors within the Winner Alternative during the fall was similar to activity recorded at wind facilities in Minnesota and Wyoming, where fatality rates were relatively low. Thus, based on the expected relationship between pre-construction bat use and post-construction fatalities, bat mortality rates at the Crow Lake Alternative would be expected to be similar to the 2.1 bat fatalities/MW/year reported at Buffalo Ridge Minnesota or 340 bat fatalities per year (based on 162 MW project), and much lower than the 34.9 fatalities/MW/year (Derby *et al.* 2010b). Based on the results of fatality surveys elsewhere in the Midwest region, fatalities at the Winner Alternative would range between 0.76 and 10.27 bat fatalities/MW/year (Derby *et al.* 2010b), or 123 to 1,664 bat fatalities per year (based on 162 MW project).

Based on the expected impacts to bats described above, Wildlife Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded, and impacts to bats would be less than significant.

Reptiles/Amphibians

The types of impacts to reptiles and amphibians would be similar to those described in **Section 4.4.3.1, Wildlife, *Amphibians/Reptiles***, although impacts may be higher at the Winner Alternative because there would be more than twice the area disturbed. These impacts would be minimal based on the small amount of habitat that would be temporarily and permanently removed and the low likelihood for direct mortality of individuals. Wildlife Significance Criteria

1 and 2 would not be exceeded, and impacts to reptiles/amphibians would be less than significant.

Birds

The 2008 PII study (**Appendix G**) evaluated possible impacts to biological resources in accordance with USFWS guidelines. The Winner PII score of 269 is lower than that of the Lake Andes National Wildlife Refuge reference area (PII of 331) but higher than that of the Crow Lake Alternative (PII of 239). The higher score can be attributed to the presence of more wetlands and grassland areas. WEST, Inc. is conducting additional migratory and breeding bird surveys in the site area. These data have been incorporated into this assessment of potential impacts to avian species.

Construction impacts common to all avian species include direct mortality, habitat alteration (fragmentation) or loss and disturbance related to noise and increased human presence resulting in the displacement of individual birds. The types of construction impacts would be similar to those described in **Section 4.4.3.1, Wildlife, *Birds*** for avian species, although impacts may be higher at the Winner Alternative because there would be more than twice the area of disturbance. While the design and application of the included BMPs, APMs, OMP (WEST 2010b), and habitat offsets (Plank 2010) (as listed in **Chapter 2, Table 2.2 and Table 2.3**) would further reduce fatalities related to nest abandonment, avian mortality would occur. Wildlife Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded. The MBTA would be violated if nest abandonment occurs; however, based on the anticipated low level of mortality, impacts to birds would be less than significant.

The Proposed Project Components would result in the permanent loss of 184 acres of mixed-grass prairie habitat (**Table 4.4-2**), which represents a small proportion of the area (0.2 percent). The spacing of turbines and access roads could contribute to habitat fragmentation and may be higher at the Winner Alternative because of the need for more access roads; however, the amount of fragmentation expected from the Winner Alternative would be small and may only slightly increase the current level of fragmentation. Construction noise and associated human activity could temporarily disturb or displace individual birds, and may interfere with migrating, foraging, breeding and nesting; these impacts are expected to be higher for the Winner Alternative. Construction-related disturbance would be limited to a single migratory (both spring and fall) and breeding-nesting season; however, survival and reproductive success would be temporally reduced. While the design and application of the included BMPs, APMs, OMP (WEST 2010b), and habitat offsets (Plank 2010) (as listed in **Chapter 2, Table 2.2 and Table 2.3**) would further reduce fatalities, avian mortality would occur. Wildlife Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded. The MBTA would be violated; however, based on the anticipated low level of mortality, impacts to birds would be less than significant. This reasoning is based on the fact that all wind facilities result in bird fatalities and therefore violate the MBTA; however, fatality rates differ at all facilities and some are higher than others. Based on existing avian use data from the Crow Lake Alternative, bird fatalities are expected to be low compared with other wind facilities around the United States and are therefore not expected to affect the viability of local, regional, or national populations.

Operation and maintenance of the Proposed Project Components could affect avian species through direct mortality, disturbance and displacement and habitat fragmentation, as described in **Section 4.4.3.1, Wildlife, *Birds***.

Avian use studies showed level of use based on habitat type to be similar to other wind facilities (Derby *et al.* 2010d); therefore, avian fatalities are expected to be around 198 per year at the Winner Alternative. This is a relatively low number when compared to the 6,226 individual birds observed during the 2009 avian surveys. Based on these data, population impacts at the local level are not anticipated.

Based on the results from other wind farms, a ranking of seasonal mean raptor use in the Winner Alternative during spring, summer, and fall of 2009 was low (0.23, 0.13, and 0.27 raptors/plot/20-min survey, respectively) relative to other existing and proposed wind-energy facilities with spring, summer, or fall data (Derby *et al.* 2010d)(**Table 3.4-10**). The Winner Alternative ranked fortieth compared to 44 other wind-energy facilities with spring data, forty-first compared to 41 other wind-energy facilities with summer data, and twenty-seventh compared to 38 other wind-energy facilities with fall data. Based upon these data, raptor use of the Winner area is lower than that observed at most existing and proposed wind farms (Derby et al. 2010d), and it is lower than that observed at the Crow Lake Alternative. Raptor mortalities are expected to be relatively low (0.006 raptors per turbine per year). If raptor mortalities occur at this rate, it is estimated that 0.65 raptor mortalities per year may occur at the Winner Alternative. Based on these data, population impacts at the local level are not anticipated.

As described in **Section 4.4.3.1, Wildlife, *Birds*** and through implementation of the included BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), measures have been included to reduce avian mortality. Data obtained through baseline avian use surveys and habitat characterization suggest that avian mortality rates are likely to be similar to or lower than those experienced at other wind farms. While the design and application of the included BMPs, APMs, OMP (WEST 2010b), and habitat offsets (Plank 2010) (as listed in **Chapter 2, Table 2.2 and Table 2.3**) would further reduce fatalities, avian mortality would occur. Wildlife Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded. The MBTA would be violated; however, based on the anticipated low level of mortality, impacts to birds would be less than significant. This reasoning is based on the fact that all wind facilities result in bird fatalities and therefore violate the MBTA; however, fatality rates differ at all facilities and some are higher than others. Based on existing avian use data from the Crow Lake Alternative, bird fatalities are expected to be low compared with other wind facilities around the United States and are therefore not expected to affect the viability of local, regional, or national populations..

Noise and human activities associated with operation and maintenance of the Proposed Project Components would result in temporary disturbance similar to those discussed for construction, but at reduced intensity. Regional roads may experience increased traffic due to interest in seeing the operational turbines; traffic would generally be restricted to public roads, thereby minimizing potential impacts. New roads would be constructed for access to the turbines, but the majority of these roads would be gated and located on private land, minimizing or eliminating increased public access.

The presence of turbines and operation and maintenance activities could result in longer-term effects, including avoidance and abandonment of habitats in proximity to the turbines (see **Section 4.4.3.1, Wildlife, *Birds***). Baseline surveys were conducted to assess pre-construction avian abundance and habitat use in the Winner Alternative. Reference sites have also been established outside of potential impact areas within the Winner Alternative boundary for comparison. Post-construction monitoring would continue pre-construction baseline surveys for three years to evaluate species-specific changes in abundance, habitat use and displacement effects associated with operation of the Proposed Project Components compared to general avian communities (**Chapter 2, Tables 2.2 and 2.3**). In addition, whooping crane and sandhill crane monitoring would occur concurrently for a minimum of three years. Both of these studies would improve the understanding of species-specific disturbance and displacement effects associated with development of the Proposed Project Components. Based on very limited data, displacement effects may be in the range of 1.9 acres to 31 acres per turbine (although this may vary by species and does not represent a 100 percent exclusion), or 205 to 3,348 acres in the Winner Alternative (out of 53,925 acres of grassland habitat) (Johnson *et al.* 2000; Erickson *et al.* 2007; Shaffer and Johnson 2009). The Applicants have committed to habitat offsets that would be used to purchase and protect in-kind habitats to offset potential impacts (Plank 2010). Based on the small acreage that may be impacted by displacement effects and proposed habitat offsets, impacts would be less than significant, and Wildlife Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded.

Operation and maintenance activities and the presence of turbines could also fragment habitat for grassland species. The Winner mixed-grass prairie ecosystem is relatively fragmented, mainly due to the presence of cropland, roads, and farmsteads, although it is more intact than the Crow Lake Alternative. Human activity, turbines and access roads could further fragment habitats for avian species; however, the amount of fragmentation expected from the Winner Alternative would be small and may only slightly increase the current level of fragmentation. The actual fragmentation effects are difficult to quantify, but would likely be species-specific and could disrupt movement between seasonal habitats. In the worst case, these effects would lead to some reduction of breeding success, productivity and survival. The post-construction monitoring program would help determine fragmentation effects.

Based on the localized impacts to birds described above and implementation of the included BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), OMP (WEST 2010b), and habitat offsets. (Plank 2010), Wildlife Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded. The MBTA would be violated; however, based on the anticipated low level of mortality, impacts to birds would be less than significant. This reasoning is based on the fact that all wind facilities result in bird fatalities and therefore violate the MBTA; however, fatality rates differ at all facilities and some are higher than others. Based on existing avian use data from the Crow Lake Alternative, bird fatalities are expected to be low compared with other wind facilities around the United States and are therefore not expected to affect the viability of local, regional, or national populations. Special Status Species

Special Status Species

Federal-Listed Species

Whooping Crane: Suitable habitat for the whooping crane in the Winner Alternative includes stop over, roosting and foraging habitats. The Winner Alternative is within the Aransas-Wood Buffalo Population migration corridor. Previous sightings in the region, large numbers of sandhill cranes (a surrogate species of the whooping crane), and the presence of suitable habitat make it possible that whooping cranes occasionally fly over and land in the Winner Alternative during seasonal migrations. Operating turbines could pose a threat. Whooping crane occurrence increases closer to the Missouri River, the approximate centerline of the migration corridor 25 miles east of the Winner Alternative. Suitable habitat is present throughout the migration corridor, and whooping cranes have been documented in the Winner Alternative. Use of the entire corridor is likely during any migratory cycle. Inclement weather, predation and human disturbance may cause whooping cranes to stray from the centerline of the migration corridor. Structures, such as wind turbines and transmission lines, pose a collision risk for whooping cranes due to poor visibility during inclement weather and poor flying agility of cranes. Transmission line collisions are the most common source of mortality for fledged whooping cranes. To date, there are no documented occurrences of whooping crane collisions with wind turbines; however, it is theoretically foreseeable. As included in the BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), the entire length of the new transmission line would be marked and maintained in perpetuity with line marking devices according to manufacturer specifications and the Applicants' engineering specifications to reduce the risk to whooping cranes.

Direct Effects

Examples of direct effects to whooping cranes include permanent and temporary loss of habitat and mortality associated with collisions. This section considers both the temporary and permanent impacts to various land cover types and the risk of mortality from turbine blade strikes and transmission line strikes.

Permanent and Temporary Impacts to Land Cover

If construction were to occur during the migration season, the disturbance would likely result in avoidance of the site by whooping cranes and a temporary reduction in available migration habitat. During placement of the turbines and construction of associated infrastructure, approximately 3,071.0 acres of suitable habitat would be temporarily disturbed (**Table 4.4-2**), the majority occurring on mixed-grass prairie and cropland (99 percent). **Table 4.4-2** indicates that no wetlands would be temporarily impacted; roads would be routed around wetlands and collector lines would be directionally drilled to avoid wetland impacts. Additionally, there would be no direct disturbance to or permanent loss of wetland areas. Habitats that are temporarily disturbed would be reclaimed and are expected to return to their former condition. The amount of land lost permanently would be significantly less than the land temporarily disturbed; approximately 185.8 acres of mixed-grass prairie and 62.0 acres of cropland (**Table 4.4-2**).

Many landowners have conservation easements on their properties. All of the easements within the site area are administered by the USFWS, and include grassland easements. There are approximately 220 acres of grassland easements in the site (**Figure 3.4.4**). Construction of the

turbines and associated infrastructure would not impact those grassland easements temporarily and permanently. The NRCS administers CRP easements but does not disclose locations of CRP land, therefore, these acreages are not included in **Table 4.4.2**.

Direct Mortality

Potential impacts resulting from direct mortality are the same as discussed for the Crow Lake Alternative in **Section 4.4.3.1, Special Status Species, *Federally-listed Species*, Whooping Crane**. It is anticipated that the level of direct collision mortality, if it occurs, is likely to be extremely low. Also, if they avoid the wind facility altogether direct mortality would not occur. Monitoring during and after construction would result in immediate reporting in the unlikely event of crane mortality, and curtailment of turbine operations (**Appendix G**).

Indirect Effects

Potential impacts related to avoidance of the stopover habitat located within the area of the proposed facilities (turbines, transmission lines, access roads, substations, O&M building) by whooping cranes are the same as discussed for the Crow Lake Alternative in **Section 4.4.3.1, Special Status Species, *Federally-listed Species*, whooping crane**. However, there are 27 wetlands (143.6 acres) within a half-mile of turbines in the Winner Alternative. Based on the anecdotal observations that sandhill cranes appear to avoid wind project areas, whooping cranes may also avoid these 27 wetlands, indicating more of a potential impact than the Crow Lake Alternative.

Based on current information and the possibility for avoidance of the Winner Alternative by the species during migration, it is unlikely, although possible, that the proposal would result in the direct mortality of a whooping crane. There would be a relatively small permanent loss of suitable stopover habitat. Avoidance of the site by whooping cranes could result in indirect effects as described above. The entire length of the new 11-mile transmission line would be marked as a voluntary conservation measure. The Applicant would also provide funding for the purchase and permanent protection of stopover habitat (habitat offsets) and implement the OMP described in the BA (**Appendix G**). The Winner Alternative was not analyzed in the BA; however, the effects determination would likely be the same as for the Crow Lake Alternative. With the proposed avoidance, minimization, and voluntary conservation measures in place, Special Status Species Criteria 1, 2, and 3 would not be exceeded and potential impacts to the whooping crane would be less than significant, provided no take occurs. If the Winner Alternative is chosen Section 7 consultation would be reinitiated for the Winner Alternative in order to further analyze impacts to this species, and Western and RUS would also follow USFWS conditions provided in the BO.

American Burying Beetle: Suitable habitat for the American burying beetle occurs within most of the Winner Alternative and the beetle has been documented in the area. Suitable habitat could include mixed-grass prairie, deciduous forest and shelterbelts (56,650 acres). It is difficult to estimate the population with the area, although temporary and permanent disturbance could result in disturbance and loss of 2,367 acres and 189 acres of habitat, respectively.

Because so little is known about the distribution of the American burying beetle, it is plausible that local population level impacts could occur with implementation of the Winner Alternative although impacts are expected to be less than significant because Special Status Species significance criteria 1, 2, and 3 would not be exceeded. If this alternative is chosen, Section 7 consultation would be reinitiated in order to further analyze impacts to this species.

State-Listed Species

Bald Eagle: The bald eagle occurs in the Winner Alternative during winter months as a transient resident, although it is not likely that they use the area regularly. The Winner Alternative could affect the bald eagle as a result of temporary disturbance or displacement associated with construction, operation and decommissioning activities, minor losses of foraging habitat, and mortality of individuals via collision with turbines and transmission lines. Traffic, noise and human presence during construction, operation and decommissioning could displace individual bald eagles foraging in the vicinity. However, the Winner Alternative contains a limited amount of suitable foraging habitat, so construction, operation and decommissioning activities would have minimal effect on bald eagles. The included BMPs and APMs (as listed in **Chapter 2, Tables 2.2 and 2.3**), including the OMP, would be implemented as part of the wind facility to minimize disturbance and displacement effects. Construction activities would be modified or curtailed when bald eagles are present to reduce disturbance. Also, construction crews would be instructed to avoid disturbing or harassing wildlife (including bald eagles) and to report any bald eagle sightings to the appropriate agencies as dictated by the project-specific OMP.

The Winner Alternative is not likely to result in bald eagle mortality. Raptor mortality has been relatively low at wind farms and, prior to 2010, there were no reported bald eagle fatalities at any wind facilities in the western U.S. (Erickson *et al.* 2002; Johnson *et al.* 2000; Young *et al.* 2003). One bald eagle was recently killed at a wind facility in Wyoming where the nest was close to the facility (Gates 2010). The probability of bald eagle mortality would be further minimized because there are very few roosting trees and no known nests in the Winner Alternative. The collection system would be underground, eliminating the risk of collision and electrocution from those lines. Overhead transmission lines would be constructed using Avian Power Line Interaction Committee (APLIC) guidelines to reduce the potential for collision or electrocution (APLIC 2006). As included in the BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), the new transmission line would be marked with line marking devices. Impacts would be less than significant, because Special Status Species Significance Criteria 1, 2, and 3 (**Section 4.4.2**) would not be exceeded. If an eagle take occurs, the BGEPA and MBTA would be violated. In that case, consultation and mitigation of take with the USFWS would be required; however, impacts to bald eagle would be less than significant based on the anticipated low level of mortality. This reasoning is based on the fact that all wind facilities result in bird fatalities and therefore violate the BGEPA and MBTA; however, fatality rates differ at all facilities and some are higher than others. Based on existing avian use data from the Winner Alternative, bald eagle fatalities are not expected or would be low compared with other wind facilities around the United States and are therefore not expected to affect the viability of local, regional, or national populations.

Peregrine Falcon: The peregrine falcon occurs in the Winner Alternative during winter months as a transient resident and migrant, although it is not likely that they use the area regularly. The

Winner Alternative could affect the peregrine falcon as a result of temporary disturbance or displacement associated with construction, operation and decommissioning activities, minor losses of foraging habitat, and mortality of individuals via collision with turbines and transmission lines. Traffic, noise and human presence during construction, operation and decommissioning could displace individual peregrine falcons foraging in the vicinity or migrating through the area. However, the Winner Alternative contains a limited amount of suitable foraging habitat, so construction, operation and decommissioning activities would have minimal effect on peregrine falcons. The included BMPs and APMs (as listed in **Chapter 2, Tables 2.2 and 2.3**), including the OMP, would be implemented as part of the Winner Alternative to minimize disturbance and displacement effects.

The Winner Alternative is not likely to result in peregrine falcon mortality. Raptor mortality has been relatively low at wind farms (Erickson *et al.* 2002; Johnson *et al.* 2000; Young *et al.* 2003). The probability of peregrine falcon mortality would be further minimized because there are very few roosting trees and no nesting habitat in the Winner Alternative. The collection system would be underground, eliminating the risk of collision and electrocution from new transmission lines. Overhead transmission lines would be constructed using APLIC guidelines to reduce the potential for collision or electrocution (APLIC 2006). As included in the BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), the new transmission line would be marked with line marking devices. Impacts would be less than significant, because Special Status Species Significance Criteria 1, 2, and 3 (**Section 4.4.2**) would not be exceeded. If a falcon take occurs, the MBTA would be violated; however, impacts to peregrine falcons would be less than significant based on the anticipated low level of mortality. This reasoning is based on the fact that all wind facilities result in bird fatalities and therefore violate the MBTA; however, fatality rates differ at all facilities and some are higher than others. Based on existing avian use data from the Winner Alternative, peregrine falcon fatalities are not expected or would be low compared with other wind facilities around the United States and are therefore not expected to affect the viability of local, regional, or national populations.

Fish Species (blacknose shiner, northern redbelly dace, pearl dace): Direct impacts on the blacknose shiner, northern redbelly dace and pearl dace would be unlikely because turbines would be placed in upland areas. There is the possibility for indirect impacts due to the construction of stream crossings for access roads and collection lines introducing sedimentation into stream channels. Increased sedimentation can result in the loss of spawning substrate, which may reduce recruitment. Siltation of gravel substrate may also greatly reduce invertebrate populations, thereby affecting the food source for these species. Access roads would be designed as low-water, at-grade gravel crossings, or culverts would be installed, reducing impacts to fish habitat. The roadbed would be designed to allow water to percolate through the gravel overlay. Construction would not involve any dewatering practices or disruption of the streambed. No damming effect would occur. Any increases in sedimentation would be short term during the construction phase. Sedimentation is not expected to increase as a result of operation and maintenance activities.

Other possible indirect impacts to fish species include the introduction of hazardous waste into stream channels through accidental spilling. This risk would be minimized by maintaining refueling areas and hazardous waste storage areas away from the stream channels.

Stormwater and erosion and sediment control BMPs and APMs would be used during construction and operation of the Proposed Project Components including the use of directional boring under all streams with flowing water, silt traps, stream bank stabilization and revegetation of disturbed areas adjacent to perennial streams. Impacts to this species would be less than significant because Special Status Species Significance Criteria 1, 2 and 3 (**Section 4.4.2**) would not be exceeded.

State and Federal Species of Concern

Greater Prairie Chicken and Sharp-tailed Grouse: Suitable habitat for greater prairie chickens and sharp-tailed grouse is present in the Winner Alternative, and active leks are known in the area (Derby et al. 2010d). Construction effects would be similar to those described in **Section 4.4.3.1, Wildlife, *Birds*** for grassland species, although more leks were confirmed at the Winner Alternative, so impacts may be higher. To minimize effects upon Greater prairie chickens and sharp-tailed grouse, no construction activities would be permitted within a pre-determined radius of known, active leks between March 1 and May 1, and the Applicants would provide habitat offsets for protection of grassland habitat. The Applicant prepared a Grouse Survey and Monitoring Protocol and OMP (WEST 2010b) that was approved by SDGFP and includes up to 10 years post-construction monitoring of prairie grouse at the preferred alternative, if this were to be selected. Impacts would be less than significant because Special Status Species Significance Criteria 1, 2, and 3 (**Section 4.4.2**) would not be exceeded.

Possible operation and maintenance impacts for greater prairie chickens and sharp-tailed grouse are similar to those described in **Section 4.4.3.1, Wildlife, *Birds***, although more leks were confirmed (Derby et al. 2010d) so impacts to these species may be higher. Impacts would be less than significant, because Special Status Species Significance Criteria 1, 2, and 3 (**Section 4.4.2**) would not be exceeded.

Noise and human activities associated with operation and maintenance would result in temporary disturbances to greater prairie chickens and sharp-tailed grouse similar to those previously discussed in **Section 4.4.3.1, Wildlife, *Birds***. These temporary disturbances and would represent a less than significant impact, because Special Status Species Significance Criteria 1, 2, and 3 (**Section 4.4.2**) would not be exceeded.

Grassland Bird Species (Chestnut-collared longspur, grasshopper sparrow, western meadowlark, upland sandpiper, marbled godwit, long-billed curlew, lark bunting, orchard oriole, prairie falcon, red-headed woodpecker, loggerhead shrike, dickcissel): Grassland species of concern occur in the Winner Alternative as migratory and breeding residents. Suitable non-breeding and breeding habitat is present for these species, and several were observed during spring and summer surveys. Adverse impacts associated with construction, operation and decommissioning would be similar to those described in **Section 4.4.3.1, Wildlife, *Birds.***

Adverse impacts associated with construction, operation and decommissioning would be similar to those described in **Section 4.4.3.1, Wildlife, *Birds*** and would be reduced through implementation of the included BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), OMP (WEST 2010b), and habitat offsets for protection of grassland habitat (Plank 2010). Impacts would be less than significant because Special Status Species Significance Criteria 1, 2, and 3

(**Section 4.4.2**) would not be exceeded. The MBTA would be violated; however, based on the anticipated low level of mortality, impacts to grassland birds would be less than significant. This reasoning is based on the fact that all wind facilities result in bird fatalities and therefore violate the MBTA; however, fatality rates differ at all facilities and some are higher than others. Based on existing avian use data from the Crow Lake Alternative, bird fatalities are expected to be low compared with other wind facilities around the United States and are therefore not expected to affect the viability of local, regional, or national populations.

Wetland Bird Species (American bittern, Wilson's phalarope, black tern, trumpeter swan, American white pelican): Wetland bird species may occur in the Winner Alternative as summer residents, since suitable breeding habitat is present. Wilson's phalaropes were observed during spring or summer surveys; the other four species were not observed (Derby et al. 2010d). Pre-construction nest surveys would identify nesting species and nest disturbance would be avoided.

Construction activities would temporarily disturb wetland species in the vicinity. Operation may result in collisions with turbines, causing injury or death. Adverse impacts would be reduced through implementation of the included BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), OMP (WEST 2010b), and habitat offsets for protection of grassland habitat (Plank 2010). Impacts would be less than significant, because Special Status Species Significance Criteria 1, 2, and 3 (**Section 4.4.2**) would not be exceeded. The MBTA would be violated; however, based on the anticipated low level of mortality, impacts to wetland birds would be less than significant. This reasoning is based on the fact that all wind facilities result in bird fatalities and therefore violate the MBTA; however, fatality rates differ at all facilities and some are higher than others. Based on existing avian use data from the Crow Lake Alternative, bird fatalities are expected to be low compared with other wind facilities around the United States and are therefore not expected to affect the viability of local, regional, or national populations..

Raptor Species (northern harrier, ferruginous hawk, Swainson's hawk, burrowing owl): Raptor species may occur in Winner Alternative as summer residents, and suitable breeding habitat is present (Derby et al. 2010d). Adverse impacts associated with construction, operation and decommissioning would be similar to those described in **Section 4.4.3.1, Wildlife, *Birds.*** Adverse impacts would be reduced through implementation of the included BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**), OMP (WEST 2010b), and habitat offsets for protection of grassland habitat (Plank 2010). Impacts would be less than significant, because Special Status Species Significance Criteria 1, 2, and 3 (**Section 4.4.2**) would not be exceeded. The MBTA would be violated; however, based on the anticipated low level of mortality, impacts to raptors would be less than significant. This reasoning is based on the fact that all wind facilities result in bird fatalities and therefore violate the MBTA; however, fatality rates differ at all facilities and some are higher than others. Based on existing avian use data from the Crow Lake Alternative, raptor fatalities are expected to be low compared with other wind facilities around the United States and are therefore not expected to affect the viability of local, regional, or national populations.

Plains Spotted Skunk: Plains spotted skunks occur in the northern portion of the Winner Alternative just south of Winner (SDNHP 2009). Impacts to this species would be similar to those described in **Section 4.4.3.1, Wildlife, *Mammals***, although they would occur on a larger scale. Overall, 2,314/ 184 acres of mixed-grass prairie and 741/ 62 acres of cropland would be

temporarily/ permanently disturbed, respectively. The area of habitat permanently disturbed represents a relatively small amount (0.3 percent) of habitat available regionally. This small loss of habitat would not disrupt breeding, rearing or wintering behavior and would not influence the viability of local populations. Impact to plains spotted skunk would be less than significant because Special Status Species Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded.

Plains Topminnow: Direct impacts on the Plains topminnow would be unlikely because turbines would be placed in upland areas. There is the possibility for indirect impacts due to the construction of stream crossings for access roads and collection lines introducing sedimentation into stream channels. Increased sedimentation can result in the loss of spawning substrate, which may reduce Plains Topminnow recruitment. Siltation of gravel substrate may also greatly reduce invertebrate populations, thereby affecting the food source for this species. Access roads would be designed as low-water, at-grade gravel crossings or culverts would be installed, reducing impacts to fish habitat. The roadbed would be designed to allow water to percolate through the gravel overlay. Construction would not involve any dewatering practices or disruption of the streambed. No damming effect would occur. Any increases in sedimentation would be short term during the construction phase. Sedimentation is not expected to increase as a result of operation and maintenance activities.

Other possible indirect impacts to fish species include the introduction of hazardous waste into stream channels through accidental spilling. This risk would be minimized by maintaining refueling areas and hazardous waste storage areas away from stream channels.

Stormwater and erosion and sediment control BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**) would be used during construction and operation of the Proposed Project Components including the use of directional boring under all streams with flowing water, silt traps, stream bank stabilization and revegetation of disturbed areas adjacent to perennial streams. Impacts to this species would be less than significant because Special Status Species Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded.

Plains Leopard Frog: Impacts to plains leopard frog could include temporary and permanent loss of grassland dispersal habitat and equipment or vehicle collisions along roads in dispersal habitat. Impacts to breeding habitat are not expected because there are only isolated areas of standing or flowing water in the Winner Alternative and these areas would be avoided by placing access roads and turbines in upland areas. Impacts to this species would be less than significant based on the small amount of habitat that would be temporarily or permanently removed and Special Status Species Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded.

Lesser Earless Lizard: Impacts to lesser earless lizard could include temporary and permanent loss of habitat and equipment or vehicle collisions along roads within suitable habitat. This species prefers sparsely vegetated areas in short grass ecosystems, including prairie dog towns. Unless heavily grazed, grassland habitats in the Winner Alternative do not support high-quality habitat and the prairie dog town would not be impacted by development of the Proposed Project Components; therefore, very little habitat would be impacted. Impacts to this species would be less than significant based on the small amount of habitat that would be temporarily or

permanently removed, and Special Status Species Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded.

Western Box Turtle: Preferred habitat for the western box turtle (lakes, rivers and large streams) would not be impacted by the Proposed Project Components. Impacts to this species are not anticipated. Therefore, impacts to this species would be less than significant because Special Status Species Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded.

Regal Fritillary Butterfly: Regal fritillary butterflies are known to occur five miles south of the Winner Alternative and suitable habitat may be present. Adverse impacts associated with construction include habitat loss and mortality. Habitat loss would be directly proportional to the amount of ground disturbance. Regal fritillary butterflies were not observed during spring or summer avian use surveys, but there has been no survey specifically designed to determine the presence or absence of this species. No studies have evaluated the effects of wind farms on regal fritillary butterflies, and it is difficult to predict the disturbance and displacement effects. General studies of butterfly mortality attributed to turbine strikes indicate that it is likely low due to wind currents generated from turbine rotation (Grealey and Stephenson 2007). Construction activities would temporarily disturb regal fritillary butterflies in the vicinity and could result in habitat loss. Operation could result in collisions with turbines, resulting in injury or death. These impacts would be less than significant because Special Status Species Significance Criteria 1 and 2 (**Section 4.4.2**) would not be exceeded.

Western's Proposed Federal Action

Development of the Western system modifications at its Winner Substation would not cause the loss of habitat for wildlife species since any changes would be confined to a previously disturbed and graded area. Construction, operation and decommissioning activities could result in the direct mortality of wildlife species if they are not able to move away from equipment and vehicles traveling to the substation. There is a potential for wildlife-electrical equipment interactions during the operation of the proposed substation additions, but it is expected that the frequency of these interactions would be low. The substation additions would be designed in accordance with the latest APLIC guidelines, and would employ the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**). The effects of any interactions would be less than significant.

4.4.3.3 No Action Alternative

Under the No Action Alternative, Western would not approve an interconnection request for the Proposed Project with the Applicants and/or RUS would not approve financing. For the purpose of impact analysis and comparison in this EIS, it is assumed that the Applicants' Proposed Project (and Wind Partners' proposed development as it pertains to the Crow Lake Alternative) would not be built and that the environmental impacts associated with construction and operation of the Proposed Project would not occur. There would be no biological resource impacts associated with the No Action Alternative.

4.5 CULTURAL RESOURCES

The Proposed Project and Wind Partners' proposed development must comply with Federal laws relating to identification, management, and protection of cultural resources. Western and RUS assessed the existing previously recorded cultural resource data for the Proposed Project and Wind Partners' proposed development under the requirements, including those in Section 106 of the NHPA and its implementing regulations (36 CFR Part 800). This EIS is not intended to address all of the requirements of Section 106. Western and RUS have collected information on historic properties in each alternative area through site records searches and public scoping meetings. For the preferred alternative they have completed a comprehensive inventory of the APE. Any minor changes to the APE would be inventoried prior to construction.

Resources listed or eligible for listing in the NRHP are defined by the regulations as "historic properties" and impacts to these resources must be considered. In addition, there may be areas of interest to Native Americans, such as traditional use areas or TCPs that extend outside the geographic boundaries of the site alternative areas. These concerns must be considered through consultation with interested tribes.

4.5.1 METHODS

A Class I cultural resources inventory was completed for both the Crow Lake and Winner alternatives. The inventory includes a review of existing cultural resources documentation on file in State repositories, a preliminary architectural history windshield survey within the Proposed Project area, and a review of 19th century Public Land Survey maps. Information used in the cultural resources analysis for this EIS includes:

- A Class I survey/records review
- Review of General Land Office maps
- Review of historic atlases
- Review of topography (slope, proximity to water, *etc*.)
- Research on Indian/pioneer/military conflict areas and trails and whether any occur within the Proposed Project alternatives

Areas that typically have a high level of sensitivity include those with the ecological or environmental, ethnohistorical, and historical potential to contain habitation sites and some temporary camps, all cremation and burial sites (and all sites described as containing evidence of human remains), rock art, intaglios, TCPs, and sites of any type that would be eligible to be included on national and State registers. Habitation sites and some temporary camps may hold significant scientific research potential and may also be of traditional cultural significance to Native Americans. Sites with evidence of human remains, rock art, intaglios, and TCPs are of demonstrated significance to Native Americans.

Areas that typically have a moderate level of sensitivity include those with conditions similar to what is described for areas of high sensitivity, but which have been subject to disturbance (such as agricultural activities) or other diminishing conditions; and as a result of these disturbances, the surface expression of the site may be less apparent.

Areas that typically have a low level of sensitivity include those that lack the ecological or environmental, ethnohistorical, and historical potential to contain sites of any type that would be eligible to be included on national and State registers. Isolates and single category sites, such as lithic or ceramic scatters are generally considered to have relatively low sensitivity because of their limited research potential. However, it is acknowledged that even an isolate (for example a Clovis point or a ceremonial object) could be significant to Native Americans and researchers. It should be noted that, when considered alone, many areas with these types of sites may be classified as having low to moderate sensitivity; however, such sites may acquire greater importance when considered part of a district of sites that together contain information relevant to answering important research questions.

Additional studies were conducted for the Crow Lake Alternative including a Class III pedestrian survey, a survey of historic architectural properties within the Proposed Project Components viewshed, and a TCP survey. The Class III pedestrian survey was conducted using parallel zig-zag pedestrian transects spaced at 15 meter intervals. The survey covered 125-foot wide corridors and 101 500 feet by 500 feet turbine blocks. Site boundaries and individual features were recorded with Magellan Professional CX GPS units, and representative electronic photographs were taken of the project area, sites, and individual site features. Appropriate site sketch maps were produced and field notes were maintained. Native American representatives accompanied the archaeological crew during the Class III survey to identify potential TCPs. A survey of historic architectural properties within the Proposed Project Components viewshed was conducted and identified potential viewshed impacts that would result from the Proposed Project and Wind Partners' proposed development. An intertribal TCP survey was conducted for the Crow Lake Alternative, following the Class III survey, and included the efforts of multiple representatives from interested Tribes.

Additional Class III field surveys, surveys of historic architectural properties within the Proposed Project Components viewshed, and TCP surveys would be conducted as needed to evaluate additional areas of disturbance that may be identified as a result of final engineering of the Proposed Project and the Wind Partners' proposed development.

4.5.2 SIGNIFICANCE CRITERIA

The threshold of significance for cultural resources is based on whether the resource is listed in, or considered eligible for listing in, the NRHP. There are four criteria under the regulations implementing the NHPA in 36 CFR 60.4 used to evaluate the significance and integrity of a resource. The degree of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) that has yielded, or may be likely to yield, information important in prehistory or history.

Within the context of the NHPA, effects to sites are classified as "no adverse effect" or "adverse effect." Under NEPA, a significant impact to cultural resources would occur if a site of archaeological, tribal, or historical value that is listed or eligible for listing in the NRHP could not be avoided or mitigated during siting and construction of the Proposed Project. In addition, NEPA regulations consider impacts to cultural resources as "direct" or "indirect." Under the regulations implementing Section 106 of the NHPA, the definition of direct or indirect refers to the APE within which the Federal undertaking may directly or indirectly cause alterations in historic properties (36 CFR 800.16[d]). Therefore, avoidance or mitigation of historic properties can ensure that sites are not adversely impacted (NHPA) and that there are no significant impacts (NEPA).

4.5.3 IMPACT ASSESSMENT

A portion of the Crow Lake Alternative and the majority of the Winner Alternative would be located on rangeland and agricultural lands, where surface cultural resources may have already been disturbed. Earthmoving activities, such as grading and digging, have the highest potential for disturbing or destroying significant cultural resources; however, pedestrian, animal, and vehicular traffic and indirect impacts of earthmoving activities, such as soil erosion, could also have an effect. The construction and decommissioning of the infrastructure necessary for wind-powered facilities has the greatest potential to impact subsurface cultural resources because of the increased ground disturbance during these phases.

Visual impacts to significant historic properties, such as sacred landscapes, historic trails, and structures could also occur. There are four criteria under the regulations implementing the NHPA in 36 CFR 60.4 used to evaluate the significance and integrity of a resource. The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) that has yielded, or may be likely to yield, information important in prehistory or history. An adverse visual impact, as it applies to built environments, is generally defined (36 CFR 800) as one that occurs when an undertaking carries the potential to directly or indirectly alter any qualifying characteristic of historic properties either listed or eligible for listing in the NRHP. There is no universally accepted yardstick for measuring visual effects, and since those effects do not always damage the defining characteristics of historic properties in any physical manner, assessing them can be difficult, complicated, and is almost always subjective. Furthermore, because an undertaking would be visible from a historic property does not mean it automatically has created adverse visual effect.

4.5.3.1 Crow Lake Alternative

Data retrieved from the Class I records review shows that six previously recorded sites and seven historic properties are present within one mile of the Crow Lake Alternative boundary (see **Table**

3.5-2). Two historic properties are listed on the NRHP, one site is recommended for listing, and one site is undetermined. One historic foundation (39AU0007) dating to 1861 is recommended eligible for the NRHP by the recording archaeologist with concurrence by the SHPO and Western. The eligibility of an artifact scatter (39JE0001), one rock-lined depression (39JE0037), and one stone circle site (39JE0039) is undetermined. The remaining two historic sites were not recommended eligible by the recording archaeologist. These sites are located outside the current project area would be avoided, and therefore, no impact would occur.

One historic structure, the Patten Consolidated School, is listed on the NRHP under Criterion A as a good example of what old county schoolhouses represented to rural communities in South Dakota. The Underwood United Methodist Church is also listed on the NRHP under Criterion C as an example of an early-twentieth century rural wooden country church. An adverse visual effect (NHPA) or visual impact (NEPA) is one that negatively visual effects the integrity to an historic built environment resource, to the extent significance and eligibility for listing in the NRHP are compromised. In particular, adverse visual effects can be seen as negatively affecting any of the seven characteristics of integrity, to wit: location, design, setting, materials, workmanship, feeling, or association. The Patten Consolidated School is located within the Proposed Project boundary and the Underwood United Methodist Church is located within the one mile buffer.

Two additional historic properties are located within one mile of the Proposed Project boundary and have been recommended eligible for the NRHP by Western (based on recommendations by the recording archaeologist) with concurrence by the SHPO. However, Structure JE01300004 at the Jerry Bennett Farm, and Structure JE01400001 at the Elwood C. Lyle Wind Powered Mill have been mitigated in the Wessington Springs Project through a MOA between the South Dakota SHPO and Western.

The Class III pedestrian survey of the Crow Lake Alternative resulted in the documentation of 69 prehistoric sites, nine historic sites, and seven isolated finds (**Table 4.5-1**). The prehistoric site types include stone cairns (37 occurrences), stone circles (16 occurrences), a depression (1 occurrence), and a combination of these types (13 occurrences).

Eight of the nine historic sites are associated with agricultural activities and include two farmsteads, two depressions, a dump, a rock wall, a foundation, and a farmstead with windmill, foundation, and depression features. The other historic site is the remains of a military bomb target.

Seven isolated finds were recorded within the proposed project boundary and include brown chert flakes (2 occurrences), gray flake (1 occurrence), quartzite flakes (6 occurrences), chert biface (1 occurrence), flint biface (2 occurrences), and flint core fragment (1 occurrences).

Nine prehistoric sites and three historic sites were recorded within the transmission line corridor. The prehistoric sites include five cairns (39JE0047, 39JE0050, 39JE0051, 39JE0057, 39JE0061) two stone circles (39JE0048, 39AU0036), and two combination stone circle / cairn sites (39JE0049, 39JE0058). The eligibility of these sites is currently undetermined; however, there would be no direct impacts to the sites because they would be avoided, or mitigation measures would be applied in addition to the implementation of the BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**).

The three historic sites include a dump (39JE0052), a farmstead (39JE0060), and a foundation (39JE0044). All three historic properties have been evaluated as not eligible for inclusion in the NRHP by Western (based on recommendations by the recording archaeologist) with concurrence by the SHPO; therefore, no impact would occur.

Thirty-one prehistoric sites, one historic site, and two isolate finds were recorded within the 101 500 feet by 500 feet turbine blocks. The prehistoric sites include 14 cairns (39JE0053, 39JE0054, 39AU0017, 39AU0025, 39AU0026, 39AU0031, 39AU0032, 39AU0034, 39AU0039, 39AU0040, 39AU0042, 39AU0058, 39AU0059, 39AU0064), seven stone circles (39JE0063, 39BR0086, 39AU0019, 39AU0038, 39AU0041, 39AU0049, 39AU0050), two lithic scatters (39AU0015, 39AU0016), one depression (39JE0064), and six sites with a combination of these features (39AU0029, 39AU0035, 39AU0047, 39AU0052, 39AU0057, 39AU0065). With the exception of the two lithic scatters, the eligibility of these sites is currently undetermined; however, measures would be taken by the Applicant to ensure that the sites are avoided and protected during construction; therefore, no impact would occur. The two lithic scatters (39AU0015, 39AU0016) have been evaluated for inclusion in the NRHP and both have been recommended as not eligible by Western (based on recommendations by the recording archaeologist) with concurrence by the SHPO; therefore, no impact would occur.

The historic site (39JE0062) is a concrete foundation and bomb target and has been recommended as eligible for nomination to the NRHP under Criterion A primarily for its association with the postwar (World War II) construction boom that swept the country and state between 1945 and 1960 (Dennis 2007: 47, 49). Two isolated finds were also recorded within the turbine blocks and include one find of two brown chert flakes (39BR0085) and another with six quartzite flakes (39BR0078). Isolated finds are recommended as not eligible for inclusion in the NRHP by Western (based on recommendations by the recording archaeologist) with concurrence by the SHPO; therefore, no impact would occur.

Twenty-nine prehistoric sites, five historic sites, and five isolate finds were recorded between the 101 500 feet by 500 feet turbine blocks or between the turbine blocks and the substation footprint. The prehistoric sites include 18 cairns (39AU0018, 39AU0020, 39AU0021, 39AU0022, 39AU0024, 39AU0028, 39AU0030, 39AU0033, 39AU0037, 39AU0043, 39AU0046, 39AU0054, 39AU0061, 39AU0062, 39AU0063, 39BR0080, 39BR0082, 39BR0083), seven stone circles (39AU0044, 39AU0048, 39AU0055, 39AU0056, 39BR0081, 39BR0084, 39JE0056), and four sites with a combination of these features (39AU0023, 39AU0027, 39AU0051, 39JE0059). The eligibility of these sites is currently undetermined; the implementation of the BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**) would occur to ensure that the sites are avoided and protected and therefore, no impact would occur.

The five historic sites include a rock wall (39AU0060), two depressions (39AU0045, 39BR0079), a farmstead (39AU0012), and a farmstead with windmill, foundation, and depression features (39JE0055). All five historic properties have been evaluated as not eligible for inclusion in the NRHP by Western (based on recommendations by the recording archaeologist) with concurrence by the SHPO; therefore, no impact would occur.

Five isolated finds were also recorded between the turbine blocks and include one chert biface (39BR0077), two flint bifaces (39AU0014, 39AU0053), a gray chert flake (39BR0076), and a

flint core fragment (39JE0046). Isolated finds are recommended as not eligible for inclusion in the NRHP by Western (based on recommendations by the recording archaeologist) with concurrence by the SHPO; therefore, no impact would occur.

The survey of historic architectural properties within the Proposed Project Components viewshed resulted in the evaluation of 38 historic properties within the Crow Lake Alternative APE. Two of the properties were recommended as eligible for nomination to the NRHP. The Patten Consolidated School and historic bomb target site (39JE0062).

Potential impacts to cultural resources, such as prehistoric properties, historic properties, and cultural landscapes, were identified in the results of the Class III Survey, survey of historic architectural properties within the Proposed Project Components viewshed, and TCP Survey that were completed for the preferred alternative (Crow Lake Alternative). Agreements are being developed to ensure avoidance and/or mitigation of adverse effects to historic properties. These agreements are being developed among Western, RUS, SHPO, affected Federal agencies, Applicants, and all interested Native American Tribes. The preferred treatment of any potential TCPs and archaeological sites that are eligible for listing or remain unevaluated for the NRHP is to avoid these identified sites. Avoidance and monitoring protocol during construction would be included in an agreement. Viewshed impacts may occur on historic architectural or structural properties. Such viewshed impacts would be mitigated through a MOA in accordance with 36 CFR 800.6.

4.5.3.2 Winner Alternative

Thirteen previously recorded sites are present within the Winner Alternative (see **Table 3.5-5**), six of which have undetermined NPHP eligibility (**Table 4.5-1**). They include one historic cairn (39TP0019), the North East Washington Rural School foundation with privy depressions (39TP0027), three farmsteads (39TP0026, 39TP0035, 39TP0036), and a concrete barn foundation (39TP0038). The remaining six sites were not recommended eligible for the NRHP by the recording archaeologist; the SHPO and Western concurred with this recommendation. The six unevaluated historic properties require additional review to determine eligibility for the NRHP. In the event these historic properties are determined eligible, avoidance would ensure that no impact would occur, or application of mitigation measures, BMPs and APMs (as listed in **Chapter 2, Tables 2.2 and 2.3**) would ensure that less than significant impacts would occur.

One historic structure within the Winner Alternative, the Manthey Barn, is listed on the NRHP under Criterion C as an example of a variation of the Midwest Three-Portal Barn in South Dakota. The Manthey Barn would be evaluated for visual impacts. Avoidance would ensure that no impact would occur, or application of mitigation measures (to be identified), as well as the implementation of the BMPs and APMs (**Chapter 2, Tables 2.2 and 2.3**); therefore, there would be less than significant impact to cultural resources and historic properties.

Seven additional historic structures or objects that are listed or recommended eligible for the NRHP are located within one mile of the Winner Alternative and include the Key Residence, the Winner Post Office, Winner Drive-In, Immaculate Conception Church, St. Mary's Parish Hall, the Winner Grade School, and the Tripp County Veteran’s Memorial (**Table 4.5-2**). The Key Residence is listed on the NRHP under Criterion C as an example of an early concrete residential

structure and as one of the first residences erected in Winner. The Tripp County Veteran's Memorial is also listed on the NRHP under Criterion A. It is a good representation of World War I memorials constructed during this time period. This piece by nationally-renowned sculptor John Paulding was erected in 1924 in front of the Tripp County Courthouse, and conveys the era's shared perception of the noble cause of World War I and the sacrifice of the common soldier. The Winner Grade School is recommended eligible for the NRHP by the recording archaeologist and concurrence with the SHPO and Western under Criterion C as an example of the style developed by Harold Spitznagel and used in several communities in South Dakota during the 1950s and may also be eligible as an example of the building boom in Winner following WWII. The Winner Post Office is recommended eligible for the NRHP by the recording archaeologist and concurrence with the SHPO and Western under Criterion C. The Winner Drive-In, Immaculate Conception Church, and St. Mary's Parish Hall are all recommended eligible for the NRHP by the recording archaeologist and concurrence with the SHPO and Western under Criterion C for their association with post-war (WWII) era building development. In addition, the Immaculate Conception Church may retain sufficient integrity to be eligible for its architecture. These structures would also be evaluated for indirect visual impacts. Avoidance would ensure that no impact would occur, or application of mitigation measures (to be identified), BMPs and APMs (as listed in **Chapter 2, Tables 2.2 and 2.3**) would ensure that less than significant would occur.

Although the Winner Alternative is not the Agencies' preferred alternative, if Western grants an interconnection request at its Winner Substation and RUS provides financing for the Proposed Project at the Winner Alternative, a complete pedestrian survey of the entire APE for cultural resources would be completed prior to construction. A qualitative approach has been developed that incorporated factors that are strong predictors of cultural resources, including climatic zone, slope, access, and water sources to predict site types and densities. The areas are rated as high, moderate or low sensitivity.

The Winner Alternative landscape is characterized by rolling plains of relatively low relief that give way to butte and mesa topography that is typical of the high plains with intermittent streams throughout the Winner Alternative area. The area has been used extensively as hunting grounds for the Sioux tribes, as well as for military excursions. It is expected that site sensitivity in certain areas of this Proposed Project area would be low to moderate.

The low rating is primarily due to the generations of disturbance from agricultural activities since the majority of the Winner Alternative is within agricultural fields. However, subsurface archaeological sites may be encountered during ground disturbing activities. If subsurface sites are encountered during construction, application of cultural resources mitigation measures (to be identified), BMPs and APMs (as listed in **Chapter 2, Tables 2.2 and 2.3**) would ensure that less than significant impacts would occur.

The moderate rating is primarily due to the Winner Alternative's proximity to archaeological regions such as the Fort Randall Archaeological Region. The 39-mile archaeological region that encompasses Fort Randall is less than two miles east of the Winner Alternative, but military excursions may have extended beyond that boundary and further into the Plains. Other archaeological regions that contribute to a higher rating include the Lower White and Sand Hills. The Sand Hills Archaeological Region is located primarily in Nebraska but also extends into

south central South Dakota and into the Winner Alternative. These sites are often buried and located along streams and rivers. The Winner Alternative is within the Tertiary tablelands, also known as the Sand Hills; limited archaeological work has been done in the South Dakota area of the Sand Hills Archaeological Region. Since the majority of sites found in the Sand Hills Archaeological Region tend to be buried sites, the likelihood of finding sites is low, but would be more likely to be encountered during construction. This does not preclude displaced surface sites

Table 4.5-1 Winner Alternative Historic Properties

Site	Site Type	NRHP Eligibility	Location
39TP0019	Cairn	Unevaluated	Within Proposed Project boundary
39TP0026	Farmstead	Unevaluated	Within one-mile of Proposed Project boundary
39TP0027	School Foundation	Unevaluated	Within Proposed Project boundary
39TP0035	Farmstead	Unevaluated	Within Proposed Project boundary
39TP0036	Farmstead	Unevaluated	Within Proposed Project boundary
39TP0038	Foundation	Unevaluated	Within Proposed Project boundary

Table 4.5-2 Winner Alternative Historic Structures

Site	Site Type	NRHP Eligibility	Location
TP00000010	Manthey Barn	Eligible – Listed Criterion C	Within Proposed Project boundary
TP00000001	Key Residence	Eligible – Listed Criterion C	Within one-mile of Proposed Project boundary
TP00000002	Winner Post Office	Eligible – Criterion C	Within one-mile of Proposed Project boundary
TP00000065	Winner Drive-In	Eligible – Criterion C	Within one-mile of Proposed Project boundary
TP00000066	Immaculate Conception Church	Eligible – Criterion C	Within one-mile of Proposed Project boundary
TP00000069	St. Mary's Parish Hall	Eligible – Criterion C	Within one-mile of Proposed Project boundary
TP00000071	Winner Grade School	Eligible – Criterion C	Within one-mile of Proposed Project boundary
TP00000073	Tripp County Veteran's Memorial	Eligible – Listed Criterion A	Within one-mile of Proposed Project boundary

that may be encountered within agricultural fields where artifacts have been turned up from plowing activities, or sites along creeks, drainages, and cutbanks. The possibility of these types of sites was discussed with the Rosebud Sioux Tribe at the conclusion of their records search; they have not had access to the area since it was removed from reservation status in the early 1900s (**Appendix D**).

In the event that NRHP-eligible properties are encountered the Applicants would make a reasonable effort to design the Proposed Project to avoid the eligible properties. If a NRHP-eligible property could not be avoided, then the application of cultural resources mitigation measures, BMPs and APMs (as listed in **Chapter 2, Tables 2.2 and 2.3**) would ensure that less than significant impacts would occur. If unknown subsurface archaeological sites are encountered during construction, application of cultural resources mitigation measures (to be

identified), BMPs and APMs (as listed in **Chapter 2, Tables 2.2 and 2.3**) would ensure that less than significant impacts would occur.

4.5.3.3 No Action Alternative

Under the No Action Alternative, Western would not approve an interconnection request(s) and RUS would not provide financial assistance for the Proposed Project. For the purpose of impact analysis and comparison in this EIS, it is assumed that the Applicants' Proposed Project (and Wind Partners' proposed development as it pertains to the Crow Lake Alternative) would not be built and the environmental impacts, both positive and negative, associated with construction and operation would not occur. There would be no cultural resources impacts associated with the No Action Alternative.

4.6 LAND USE

4.6.1 METHODS

The ROI for land use includes areas of immediate disturbance associated with the Proposed Project Components and the proposed Federal actions. Additionally, adjacent land uses have been considered. Analyses completed for this section evaluate environmental impacts as a result of the Proposed Project Components and the proposed Federal actions. Land use plans for Aurora and Brule counties are currently being revised. Jerauld County's Comprehensive Plan was approved in 1998. No land use plan is available for Tripp County. Reviews of aerial photographs, existing public inventories (*e.g.*, USFWS, NWI, NRCS databases), and field studies have been used to identify the land uses within the alternatives.

The evaluation of impacts to land uses considered potential impacts to existing productive uses of the land, such as agriculture, rangeland and preservation of natural environments, as well as prime farmland and farmland of statewide importance, residential uses and recreational opportunities as a result of the Proposed Project Components and the proposed Federal actions.

4.6.2 SIGNIFICANCE CRITERIA

A significant impact to land use would occur if:

- An activity would conflict with any applicable land use policy or regulation of an agency with jurisdiction over those areas

4.6.3 IMPACT ASSESSMENT

For either alternative, the Proposed Project Components and proposed Federal actions would not conflict with any applicable policy or regulation of an agency with jurisdiction in the area. The majority of the area is used for rangeland and agriculture. Current land uses would continue, even though some land would be converted to industrial use. Additionally, the Applicants have coordinated with landowners and are establishing lease agreements for the Proposed Project

Components development. BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**) would be employed. Impacts to land use would be less than significant.

4.6.3.1 Crow Lake Alternative

Development of the Crow Lake Alternative would result in approximately 11 acres of temporary impact and approximately 1.5 acres of permanent impact to prime farmlands, and approximately 566 acres of temporary impact and approximately 99 acres of permanent impact to farmland of statewide importance. Temporary impacts due to construction would be revegetated with native grasses and/or crops matching the surrounding agriculture landscape. The permanent impacts account for less than 0.1 percent of available respective farmland within the Crow Lake Alternative boundary. In addition, there is a small area of prime farmland, if irrigated, that would be impacted by the Proposed Project Components; however, the land is not being used for agricultural purposes, and therefore would not result in a reduction in active agriculture. It would not substantially alter the use of farmland in areas designated for turbine and access road installations. The FPPA does not authorize the Federal government to affect the property rights of private landowners or regulate the use of private land, so conversion of some prime farmland and farmland of statewide importance to different uses would not conflict with FPPA policy.

The Crow Lake Alternative would result in the temporary disturbance of 68 acres and the permanent disturbance of 15 acres within USFWS grassland easements. It would also result in the temporary disturbance of 120 acres and the permanent disturbance of 22 acres within USFWS wetland easements (additional biological information pertaining to USFWS easements can be found in **Section 4.4**). The Applicants would work with the USFWS to obtain permits for the impact. The Proposed Project Components would not conflict with current USFWS land uses and policies for wetland and grassland easements.

During construction and decommissioning, noise, dust, traffic and the presence of a construction force would temporarily affect the rural to primitive character of the area. No residences are within 1,000 feet of the proposed turbine locations, in accordance with the Applicants' siting parameters. Further, the minimum distance from the centerline of the transmission line corridor to the nearest residence is greater than 1,900 feet, so residential use would not be affected.

People engaging in casual hiking, birding and hunting within the Crow Lake Alternative ROIs could be temporarily affected during the construction and decommissioning activities due to limited access.

System modifications at Western's Wessington Springs Substation would be confined within the existing substation and not alter current uses for the site.

4.6.3.2 Winner Alternative

Development of the Winner Alternative would result in approximately 2.1 acres of temporary impact and approximately 0.2 acres of permanent impact to prime farmlands, and approximately 509 acres of temporary impact and approximately 59 acres of permanent impact to farmland of

statewide importance. Temporary impacts due to construction of the Proposed Project Components would be revegetated with native grasses and crops matching the surrounding agriculture landscape. The permanent impacts account for less than 0.5 percent of available respective farmland within the Winner Alternative boundary. In addition, there is a small acreage of prime farmland, if irrigated, that would be impacted by the Proposed Project Components; however, the land is not being used for agricultural purposes and therefore would not result in a reduction in active agriculture.

Additionally, the Winner Alternative would not result in temporary or permanent disturbance within USFWS grassland easements.

During construction and decommissioning, noise, dust, traffic and the presence of a construction force would temporarily affect the rural to primitive character of the area. One residence is located within approximately 800 feet from a proposed turbine location. It is anticipated that this turbine location would be eliminated from further consideration, because it does not meet the Applicants' siting criteria. The second nearest residence is 1,050 feet away from a proposed turbine location, and meets the Applicants' siting criteria.

The closest residence to the centerline of the alternative 1 transmission line corridor is approximately 100 feet away, and due to this proximity, does not meet the Applicants' line siting criteria. It is anticipated that the alternative 1 transmission line corridor would be eliminated from further consideration. The closest residence to centerline of the alternative 2 transmission line corridor is at least 900 feet away, and meets the Applicants' siting criteria. Impacts associated with the short-term construction of the transmission corridor would be minimized through the included BMPs and APMs as described in **Chapter 2, Tables 2.2 and 2.3**.

Similar to the Crow Lake Alternative, people engaging in casual hiking, birding and hunting could be temporarily affected during the construction and decommissioning activities due to limited access.

System modifications at Western's Winner Substation would not alter current uses for the site. All additions would be confined within or adjacent to the existing substation.

4.6.3.3 No Action Alternative

Under the No Action Alternative, Western would not approve an interconnection request(s) and RUS would not provide financial assistance for the Proposed Project. For the purpose of impact analysis and comparison in this EIS, it is assumed that the Applicants' Proposed Project (and Wind Partners' proposed development as it pertains to the Crow Lake Alternative) would not be built and the environmental impacts, both positive and negative, associated with construction and operation would not occur. Local landowners would not receive lease payments from the Applicants and could sign leases with another wind power developer. There would be no land use impacts associated with the No Action Alternative.

4.7 TRANSPORTATION

4.7.1 METHODS

The ROI for roads and highways includes roads near the site alternatives that would be used for delivery of construction equipment, construction worker access and maintenance access. The impact analysis only includes roads and highways within the counties in which the site would be located. The ROI for aviation includes airports within 20 miles. Additionally, information has been reviewed from the Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM Administered Lands in the Western United States (Bureau of Land Management [BLM] 2005).

4.7.2 SIGNIFICANCE CRITERIA

A significant impact to transportation would occur if:

- An activity would result in the permanent disruption of regional and local traffic
- An activity would result in the destruction of existing transportation infrastructure
- An activity would result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks; or impact an FAA-designated air safety zone around an existing airport

4.7.3 IMPACT ASSESSMENT

In general, a variety of transportation operations are necessary to support wind energy development. A list of representative transportation requirements for each phase of development is provided below. Most of these requirements would involve the transportation of material and equipment necessary for the Proposed Project Components and the proposed Federal actions.

Roads and Highways

Construction

The construction and operation of the Proposed Project Components would result in an increase in the ADT on the respective roadway network surrounding the site alternatives. The majority of the additional traffic would be during the initial construction phase.

- Site and road grading and preparation would require heavy earthmoving equipment, typically involving 10 to 40 pieces of heavy machinery
- Road, pad and staging areas would require sand or gravel, delivered by dump trucks
- Tower foundations would require concrete, aggregate, sand and cement to be delivered by dump trucks; typically 15 to 35 truck shipments per foundation
- Tens of thousands of gallons per day of water typically would be obtained locally in the site alternative area that may require a State specific appropriation permit
- Turbines would be brought to the site by specialized equipment; overweight and/or oversized loads may require State and county specific permits and traffic management

- Turbine assembly and installation would require specialized cranes; overweight and/or oversized loads may require State and county specific permits and traffic management
- Turbine interconnections and transmission lines would require trenching or auger equipment and line trucks

Construction hours are expected to be from 6:00 a.m. to 6:00 p.m. on weekdays, and possibly weekends. Some activities may require extended construction hours, and nighttime construction may be necessary to meet the overall schedule. The movement of equipment and materials to the site alternatives would cause a relatively short-term increase in the level of service of local roadways during the construction period. Most equipment (*e.g.*, heavy earthmoving equipment and cranes) would remain at the site for the duration of construction. Shipments of materials, such as gravel, concrete and water, would not be expected to substantially affect local primary and secondary road networks.

Shipments of overweight and/or oversized loads could be expected to cause temporary disruptions on the secondary and primary roads used to access a construction site. The transport vehicles may require defined routes, and by obtaining necessary permits for hauling heavy loads would comply with all Federal, State and local rules and ordinances. Local roads might require fortification of bridges and removal of obstructions to accommodate overweight or oversized shipments. The need for such actions would be determined on a site-specific basis. Access roads may need to be upgraded or constructed to accommodate overweight or oversize shipments. Because of the anticipated weight of the turbine components and electrical transformers that would be brought to the site, maximum grade becomes a critical road design parameter.

Operation

Once the Proposed Project Components are in operation, the expected traffic would be minimal. Minimal support personnel would be needed to maintain and operate the facility. Normally, no heavy or large loads would be expected; pickup or medium-duty trucks would be used for daily operations. Turbine site locations may be attended during business hours by a small maintenance crew of 10 to 12 people that would work in teams of two. Consequently, transportation activities would be limited to about 12 trips from the maintenance building to turbines in a typical day, using pickup trucks, medium-duty vehicles or personal vehicles. Large components may be required for equipment replacement in the event of a major mechanical breakdown. However, such shipments would be expected to be infrequent. Transportation activities during operations would be minimal, similar to those currently occurring, and not be expected to cause noticeable impacts to local road networks.

Decommissioning

Most transportation activities during site decommissioning would be similar to those during site development and construction.

- Foundation removal, site regrading and recontouring would require heavy earthmoving equipment transported to the site using flatbed or goose-neck trailers

- Turbine and tower disassembly would require cranes; overweight and/or oversized loads may require State-specific permits and traffic management
- Equipment and debris removal would require medium- to heavy-duty trucks

Heavy equipment and cranes would be required for turbine and tower dismantlement, breaking up tower foundations, and regrading and recontouring the site to the original grade. With the possible exception of a main crane, oversized and/or overweight shipments are not expected during decommissioning activities because the major turbine components could be disassembled, segmented or size-reduced prior to shipment. Thus, potential disruptions to local traffic during decommissioning would likely be fewer than those during original construction activities; therefore, decommissioning impacts would be less than significant.

Short-term traffic congestion may exist when construction delivery vehicles are on the road, and localized increases in road wear and maintenance may occur. However, the construction, operation and decommissioning of the Proposed Project Components would result in less than significant impacts to permanent, regional and local traffic and transportation infrastructure through the implementation of traffic control measures and other standard construction practices described above.

Aviation

The FAA regulates obstructions to navigable airspace (14 CFR 77, or "FAA Part 77"). The Applicants are required to notify the FAA Administrator of any proposed construction "of facilities more than 200 feet in height above the ground level at its site" (Section 77.13[a][1]). The height of towers and length of blades have a combined height of approximately 389 feet, exceeding the FAA notice threshold. The Applicants have provided preliminary information to the FAA regarding the Proposed Project Components. Prior to construction, the Applicants would notify the FAA regarding exact facility heights and latitude and longitude coordinates.

FAA requires that aircraft warning lights be installed on turbines taller than 200 feet. Recently, the FAA drafted new recommendations for lighting of wind-powered facilities. Based on studies prompted by the American Wind Energy Association and DOE, the FAA has developed a new set of recommendations for lighting wind farms that would require fewer lights than needed under its current policy. The new recommendations suggest red or white synchronized flashing strobe lights, at most 0.5 mile apart around the perimeter of wind farms. Daytime lighting and dual lighting of the turbines were both deemed unnecessary. Prior to construction, the Applicants would consult with the FAA to identify applicable lighting requirements.

4.7.3.1 Crow Lake Alternative

Roads and Highways

The heavy equipment and materials needed for site access, site preparation and foundation construction are typical of heavy construction projects and do not pose unique transportation considerations. Construction, operation and decommissioning of the Proposed Project Components would not result in a permanent disruption of regional and local traffic, nor would

these activities result in the destruction of existing transportation infrastructure; therefore development of the Proposed Project Components would result in less than significant impacts.

Aviation

The Proposed Project Components would not impact an FAA-designated air safety zone, nor would it result in a change in air traffic patterns, an increase in traffic levels or a change in location that results in substantial safety risks. Therefore, with the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), the construction, operation and decommissioning of the Proposed Project Components would result in less than significant impacts to aviation.

Western's system modifications at its Wessington Springs Substation would require personnel and shipments of materials, such as electrical equipment, gravel, concrete and water. Such shipments would similarly be expected to result in less than significant impacts to transportation.

4.7.3.2 Winner Alternative

Transportation impacts associated with the Winner Alternative would be similar to those described for the Crow Lake Alternative because the Proposed Project Components design requirements are comparable despite the alternative selected; therefore, with the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), impacts would be less than significant.

Shipments to Western's Winner Substation would similarly be expected to result in less than significant impacts.

4.7.3.3 No Action Alternative

Under the No Action Alternative, Western would not approve an interconnection request(s) and RUS would not provide financial assistance for the Proposed Project. For the purpose of impact analysis and comparison in this EIS, it is assumed that the Applicants' Proposed Project (and Wind Partners' proposed development as it pertains to the Crow Lake Alternative) would not be built and the environmental impacts, both positive and negative, associated with construction and operation would not occur. There would be no transportation impacts associated with the No Action Alternative.

4.8 VISUAL RESOURCES

4.8.1 METHODS

The ROI includes areas within and adjacent to the site alternative area from which a person may be able to observe changes to the visual landscape resulting from constructing the Proposed Project Components. In addition, the ROI includes residences within the alternative boundaries, nearby population centers and nearby roadways from which the Proposed Project Components may be viewed if built. The impact analysis for visual resources evaluates the visual quality of the existing setting, assesses the sensitivity of visual resources, and evaluates modifications that would occur as a result of the Proposed Project Components. The following aesthetic values

have been considered when evaluating the visual quality of, and modifications to, the existing landscape:

- Form – topographical variation, mountains, valleys
- Line/Pattern – roads, transmission lines
- Color/Contrast – brightness, diversity
- Texture – vegetation, buildings, disturbed areas

The sensitivity of the existing visual resources to changes associated with the Proposed Project Components and proposed Federal actions are based on a number of factors:

- The extent to which the existing landscape is already altered from its natural condition.
- The number of people within visual range of the area, including residents, highway travelers, and those involved in recreational activities.
- The degree of public concern or agency management directives for the quality of the landscape.

KOPs were selected to depict viewpoints that would be visually sensitive to change as a result of the Proposed Project Components. The KOPs depict the general visual setting of each of the alternatives and provide a baseline for developing visual simulations. As described in **Section 3.8.2**, based on public input received during the EIS scoping process, local (*i.e.,* residents within and near the alternative boundaries) sensitivity to visual changes as a result of the Proposed Project Components is low. The LCTDR and LCIC were identified as sensitive viewpoints for the Proposed Project Components; therefore, KOPs were selected for each of the alternatives based on topography, distance, and elevation to identify locations with the greatest potential to view the site from the Lewis and Clark NHT auto tour route and LCIC, as depicted in **Figure 3.8-1**.

WindPRO version 2.6 (designed by EMD International) was used to prepare a visual simulation for each of the KOPs. To develop the simulation, a photograph and GPS point were taken at each KOP. The camera's height, direction and focal length were recorded along with the date, time of day and weather conditions (*i.e.,* "clear sky" or "overcast"). Then, control points (*e.g.,* power poles, fence posts, street signs) were located and GPS positions and heights of these control points were recorded. This information along with the photograph was loaded into the visual simulation program in WindPRO. The software contains the location of each of the proposed turbines as well as each turbine's height, rotor diameter, color, and ground elevation. The software also contains topographical information between the camera's location and the turbine locations. When the photograph is placed on the topographical map, the control points (*e.g.,* power poles, fence posts, street signs) are matched with their corresponding image on the photograph. The control points control the accuracy of the model. The software then uses the topographical information to locate the horizon of the camera's location. After the control points and horizon are set, the software models the visual simulation and inputs the turbines over the photograph image. This resulting image (*i.e.,* the photograph with the turbine overlay) is presented in the EIS as the visual simulation.

Proposed Project Components have been labeled in the simulations in which they would be visible. If the simulation model has determined that the Proposed Project Components would not

be visible, then there is no additional label on the photograph. The existing condition photographs from **Section 3.8** are repeated in this section for side-by-side comparison between the existing condition and the simulation.

4.8.2 SIGNIFICANCE CRITERIA

A significant impact to visual resources would occur if:

- An activity would permanently and substantially alter or degrade scenic resources, including, but not limited to, geologic and topographic features, major stands of vegetation and/or trees, and other visual resources within a State scenic highway
- An activity would substantially degrade the existing visual character or quality of the site alternative and its surroundings

4.8.3 IMPACT ASSESSMENT

For visual resource analysis, the following impact assessment applies to both alternatives. The KOP analysis is separated for each alternative into **Sections 4.8.3.1** and **4.8.3.2** below. Additionally, potential impacts to historic property settings would be addressed through the NHPA, Section 106 process.

Aboveground facilities for the Proposed Project Components would consist of up to 101 turbines, access roads, overhead electric transmission lines and a new collection substation. Aboveground facilities for the Wind Partners' proposed development would consist of seven turbines and access roads within the Crow Lake Alternative. The most visible component of the Proposed Project Components would be the addition of the turbines to the landscape. Impacts to visual resources from the construction, operation and decommissioning of a wind-powered facility in a rural, agricultural area would occur by altering the physical setting and visual quality of the existing landscape and by effects on the landscape as experienced from sensitive viewpoints, including residential areas and travel routes. The proposed turbines would introduce new or different elements into the landscape and would alter the existing form, line, color and texture that characterize the existing landscape. To avoid or minimize visual impacts, all wind turbines would be uniform in design and color throughout the area. The neutral color of the turbines would minimize contrast against the sky. The turbines would be visible at greater distances on clear days with blue skies compared with cloudy, overcast skies when the neutral turbines have a greater ability to blend with the background. All KOP photographs were taken on clear sky days so that the simulations would represent the conditions of greatest potential contrast between the turbines and landscape. The low-reflectivity finish of the turbines would minimize reflection and glare.

Flickering shadows could be cast by moving rotors. Flickering is the result of alternating changes in light intensity caused by the moving blade casting shadows on the ground and stationary objects, such as a window at a residence. Flickering would be limited to daylight hours when the sun is shining, would be noticeable only in the immediate area, and would vary throughout the day and by season. Flickering shadows would be greatest or longest – up to approximately 1,000 feet – at sunrise and sunset when the sun is shining and shadows are at their longest (WIND Engineers 2003). The uppermost portion of the turbine blades would stand approximately 389

feet above the ground surface. The visual character of the area would be altered from minimally developed agricultural land use to somewhat industrial. Some of the turbines would require lights on top of the nacelle, for aircraft safety, potentially changing the view from nearby rural residences and roadways. Turbines would not be sited near trees or cause trees to be removed. The regional landscape is generally uniform, does not contain highly distinctive or important landscape features, is not densely populated or used, and the local residents' sensitivity to visual changes associated with the Proposed Project Components is low; therefore, impacts to the existing visual character or quality within either of the alternatives from development of the Proposed Project Components would be less than significant.

System modifications at either of Western's substations would be confined within or adjacent to the existing substation, so system additions would not introduce new or different elements into the landscape, or substantially alter the characteristics of the existing landscape.

4.8.3.1 Crow Lake Alternative KOPs

Figures 4.8-1 and **4.8-2** depict the existing condition and visual simulation, respectively, from KOP 1. KOP 1 is one of the highest elevations on the Lewis and Clark NHT auto tour route from which the Proposed Project Components may be viewed. The nearest turbine to KOP 1 would be approximately 22 miles away and, as demonstrated by the visual simulation, Proposed Project Components would not be visible in the existing landscape (see **Figure 4.8-2**).

Figures 4.8-3 and **4.8-4** depict the existing condition and visual simulation, respectively, from KOP 2. KOP 2 is the view from the LCIC. The nearest turbine to KOP 2 would be approximately 24 miles away and, as demonstrated by the visual simulation, Proposed Project Components would not be visible in the existing landscape (see **Figure 4.8-4**).

Figures 4.8-5 and **4.8-6** depict the existing condition and visual simulation, respectively, from KOP 3. KOP 3 is the nearest location on the Lewis and Clark NHT auto tour route from which the Proposed Project Components may be viewed. The nearest turbine to KOP 3 would be approximately 17 miles away and would be barely perceptible on the horizon within the existing landscape (see **Figure 4.8-6**). The turbines (labeled on the simulation) would be a minimal addition to the existing landscape, but would be indistinguishable from the existing transmission line structures.

The KOPs were selected based on topography, distance and elevation to represent the points along the Lewis and Clark NHT auto tour route where the Proposed Project Components would be most visible to users of the route; the simulations represent stationary scenes at these points. The portion of the Lewis and Clark NHT auto tour route along I-90 (in the vicinity of KOP3) is the location at which the site would be most visible to travelers on the route. KOP3 is also the closest point (17 miles) to the Crow Lake Alternative. Given the distance (minimum of 17 miles) and gently rolling terrain, travelers on the route would have minimal viewing opportunities of the site as represented in **Figures 4.8-2, 4.8-4, and 4.8-6**. At the closest point (*i.e.,* KOP3 or I-90) route users would be travelling on the interstate at high speeds and have a minimal viewing time of the Proposed Project Components. Along other portions of the route, viewing duration would be minimized because route users would be travelling at state route speeds and viewing opportunities would be obscured by the distance (minimum of 17 miles) and gently rolling

terrain. As represented in **Figure 4.8-6** the turbines would be barely perceptible and indistinguishable from the existing transmission towers. Additionally, the Lewis and Clark NHT is located further west from the alternative and at a lower elevation than the auto tour route, further diminishing the ability to view the Proposed Project Components from the Lewis and Clark NHT.

As illustrated by the photographic simulations, development of the Proposed Project Components would not substantially alter or degrade scenic resources and would not substantially degrade the visual quality of the Crow Lake Alternative as viewed from the Lewis and Clark NHT auto tour route or LCIC; therefore, impacts to visual resources would be less than significant.

Figure 4.8-1 KOP 1 Existing Condition

Figure 4.8-2 KOP 1 Simulation

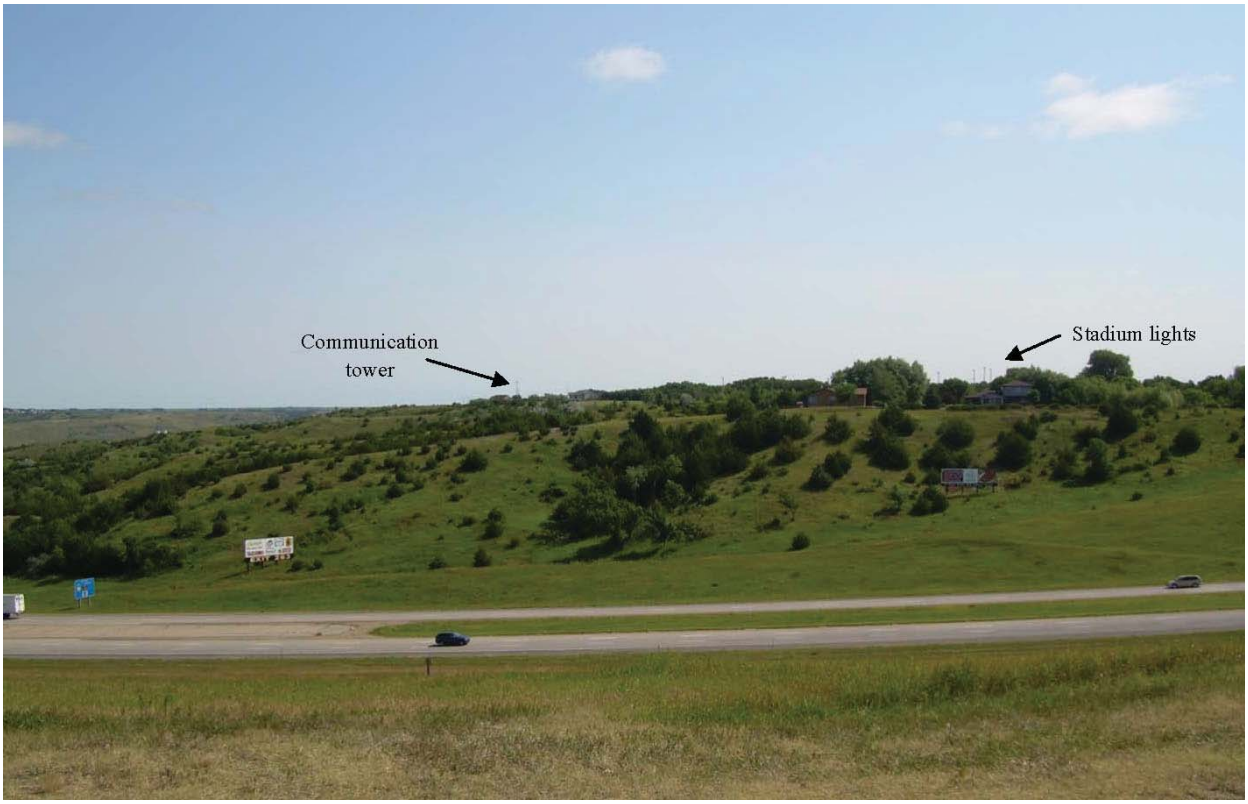

Figure 4.8-3 KOP 2 Existing Condition

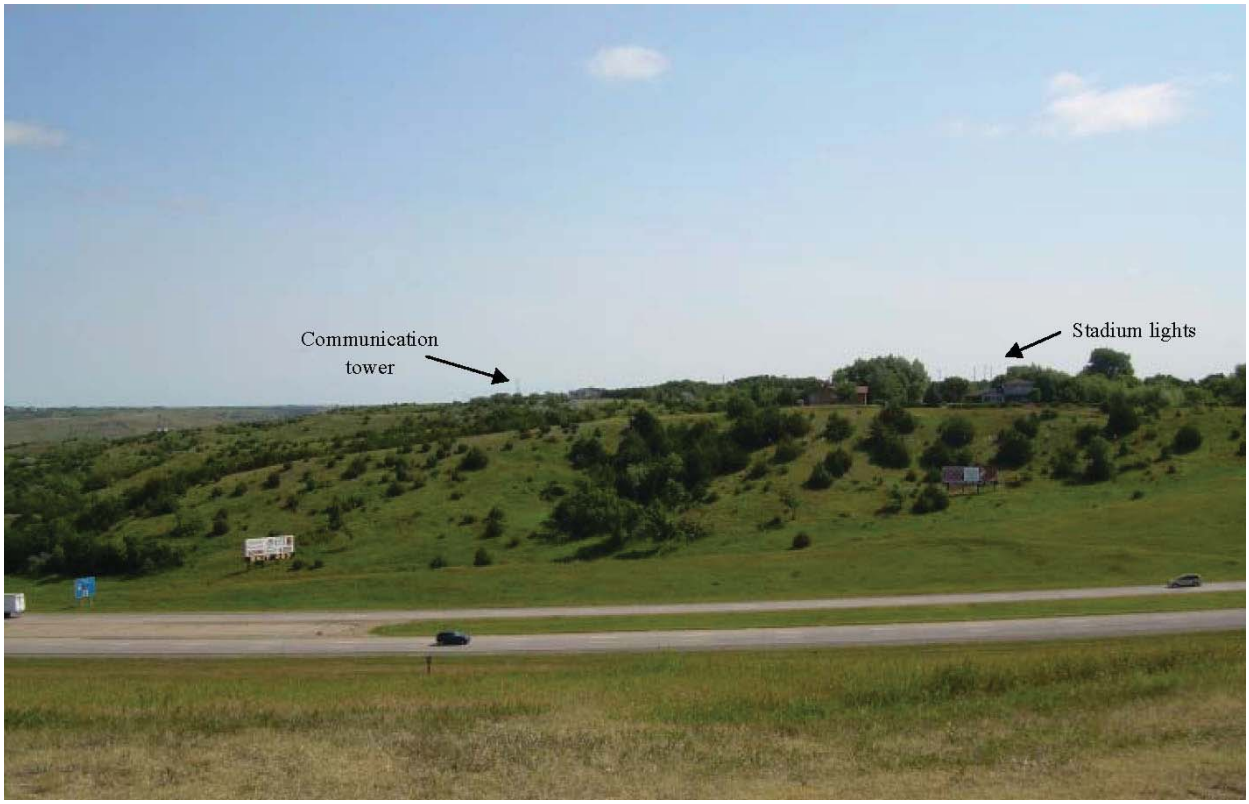

Figure 4.8-4 KOP 2 Simulation

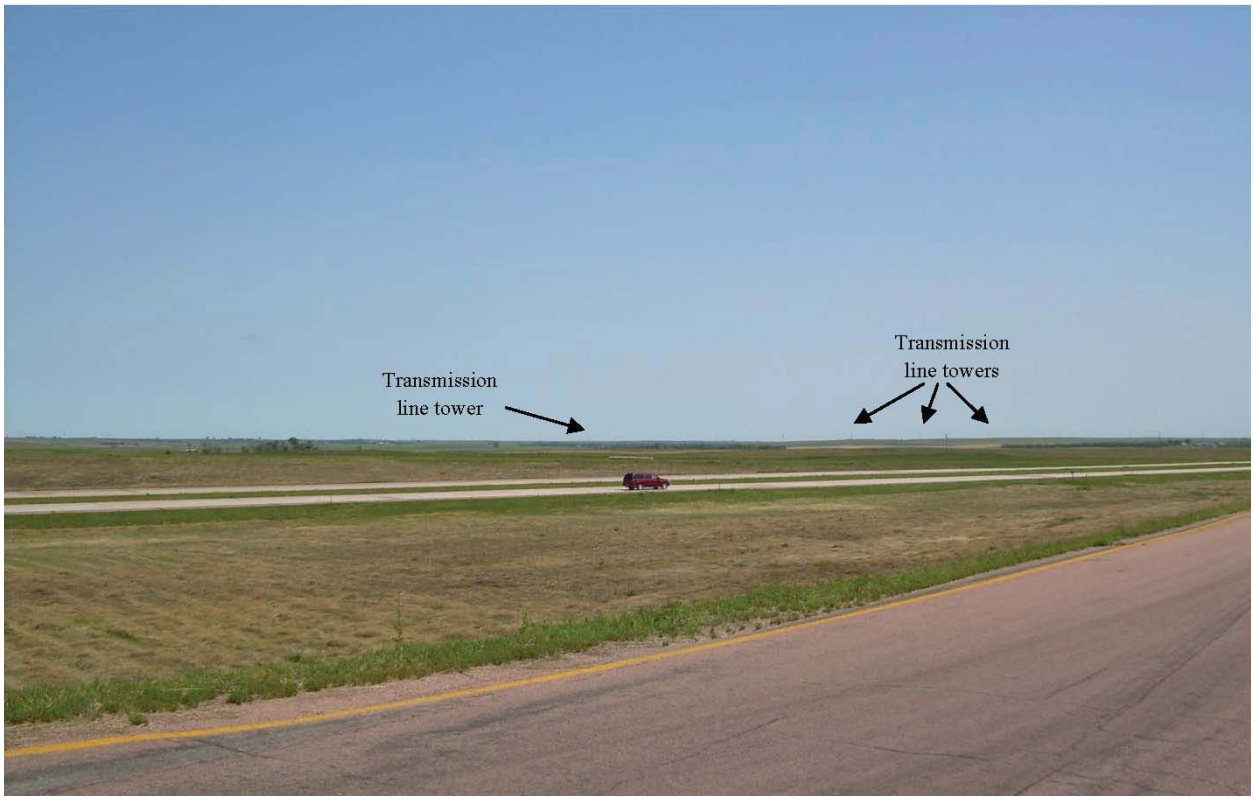

Figure 4.8-5 KOP 3 Existing Condition

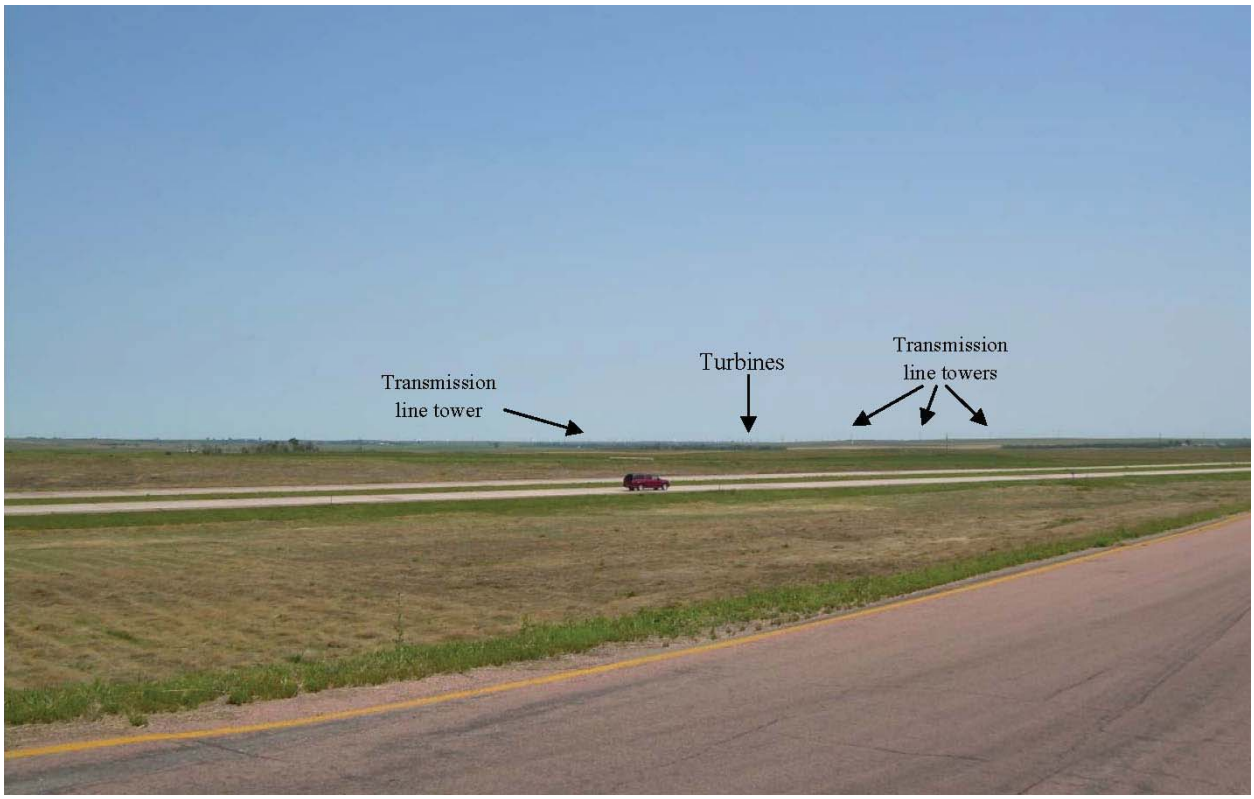

Figure 4.8-6 KOP 3 Visual Simulation

4.8.3.2 Winner Alternative KOPs

Figures 4.8-7 and **4.8-8** depict the existing condition and visual simulation, respectively, from KOP 4. KOP 4 is near the intersection of SR44 and SR47. The nearest turbine (labeled on the simulation) within the KOP 4 field of view would be approximately 22 miles away and would be nearly imperceptible on the horizon within the existing landscape (see **Figure 4.8-8**).

Figures 4.8-9 and **4.8-10** depict the existing condition and visual simulation, respectively, from KOP 5. KOP 5 provides another viewing angle from near the intersection of SR44 and SR47. The nearest turbine (labeled on the simulation) within the KOP 5 field of view would be approximately 15 miles away and would be nearly imperceptible on the horizon within the existing landscape (see **Figure 4.8-10**).

Figures 4.8-11 and **4.8-12** depict the existing condition and visual simulation, respectively, from KOP 6. KOP 6 is one of the highest elevations on the Lewis and Clark NHT auto tour route from which the Proposed Project Components may be viewed. The nearest turbine to KOP 6 would be approximately 19.5 miles away and, as demonstrated by the visual simulation, Proposed Project Components would not be visible in the existing landscape (see **Figure 4.8-12**).

Figures 4.8-13 and **4.8-14** depict the existing condition and visual simulation, respectively, from KOP 7. KOP 7 is the nearest location on the Lewis and Clark NHT auto tour route from which the Proposed Project Components may be viewed. The nearest turbine to KOP 7 would be approximately 8.4 miles away and would be barely perceptible on the horizon within the existing landscape (see **Figure 4.8-14**). The turbines (labeled on the simulation) would be a minimal addition to the existing landscape, but would draw less attention than the existing roadway and water tower.

The KOPs were selected based on topography, distance and elevation to represent the points along the Lewis and Clark NHT auto tour route where the Proposed Project Components would be most visible to users of the route; the simulations represent stationary scenes at these points. KOP7 is the closest point (8.4 miles) to the Winner Alternative and is the portion of the Lewis and Clark NHT auto tour route from which the Proposed Project Components would be most visible. Given the distance (minimum of 8.4 miles) and gently rolling terrain, the turbines would not be visible at all locations along the route, as represented in **Figures 4.8-8, 4.8-10, 4.8-12, and 4.8-14;** and when visible, would be barely perceptible on the horizon. Viewing duration would be minimized because route users would be travelling at state route speeds and viewing opportunities would be obscured along the route by the distance (minimum of 8.4 miles) and gently rolling terrain. Additionally, the Lewis and Clark NHT is located further east from the alternative and at a lower elevation than the auto tour route, further diminishing the ability to view the Proposed Project Components from the Lewis and Clark NHT.

As illustrated by the photographic simulations, development of the Proposed Project Components would not substantially alter or degrade scenic resources and would not substantially degrade the visual quality of the Winner Alternative as viewed from the Lewis and Clark NHT auto tour route; therefore, impacts to visual resources would be less than significant.

Figure 4.8-7 KOP 4 Existing Condition

Figure 4.8-8 KOP 4 Simulation

Figure 4.8-9 KOP 5 Existing Condition

Figure 4.8-10 KOP 5 Simulation

Figure 4.8-11 KOP 6 Existing Condition

Figure 4.8-12 KOP 6 Simulation

Figure 4.8-13 KOP 7 Existing Condition

Figure 4.8-14 KOP 7 Simulation

4.8.3.3 No Action Alternative

Under the No Action Alternative, Western would not approve an interconnection request(s) and RUS would not provide financial assistance for the Proposed Project. For the purpose of impact analysis and comparison in this EIS, it is assumed that the Applicants' Proposed Project (and Wind Partners' proposed development as it pertains to the Crow Lake Alternative) would not be built and the environmental impacts, both positive and negative, associated with construction and operation would not occur. There would be no visual resource impacts associated with the No Action Alternative.

4.9 NOISE

4.9.1 METHODS

The ROI for noise includes residences located within the site alternatives and residences adjacent to the areas of the proposed Federal actions. Examples of construction and decommissioning related noise-emitting sources include heavy equipment used in earthmoving, foundation preparation and demolition, structure assembly and other activities. Operational noise-emitting sources include the wind turbines, as well as the low, continuous vibrational hum which can be heard from the completed transmission lines and facilities.

As described in **Section 3.9**, dBA represents the human hearing response to sound for a single sound event. In 1974, the EPA identified safe noise levels that could be used to protect public health and welfare, including prevention of hearing damage, sleep disturbance and communication disruption. Outdoor L_{dn} values of 55 dBA were identified as desirable to protect against activity interference in residential areas. When annual averages of the daily level are considered over a period of 40 years, the EPA identified average noise levels equal to or less than 70 dBA as the level of environmental noise that would prevent any measurable hearing loss over the course of a lifetime. Low-frequency sound is discussed in **Section 4.12**.

Construction

Construction noise levels associated with a wind farm vary greatly depending on equipment, operation schedule and condition of the area being worked (BLM 2005). **Table 4.9-1** identifies noise levels for typical construction equipment.

Operation

Table 4.9-2 provides a comparison of wind turbine noise to other noise sources.

The Wessington Springs Wind Project located in Jerauld County, South Dakota, modeled operational noise impacts associated with the same make and model wind turbine as identified for the Proposed Project Components. Based on these results, the anticipated noise level at the base of the wind turbine would be 55 dBA and would be between 50 dBA and 45 dBA at a distance between 660 feet and 1,320 feet from the wind turbine (Western 2007). As a

Table 4.9-1 Noise Levels at Various Distances from Typical Construction Equipment

Construction Equipment	Noise Level $L_{eq(1-h)}$[a] at Distances [dBA]					
	50 ft	250 ft	500 ft	1,000 ft	2,500 ft	5,000 ft
Bulldozer	85	71	65	59	51	45
Concrete mixer	85	71	65	59	51	45
Concrete pump	82	68	62	56	48	42
Crane, derrick	88	74	68	62	54	48
Crane, mobile	83	69	63	57	49	43
Front-end loader	85	71	65	59	51	45
Generator	81	67	61	55	47	41
Grader	85	71	65	59	51	45
Shovel	82	72	62	56	48	42
Truck	88	74	68	62	54	48

Source: Harris Miller Miller & Hanson, Inc. 1995 and BLM 2005

[a] $L_{eq(1-h)}$ is the equivalent steady-State sound level that contains the same varying sound level during a 1-hour period.

Table 4.9-2 Comparison of Wind Turbine Noise to Other Noise Sources

Noise Source	Typical dBA
Threshold of pain	140
Fire engine siren at 100 feet	130
Flyover of an F-16 aircraft at 500 feet	104
Average street traffic	85
Vacuum cleaner	70
Normal conversation	55
Large wind turbine at base of tower	**55**
Soft music, moderate rainfall	50
Background noise in a rural environment	48
Typical living room	40
Large wind turbine from 0.25 mile	**35**
Whisper, quiet library	35
Rustling leaves	20
Threshold of hearing	0

Source: Western 2007

conservative approach, noise levels would be reduced for receptors further removed from the noise source by approximately 6 dBA for each doubling of distance from the source (Harris 1991).

Decommissioning

The decommissioning phase of the Proposed Project Components would be anticipated to require similar types of activities and generate similar noise levels as described in construction.

4.9.2 SIGNIFICANCE CRITERIA

The impact analysis for noise is based on the following significance criteria. A significant impact to noise would occur if:

- An activity would expose persons to or generate noise or vibration levels in excess of EPA-recommended levels
- An activity would result in a substantial permanent increase in ambient noise or vibration levels in the vicinity above levels existing without the Proposed Project Components. A 3 dB increase in noise is considered barely noticeable to humans, a 5 dB increase would typically result in a noticeable community response, and a 10 dB increase is considered a doubling of the sound and is generally considered to be substantial

4.9.3 IMPACT ASSESSMENT

The following considerations for construction and operation apply to both alternatives. Site specific analysis is provided in the following sections.

Construction

Construction equipment would generally not operate at the same time and would be spread throughout the construction area depending on the activity. Construction would occur intermittently at each of the wind turbine locations, typically during normal daytime working hours. Nighttime construction may be necessary to meet the overall Proposed Project Components schedule, and in such cases, residents would be notified of this temporary, short-term activity. Construction would generally occur for one week or less in any given area. As identified in **Table 4.9-1**, between 250 feet and 500 feet from the construction location, the anticipated noise levels would drop below the EPA-recommended noise guideline (70 dBA) to prevent hearing loss. Between 1,000 feet and 2,500 feet from the construction location, the construction noise levels are anticipated to drop below the EPA-recommended noise guideline (55 dBA) for residential areas.

Operation

During dry weather conditions, noise from transmission lines (operational "hum") is generally lost in the background noise at locations beyond the edge of the transmission line right-of-way (DOE 2005). In wet conditions, however, water drops collecting on the lines provide favorable conditions for corona discharges, which can result in a humming noise. During rainfall events, the noise level at the edge of the right-of-way of a 230-kV transmission line would be less than 39 dBA (BPA 1996), which is typical of the noise level at a library or rural residential area. Operation of the transmission line would result in no impact to noise.

4.9.3.1 Crow Lake Alternative

Construction

The nearest residence to a proposed turbine location would be located approximately 1,270 feet away. On the basis of the noise levels presented in **Table 4.9-1**, it is estimated that noise levels would be 57 to 59 dBA. The minimum distance to a residence from the centerline of the transmission line corridor would be approximately 1,900 feet. On the basis of the noise levels presented in **Table 4.9-1**, it is estimated that noise levels during construction of the transmission line would be 52 to 54 dBA or less at the nearest residence. The nearest residence to the proposed collector substation would be located approximately 6,000 feet away. On the basis of the noise levels presented in **Table 4.9-1**, it is estimated that noise levels would be 41 to 43 dBA. Construction of the turbines, transmission line, and proposed collector substation would result in a temporary increase in background noise to levels near the 55 dBA level, identified as desirable to protect against activity interference. This would be a noticeable, temporary increase over background noise levels. Thus, with the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), construction-related noise impacts would be less than significant.

The nearest residence to Western's existing Wessington Springs Substation is 1,500 feet away. On the basis of the noise levels presented in **Table 4.9-1**, it is estimated that construction noise levels would be approximately 56-58 dBA. Western system modifications at the existing Wessington Springs Substation, would include BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), and would result in short-term, temporary construction impacts. Therefore, impacts would be less than significant.

Operation

Based on noise modeling results of a similar wind project (Western 2007), anticipated noise levels would be between 50 dBA and 45 dBA at a distance between 660 feet and 1,320 feet from the wind turbine; therefore, noise levels associated with the wind turbines at the nearest residence would be near or below 45 dBA. As identified in **Section 3.9.3**, the average outdoor noise levels for rural residential and agricultural areas typically range from 39 dBA to 44 dBA. At the nearest residence, operational noise associated with the Proposed Project Components would likely be between 3 dB and 5 dB greater than existing ambient noise levels. With the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), impacts from operational noise would be less than significant, and operation of the transmission line would result in no impact to noise.

Development of the Western system modifications at the existing Wessington Springs Substation, would include BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), and would similarly be expected to result in less than significant noise impacts.

Decommissioning

The decommissioning phase of the Crow Lake Alternative would be anticipated to result in similar noise effects as described for construction.

4.9.3.2 Winner Alternative

Construction

The nearest residence to a proposed turbine location would be located approximately 800 feet away. It is anticipated that this turbine location would be eliminated from further consideration, because it doesn't meet the Applicants' siting criteria.

The next nearest residence to a proposed turbine location would be 1,050 feet away from a proposed turbine location, and meets the Applicants' siting criteria. On the basis of the noise levels presented in **Table 4.9-1**, it is estimated that noise levels would be 57 to 59 dBA. Construction of the turbines would result in a temporary increase in background noise to levels above 55 dBA, but below the 70 dBA average level to prevent hearing loss over the course of a lifetime. This would be a noticeable, but temporary increase over background noise levels; with the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), construction-related noise impacts would be less than significant.

The nearest residence to the proposed collector substation would be located approximately 1,400 feet away. On the basis of the noise levels presented in **Table 4.9-1**, it is estimated that noise levels would be 56 to 58 dBA. Construction of the proposed collector substation would result in a temporary increase in background noise to levels above 55 dBA, but below the 70 dBA average level to prevent hearing loss over the course of a lifetime. This would be a noticeable, but temporary increase over background noise levels. With the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), construction-related noise impacts would be less than significant.

The closest residence to the centerline of the alternative 1 transmission line corridor is approximately 100 feet away, and due to this proximity, does not meet the Applicants' line siting criteria. It is anticipated that the alternative 1 transmission line corridor would be eliminated from further consideration.

The closest residence to centerline of the alternative 2 transmission line corridor is at least 900 feet away, and meets the Applicants' siting criteria. On the basis of the noise levels presented in **Table 4.9-1**, it is estimated that construction noise levels would be approximately 59 to 61 dBA. Construction of the alternative 2 transmission would result in a temporary increase above background noise, but would be within the level identified as desirable to protect against activity interference. With the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), construction-related noise impacts would be less than significant.

The nearest residence to Western's existing Winner Substation is 300 feet away. On the basis of the noise levels presented in **Table 4.9-1**, it is estimated that noise levels would be 69 to 71 dBA;

therefore construction noise at the closest point would be near the EPA-recommended level of 70 dBA. However, the EPA-recommended level of 70 dBA applies to an estimated 40-year average exposure. Therefore the short-term, temporary construction impacts would likely be perceived at the nearest residence. With the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), impacts would be less than significant.

Operation

Anticipated noise levels would be between 50 dBA and 45 dBA at a distance between 660 feet and 1,320 feet from the wind turbine. The two nearest residences to a proposed turbine location would be located approximately 800 feet away and 1,050 feet away from a proposed turbine location. Noise levels associated with the wind turbines at the two nearest residences would be between 50 dBA and 45 dBA. As identified in **Section 3.9.3**, the average outdoor noise levels for rural residential and agricultural areas typically range from 39 dBA to 44 dBA.

At the nearest residence, operational noise associated with the Proposed Project Components would be closer to 50 dBA and well below the EPA guideline for outdoor noise levels; however, the increase would likely be between 5 dBA and 10 dBA greater than existing ambient noise levels. With the turbine locations currently indicated, the increased noise would likely be noticeable at the nearest residence. However, it is anticipated that the nearest turbine location would be eliminated from further consideration, because it doesn't meet the Applicants' siting criteria. With this consideration, impacts from operational noise would be less than significant. Operational noise at the second nearest residence, which meets the Applicants' siting criteria, would be closer to 45 dBA and would likely be between 3 dB and 5 dB greater than existing ambient noise levels. With the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), impacts from operational noise would be less than significant.

During dry weather conditions, noise from transmission lines (operational "hum") is generally lost in the background noise at locations beyond the edge of the transmission line right-of-way (DOE 2005). In wet conditions, however, water drops collecting on the lines provide favorable conditions for corona discharges, which can result in a humming noise. During rainfall events, the noise level at the edge of the right-of-way of a 230-kV transmission line would be less than 39 dBA (BPA 1996), which is typical of the noise level at a library or rural residential area. With the included BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), operation of the transmission line would result in no impact to noise.

The nearest residence to Western's existing Winner Substation is 300 feet away. Employing the BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), Western system modifications at its Winner Substation would be expected to result in less than significant noise impacts.

Decommissioning

The decommissioning phase of the Proposed Project Components would be anticipated to result in similar noise impacts as described for construction.

4.9.3.3 No Action Alternative

Under the No Action Alternative, Western would not approve an interconnection request(s) and RUS would not provide financial assistance for the Proposed Project. For the purpose of impact analysis and comparison in this EIS, it is assumed that the Applicants' Proposed Project (and Wind Partners' proposed development as it pertains to the Crow Lake Alternative) would not be built and the environmental impacts, both positive and negative, associated with construction and operation would not occur. There would be no noise impacts associated with the No Action Alternative.

4.10 SOCIOECONOMICS

4.10.1 METHODS

The socioeconomic analysis evaluates only the counties in which the site alternatives are located. While economic effects could occur to additional counties and regions of the U.S., depending on where the specific Proposed Project Components are manufactured, these effects are impossible to determine at this time. For this reason, the ROI for the Crow Lake Alternative is limited to Aurora, Brule and Jerauld counties. The ROI for the Winner Alternative is limited to Tripp County. Potential impacts have been identified for each alternative based on the available resource information for the ROI with consideration to the significance criteria.

4.10.2 SIGNIFICANCE CRITERIA

A significant impact to socioeconomics would occur if:

- An activity would induce population growth that would impact government and community facilities and services from the in-migration of the workforce
- An activity would result in insufficient existing housing in the ROI within commuting distance sufficient to meet the influx of workers and their families
- An activity would result in a need for new or altered governmental services such as fire protection, police protection, schools, or other governmental services
- An activity would result in a need for new systems, or substantial alterations to utilities including power or natural gas, communications systems, water, sewer or septic tanks, solid waste and disposal

4.10.3 IMPACT ASSESSMENT

The below pertinent socioeconomic considerations have been included in the FEIS analysis, although they are not tied to a specific significance criteria.

Lease and Easement Arrangements

The Applicants' right-of-way agents have contacted landowners in the site alternative areas and the proposed Federal actions areas and have negotiated with landowners to acquire leasing rights for specific parcels of land. In general, a landowner who provides leasing rights would receive

annual rental payments resulting in supplemental income. Potential lease payments would provide a long term supplement to farm and ranch incomes in these rural areas.

Employment and Secondary Economic Effects

According to the American Wind Energy Association (AWEA) *Wind Energy and Economic Development: Building Sustainable Jobs and Communities* (AWEA 2009a), the European Wind Energy Association has estimated that in total, every MW of installed wind capacity directly and indirectly creates about 60 person-years of employment and 15 to 19 jobs.

At the local level, new jobs are likely to be created that may involve site preparation and facility construction, maintenance during facility operation (which is typically about 20 years), and crews to perform decommissioning and site restoration work when the facility is closed. Secondary effects of the Proposed Project Components development and the proposed Federal actions on the local economy may also exist through the need for service-sector businesses and jobs (gas stations, motels, restaurants, *etc.*).

Surveying 13 studies of economic impacts (actual and forecast) of wind facilities on rural economies, one NREL report concluded that these facilities have a large direct impact on the economies of rural communities, especially those with few other supporting industries; however, such communities also see greater "leakage" of secondary economic effects to outside areas. In addition, the report concluded that the number of local construction and operations jobs created by the facility depends on the skills locally available (NRC 2007).

Public Revenues and Costs

Typically, a wind-energy project generates tax dollars for both the local and State governments. Direct monies are collected through income, excise and property taxes, and indirect monies are generated from sales, use, and income taxes on project created employment. The State of South Dakota does not impose corporate or personal income taxes. However, South Dakota does generate revenue from sales, use, property and contractor excise taxes.

Sales/use tax in South Dakota is a combination of a four percent State tax and a general, municipal tax, which varies from zero to two percent (municipal taxes only apply if sale/use is within city limits). Property taxes in South Dakota are levied by local government (*e.g.* counties and municipalities). Real property taxes are determined by taking the local mill levy and applying it to 85 percent of the market value of a property. The contractors' excise tax (tax imposed upon the gross receipts of contractors who are engaged in construction services or realty improvements in South Dakota collectible from both public and private entities) is two percent.

The South Dakota State Legislature has been active in passing laws that affect the development, taxation and operation of wind-energy facilities in the State.

A number of recent laws have been passed by the State to provide construction rebates and an alternate taxation method on wind-energy facilities exceeding five MW.

4.10.3.1 Crow Lake Alternative

Given the short-term duration of construction activities, no significant increase in permanent population to local communities would be expected as a result of construction and operation of the Proposed Project Components. It would not result in significant increased needs for public services, including fire protection. In addition, there would be no discernible impact on local utilities, government, or community services from the construction workforce. Any impacts to social and economic resources would be primarily short-term effects to the local economy. Revenue would likely increase for some local businesses such as hotels, restaurants, gas stations and grocery stores, due to workers associated with construction. Other impacts to community services would be unlikely because of the short-term nature of construction.

The relatively short-term nature of construction and the limited number of workers who would be hired from outside of the local counties would result in limited positive economic impacts to the area in the form of increased spending on lodging, meals and other consumer goods and services. As described in **Chapter 2**, the Applicants would begin construction in mid-2010 and complete construction by the end of 2010. It is anticipated that local workers from the counties would fill the majority of the open construction jobs. The Applicants have estimated the Crow Lake Alternative would create an average of 225 to 250 temporary jobs and 10 to 12 permanent jobs.

Anticipated labor trades required during construction include electricians, crane operators, heavy equipment operators and other skilled construction laborers. Local businesses such as ready-mix concrete, hardware stores, welding and machine shops, packaging and postal services, and heavy equipment repair and maintenance service providers would also likely benefit from construction of the Proposed Project Components.

Minor employment or population changes are anticipated as a direct result of development of the Crow Lake Alternative. Any increase in population would be for the duration of the construction period, and would be small relative to the total population. Most of the non-local construction workforce would likely reside within a 60-mile commuting distance of the area, so there would be very little demand for additional temporary or permanent housing near the site. There would be no impact to the available supply of housing in Aurora, Brule or Jerauld counties. In the event that construction workers hired from outside the 60-mile radius of the standard commuting distance from the site alternative area, there would likely be sufficient capacity in the existing motel rooms in the local counties. Therefore, less than significant impacts are likely to occur from the influx of the construction workforce.

Benefits would also result from wages paid to the construction workforce. There would be beneficial long-term impacts to the counties' tax base for the life of the Proposed Project as a result of the construction and operation of the facilities. Aurora, Brule and Jerauld counties would receive revenues from property taxes, fees and permits. Additional personal income would be generated for residents in the counties and the State of South Dakota by circulation and recirculation of dollars paid out as business expenditures, and as State and local taxes. The most

direct beneficial impact would be the net economic benefit to participating landowners from lease payments, which would provide a supplementary source of income. An increase in Aurora, Brule and Jerauld's county tax base would also provide benefits to all county residents. Indirect economic benefits would accrue to businesses in the area from construction workers purchasing goods and services. There would also be economic benefits for the counties from added taxes paid on real property. Increased tax revenues collected as a result of operation could be utilized to benefit or improve local government or community services.

Western's system modifications at Wessington Springs Substation would similarly be expected to result in beneficial economic impacts. The influx of construction workers to install new electrical equipment would similarly be expected to result in less than significant impacts to housing availability or local services.

4.10.3.2 Winner Alternative

The positive local economic benefits to the Winner Alternative would be similar to those identified for the Crow Lake Alternative. The influx of construction workers for the Proposed Project would similarly be expected to result in less than significant impacts to housing availability or local services.

4.10.3.3 No Action Alternative

Under the No Action Alternative, Western would not approve an interconnection request(s) and RUS would not provide financial assistance for the Proposed Project. For the purpose of impact analysis and comparison in this EIS, it is assumed that the Applicants' Proposed Project (and Wind Partners' proposed development as it pertains to the Crow Lake Alternative) would not be built and the environmental impacts, both positive and negative, associated with construction and operation would not occur. Local landowners would not receive lease payments from the Applicants and could sign leases with another wind power developer. There would be no socioeconomic impacts associated with the No Action Alternative.

4.11 ENVIRONMENTAL JUSTICE

4.11.1 METHODS

The ROI for the Crow Lake Alternative includes the following census tracts: 9731, 9736 and 9746. The ROI for the Winner Alternative includes the following census tracts: 9716 and 9717. **Section 3.11** identifies minority and low-income populations in the site alternative areas pursuant to Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629). This section discusses the potential for impacts to those populations (**Section 3.11**). The environmental justice analysis has been performed in three steps:

- Identify minority and/or low income populations in the ROI (see **Section 3.11**)
- Identify the anticipated impacts from development of the Proposed Project Components and/or the proposed Federal actions
- Determine if the anticipated activity impacts would disproportionately impact the minority and/or low-income populations

The analysis protocol for identifying minority or low-income populations follows the guidelines described in the *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). Information on locations and numbers of minority and low-income populations for each census tract within the site alternatives was obtained and derived from 2000 Census data. "Minority" refers to people who classified themselves in the 2000 Census as Black or African American, Asian or Pacific Islander, American Indian or Alaskan Native, Hispanic of any race or origin, or other non-White races (CEQ 1997). Environmental justice guidance defines low-income populations using U.S. Census Bureau statistical poverty thresholds. Information on low-income populations was developed from 1999 incomes reported in the 2000 Census. In 1999, the poverty-weighted average threshold for an individual was $8,501 (U.S. Census 2001).

Analyses of potential impacts from the Proposed Project Components and the proposed Federal actions are provided in **Chapter 4** for each resource including: geology and soils, water resources, air resources, biological resources, cultural resources, land use and recreation, transportation, visual resources, noise, socioeconomics, and health and safety, during the construction, operation and decommissioning phases.

An analysis was performed to determine if the anticipated impacts of the Proposed Project Components and the proposed Federal actions would disproportionately affect minority and low-income populations. The basis for making this determination was a comparison of locations predicted to experience human health or environmental impacts with any areas in the ROI known to contain high percentages of minority or low-income populations, as reported by the U.S. Census Bureau and defined by the CEQ. Impacts on minority or low-income populations that could result from the proposed activities were analyzed for the geographic areas in which the site alternatives would be located. Impacts were analyzed within the census tracts containing the alternative sites to determine if minority or low-income populations would have disproportionately high and adverse impacts.

Environmental justice impacts are also analyzed for issues that are unique to and involve Native Americans, in particular, to cultural resource issues. Input from tribal representatives would determine if adverse impacts are likely to occur to cultural resources of importance to the tribes. Potential impacts of the proposed activities related to Native American cultural resources could occur not only to individual resources, but also to the traditional, sacred and historic landscape of the site alternative areas. Impacts to the cultural landscape and individual resources could have an adverse impact on the role of the landscape in tribal traditions and the use of the landscape by tribal members.

The following definitions are excerpted from Executive Order 12898:

Disproportionately high and adverse human health effects: When determining whether human health effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable:

(a) Whether the health effects, which may be measured in risks and rates, are significant (as employed by NEPA), or above generally accepted norms. Adverse health effects may include bodily impairment, infirmity, illness, or death

(b) Whether the risk or rate of hazard exposure by a minority population, low-income population, or Indian tribe to an environmental hazard is significant (as employed by NEPA) and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group

(c) Whether health effects occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards

Disproportionately high and adverse environmental effects: When determining whether environmental effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable:

(a) Whether there is or would be an impact on the natural or physical environment that significantly (as employed by NEPA) and adversely affects a minority population, low-income population, or Indian tribe. Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment

(b) Whether environmental effects are significant (as employed by NEPA) and are or may be having an adverse impact on minority populations, low income populations, or Indian tribes that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group

(c) Whether the environmental effects occur or would occur in a minority population, low income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards

4.11.2 SIGNIFICANCE CRITERIA

Significance criteria were developed based on Executive Order 12898. A significant impact to environmental justice would occur if:

- An activity would disproportionately affect a minority, Native American, or low income subsistence population
- An activity would result in high and adverse health or environmental impacts, such as impacts from noise, dust or air emissions, displacement of residences, visual effects,

traffic increases or delays, EMF effects, or other effects to a minority, Native American, or low income population

4.11.3 IMPACT ASSESSMENT

4.11.3.1 Crow Lake Alternative

Disproportionately high and significant effects to minority populations are unlikely based on three factors: a lower percentage of minority populations in the Crow Lake Alternative area (approximately one to five percent) compared with South Dakota as a whole (approximately 11 percent), a low population density within the site area, and overall low expected impacts from the construction, operation and decommissioning of the Proposed Project Components. Potential impacts to minority residents, like any other resident, are expected to be less than significant.

As identified in **Table 3.11-1**, income for 13.2 percent of the population of South Dakota is considered below the poverty level, whereas the percentage of the population below the poverty level ranges between approximately 11 to 21 percent in the vicinity of the Crow Lake Alternative. The Proposed Project Components may generate positive economic benefits to the local economy, including opportunities for lease agreements, employment and earning potential for local individuals. Overall the Crow Lake Alternative is expected to result in low environmental impacts; therefore, the impacts to low-income populations would be less than significant.

Development of the Western system modifications at Wessington Spring Substation would similarly not be expected to disproportionately affect a minority, Native American, or low income subsistence population.

4.11.3.2 Winner Alternative

Year 2000 demographic information from the U.S. Census Bureau characterizes the population in the vicinity of the Winner Alternative as approximately 84 percent White and 15 percent American Indian and Alaskan Natives. The Winner Alternative would be located in an area with a higher percentage of minority population compared to the Crow Lake Alternative; however, disproportionately high and significant effects to minority populations are unlikely given the low population density within the site area, and overall low expected impacts from constructing, operating and decommissioning the Proposed Project Components. Potential impacts to minority residents, like any other resident, are expected to be less than significant.

Income for 13.2 percent of the population of South Dakota is considered below the poverty level, whereas the percentage of the population below the poverty level ranges between approximately 19 to 21 percent in the vicinity of the Winner Alternative. The Proposed Project Components may generate positive economic benefits to the local economy, including opportunities for lease agreements, employment, and earning potential for local individuals; therefore, the impacts to low-income populations would be less than significant.

Developing Western's system modifications at Winner Substation would not be expected to disproportionately affect a minority, Native American, or low income subsistence population.

4.11.3.3 No Action Alternative

Under the No Action Alternative, Western would not approve an interconnection request(s) and RUS would not provide financial assistance for the Proposed Project. For the purpose of impact analysis and comparison in this EIS, it is assumed that the Applicants' Proposed Project (and Wind Partners' proposed development as it pertains to the Crow Lake Alternative) would not be built and the environmental impacts, both positive and negative, associated with construction and operation would not occur. There would be no environmental justice impacts associated with the No Action Alternative.

4.12 HUMAN HEALTH AND SAFETY

4.12.1 METHODS

The ROI for health and safety includes areas of immediate disturbance associated with the Proposed Project Components and proposed Federal actions. The ROI associated with the proposed transmission line includes the area within the right-of-way. The assessment to human health and safety has been undertaken with the assistance of the previous compilations of technical memoranda (Terracon 2009a and 2009b) and the *Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM Administered Lands in the Western United States* (BLM 2005).

4.12.2 SIGNIFICANCE CRITERIA

A significant impact to human health and safety would occur if:

- An activity would result in a substantial increase in health and safety risks to area residents and the general public
- An activity would create potential impacts to public health as a result of increased electric and magnetic fields and electrocution hazards
- An activity would violate any local, State, or Federal regulations regarding handling, transport, or containment of hazardous materials

4.12.3 IMPACT ASSESSMENT

The *Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM Administered Lands in the Western United States* (BLM 2005) evaluates the potential health and safety impacts for a typical wind generation project. A summary of the Programmatic EIS is provided herein.

Solid Waste and Hazardous Materials

Types of hazardous materials that may be used in the construction, operation and decommissioning phases of the proposed activities may include: fuels (*e.g.,* gasoline, diesel), lubricants, cleaning solvents, paints, pesticides and explosives. **Table 4.12-1** lists these hazardous materials associated with a typical wind energy project, their use and typical quantities that may be anticipated in each phase. Handling and disposal of these items fall under Federal, State, and local laws and regulations.

Construction Activities

Minimal solid waste is expected to be generated during construction of the Proposed Project Components. Shipping and packing materials and ground clearing are expected to be the most likely activities generating solid wastes. Solid wastes generated from construction activities would be stored in closed containers in accordance with regulatory requirements. The Applicants and Western would adhere to their BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**), and all construction waste including trash and litter, garbage, other solid waste, petroleum products and other potentially hazardous materials would be removed to a disposal facility authorized to accept such materials.

To minimize impacts from potential leaks of hazardous materials or industrial wastes during on-site storage, materials storage and dispensing areas (*e.g.*, fueling stations for off-road construction equipment), as well as waste storage areas, would be equipped with secondary containment features.

Small amounts of hazardous waste may be generated during construction of the Proposed Project Components (**Table 4.12-1**). All petroleum fluids would be contained within the wind turbines and electrical equipment. The Applicants and Western would adhere to their BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**) regarding petroleum hazardous waste and material would be handled and disposed of in accordance with all applicable Federal, State and local laws and regulations. To further minimize risks and ensure timely response to accidental leaks or spills, spills would be immediately reported to construction inspectors so that cleanup activities could be implemented.

Operation

There would be only small volumes of solid waste produced during operation of the Proposed Project Components. Unlike traditional power generation facilities, wind farms do not produce solid waste products as a direct result of energy conversion. Typically, the facility would be maintained by personnel who would generate approximately 0.5 to 1.0 cubic yards/month/personnel of recyclable waste and 1.0 to 2.0 cubic yards/month/personnel of non-recyclable waste.

Table 4.12-1 Hazardous and Regulated Materials Associated with a Typical Wind Energy Project

Hazardous and Regulated Material	Uses	Typical Quantities Present
Fuel: diesel fuel[a]	Powers most construction and transportation equipment during construction and decommissioning phases.	Less than 1,000 gallons (gal); stored in aboveground tanks during construction and decommissioning phases.[b]
	Powers emergency generator during operational phase.	Less than 100 gal; stored in aboveground tank to support emergency power generator throughout the operation phase.
Fuel: gasoline[c]	May be used to power some construction or transportation equipment.	Because of the expected limited number of construction and transportation vehicles utilizing gasoline, no on-site storage is likely to occur throughout any phase of the life cycle of the wind energy.
Fuel: propane[d]	Most probable fuel for ambient heating of control building.	Typically 500 to 1,000 gal; stored in aboveground propane storage vessel.
Lubricating oils/ grease/ hydraulic fluids/ gear oils	Lubricating oil is present in some wind turbine components and in the diesel engine of the emergency power generator.	Limited quantities stored in portable containers (capacity of 55 gal or less); maintained on-site during construction and decommissioning phases.
	Maintenance of fluid levels in construction and transportation equipment is needed.	Limited quantities stored in portable containers (capacity of 55 gal or less); stored on-site during operational phase.
	Hydraulic fluid is used in the rotor driveshaft braking system and other controls. Gear oil and/or grease are used in the drive train transmission and motor gears.	Limited quantities stored in portable containers (capacity of 55 gal or less); stored on-site during operational phase.
Glycol-based antifreeze	Present in some wind turbine components for cooling (*e.g.*, 5 to 10 gal [19 to 38 L] present in re-circulating cooling system for the transmission). Present in the cooling system of the diesel engine for the emergency power generator.	Limited quantities (10 to 20 gal of concentrate) stored on-site during construction and decommissioning phases. Limited quantities (1 to 10 gal of concentrate) stored on-site during operational phase.
Lead-acid storage batteries and electrolyte solution	Present in construction and transportation equipment. Backup power source for control equipment, tower lighting and signal transmitters.	Limited quantities of electrolyte solution (< 20 gal) for maintenance of construction and transportation equipment during construction and decommissioning phases. Limited quantities of electrolyte solution (< 10 gal) for maintenance of control equipment during operational phase.
Other batteries (*e.g.*, nickel-cadmium [NI-CAD] batteries)	Present in some control equipment and signal transmitting equipment. No maintenance of such batteries is expected to take place on-site.	

Hazardous and Regulated Material	Uses	Typical Quantities Present
Cleaning solvents	Organic solvents (most probably petroleum-based but not Resource Conservation and Recovery Act listed) used for equipment cleaning and maintenance. Where feasible, water-based cleaning and degreasing solvents may be used.	Limited quantities (< 55 gal) on-site during construction and decommissioning to maintain construction and transportation equipment. Limited quantities (< 10 gal) on-site during operational phase to maintain equipment.
Paints and coatings[e]	Used for corrosion control on all exterior surfaces of turbines and towers. Limited quantities (< 50 gal [189 L]) for touch-up painting during construction phase.	Limited quantities (< 20 gal) for maintenance during operational phase.
Dielectric fluids[f]	Present in electrical transformers, bushings and other electric power management devices as an electrical insulator.	Some transformers may contain more than 500 gal of dielectric solutions.
Explosives	May be necessary for excavation of tower foundations in bedrock. May be necessary for construction of access and/or on-site roads or for grade alterations on-site.	Limited quantities equal only the amount necessary to complete the task. On-site storage expected to occur only for limited periods of time as needed by specific excavation and construction activities.
Pesticides	May be used to control vegetation around facilities for fire safety.	Pesticides would likely be brought to the site and applied by a licensed applicator as necessary.

Source: BLM 2005

[a] It is assumed that commercial vendors would replenish diesel fuel stored on-site as necessary.

[b] This value represents the total on-site storage capacity, not the total amounts of fuel consumed. See footnote a. On-site fuel storage during construction and decommissioning phases would likely be in aboveground storage tanks with a capacity of 500 to 1,000 gal. Tanks may be of double-wall construction or may be placed within temporary, lined earthen berms for spill containment and control. At the end of construction and decommissioning phases, any excess fuel as well as the storage tanks would be removed from the site, and any surface contamination resulting from fuel handling operations would be remediated. Alternatively, rather than store diesel fuel on-site, the off-road diesel-powered construction equipment could be fueled directly from a fuel transport truck.

[c] Gasoline fuel is expected to be used exclusively by on-road vehicles (primarily automobiles and pickup trucks). These vehicles are expected to be refueled at existing off-site refueling facilities.

[d] Delivered and replenished as necessary by a commercial vendor.

[e] It is presumed that all wind turbine components, nacelles, and support towers would be painted at their respective points of manufacture. Consequently, no wholesale painting would occur on-site. Only limited amounts would be used for touch-up purposes during construction and maintenance phases. It is further assumed that the coatings applied by the manufacturers during fabrication would be sufficiently durable to last throughout the operational period of the equipment and that no wholesale repainting would occur.

[f] It is assumed that transformers, bushings and other electrical devices that rely on dielectric fluids would have those fluids added during fabrication. However, very large transformers may be shipped empty and have their dielectric fluids added (by the manufacturer's representative) after installation. It is further assumed that servicing of electrical devices that involves wholesale removal and replacement of dielectric fluids would not likely occur on-site and that equipment requiring such servicing would be removed from the site and replaced. New transformers, bushings or electrical devices are expected to contain mineral-oil-based or synthetic dielectric fluids that are free of polychlorinated biphenyls; some equipment may instead contain gaseous dielectric agents (*e.g.*, sulfur hexafluoride) rather than liquid dielectric fluids.

Small amounts of hazardous waste may be generated due to typical maintenance activities during operation of the Proposed Project Components (**Table 4.12-1**). Hazardous wastes would be handled and disposed in accordance with all applicable Federal, State and local laws and regulations, and the BMPs and APMs (**Chapter 2, Tables 2.2** and **2.3**).

Decommissioning

At the end of the wind farm life cycle, large amounts of solid wastes would result from dismantling the Proposed Project Components. Recycling Proposed Project Components, where feasible, would be a priority, and the remaining materials would be placed in an appropriate waste disposal facility. Possible components that may be recycled include tower segments, electrical transformers and concrete foundations.

Waste Collection

Waste receptacle bins for both solid and hazardous waste would be provided during both construction, operation and decommissioning for the Proposed Project Components. The amount of waste generated should be minimal. Recycling of materials would occur when feasible.

The solid waste resulting from construction and decommissioning would be transported by a commercial trash company and disposed of in a designated landfill. “Roll-offs” may be available at multiple locations for disposal construction debris. Mixed-material waste would be transported to a transfer station, waste disposal facility, or commercial recycling facility.

Occupational Hazards

The types of activities that typically occur during construction, operation and decommissioning of a wind energy development project include a variety of major actions, such as establishing site access; excavating and installing tower foundations; tower assembly; constructing the central control building, electrical substation, meteorological towers and access roads; and routine maintenance of the turbines and ancillary facilities. Construction and operations workers at any facility are subject to risks of injuries and fatalities from physical hazards. While such occupational hazards can be minimized when workers adhere to safety standards and use appropriate protective equipment, fatalities and injuries from on-the-job accidents can still occur. Occupational health and safety are protected through the Federal Occupational Safety and Health Administration (OSHA) (29 U.S. Code 651, *et seq*.) and State laws.

An operator’s instruction manual would be prepared in conformance with the International Electrotechnical Commission (IEC) minimum safety requirements for wind turbine generators (IEC 1999), with supplemental information on special local conditions. The manual would include system safe operating limits and descriptions, start-up and shutdown procedures, alarm response actions and an emergency procedures plan. The emergency procedures plan would identify probable emergency situations and the actions required of operating personnel. The emergency procedures plan may address over-speeding, icing conditions, lightning storms,

earthquakes, broken or loose guy wires, brake failure, rotor imbalance, loose fasteners, lubrication defects, sandstorms, fires, floods and other component failures.

Chemical exposures during construction and operation of a typical wind energy project are expected to be routine and minimal, and reduced by using personal protective equipment and/or engineering controls to comply with OSHA permissible exposure limits applicable for construction activities.

Public Safety and Site Security

The Programmatic EIS (BLM 2005) identifies a rotor blade breaking and parts being thrown as one of the primary safety hazards of wind turbines. This type of occurrence is anticipated to be extremely rare, particularly with today's generation of turbines. The probability of a fragment hitting a person is even lower. The related issue of ice throw can occur if ice builds up on the turbine blades. As a design characteristic, wind turbines would be set back at least 1,000 feet from occupied residences.

Unauthorized or illegal access to site facilities and the potential for members of the public to attempt to climb towers, open electrical panels, or encounter other hazards is another concern. This section also evaluates the potential for sabotage and terrorism-related impacts (also referred to as Intentional Destructive Acts).

Security measures would be taken during construction and operation, including temporary and permanent (safety) fencing at the substation, warning signs and locks on equipment and wind power facilities. Also, turbines would sit on solid-steel-enclosed tubular towers in which all electrical equipment would be located, except for the pad-mounted transformer. Access to the turbines would only be through a solid steel door that would be locked when not in use. These measures would also act to reduce potential sabotage and terrorism-related impacts. Western and RUS believe that the Proposed Project Components presents an unlikely target for an act of terrorism, with an extremely low probability of attack. The potential for the Proposed Project Components to be targeted in terrorism-related activity would be negligible. All authorized personnel would be issued specific access entry codes/keys to regulate entry into the facilities, including substation and O&M building areas. These measures would limit access and deter intruders.

Electric and Magnetic Fields

EMF is composed of both electric and magnetic fields. Electric fields are produced by voltage (or electric charges). Electric fields increase in strength as the voltage increases and are measured in units of volts per meter (V/m). Magnetic fields result from the flow of load current in transmission line conductors or any electrical device. The magnetic field also increases in strength as the current increases and is measure in units of Gauss (G) or Tesla (T). The Gauss is the unit most commonly used in the United States and the Tesla is the internationally accepted scientific term; 1 T is equivalent to 10,000 G. Since a Gauss or Tesla are both very large fields and the majority of magnetic field exposure are substantially lower, values typically reported and measured are in milligauss (mG) (1/1,000 of a Gauss) and microtesla (μT) (1/1,000,000 of a

Tesla, equivalent to 10 mG). Both the electric and magnetic field decrease rapidly, or attenuate, with distance from the source. Electric field induction effects are not generally associated with 230 kV transmission lines.

Exposures to extremely low-frequency EMF from natural and anthropogenic sources are ubiquitous. However, concerns about potential adverse health effects from residential and occupational exposures have been explored. Over the past 25 to 30 years, hundreds of studies have been performed to examine whether power-frequency (60-Hertz [Hz]) electric and magnetic fields pose a potential human health risk. The majority of the scientific studies have been conducted in the following research fields: epidemiology, laboratory cellular research and animal studies. In the U.S. and internationally, expert scientists from a variety of disciplines were assembled to review this very large body of research material and to assess the potential health risk. Major reviews of the existing research have concluded that the current body of scientific evidence does not show that exposure to power-frequency 60-Hz electric and magnetic fields represent a human health hazard.

EMF would be present in the vicinity of overhead power lines and the electric substation. While there is the potential for any generator to produce EMF, the 60-Hz frequencies are thought to be too low to damage human tissue, and EMF would diminish to background levels near the edge of the transmission line right-of-way.

Aviation Operations and Electromagnetic Interference

The Programmatic EIS (BLM 2005) considered two primary aviation safety considerations, including (1) the physical obstruction of the tower itself, and (2) the effects on communications, navigation, and surveillance systems, such as radar. The potential vertical obstruction of the wind turbine, like any tall structure, could pose a hazard to aircraft arriving or departing at a nearby airfield. See **Sections 3.7** and **4.7** for additional description of the proximities to local airports.

Moving wind turbine blades interfere with radar by essentially creating radar echoes, however radar installations can be modified to eliminate this potential problem. Interference with other electromagnetic transmissions can occur when a large wind turbine is placed between a radio, television, or microwave transmitter and receiver, including potential disruptions of public safety communication systems.

Low-Frequency Sound

In addition to more audible noise as discussed in **Section 4.9**, wind turbines are capable of generating low-frequency sound waves. Low-frequency sound may be perceived audibly as well as a vibration. Research suggests that low-frequency sound is disturbing, irritating and even tormenting to some people. Insomnia, headaches and heart palpitations have also been reported as secondary effects.

Infrasound and low-frequency noise are ubiquitous, since they are generated from natural sources (*e.g.*, earthquakes, wind) and anthropogenic sources (*e.g.*, automobiles, industrial

machinery, household appliances) and are common in urban environments. The primary effect appears to be annoyance, and has not been proven to result in adverse health impacts.

Shadow Flicker

As discussed in the Programmatic EIS (BLM 2005), shadow flicker refers to the phenomenon that occurs when the moving blades of wind turbines cast moving shadows that cause a flickering effect. While the flickering effect may be considered an annoyance, there is also concern that the variations in light frequencies may trigger epileptic seizures in the susceptible population. However, the rate at which modern three-bladed wind turbines rotate generates blade-passing frequencies of less than 1.75-Hz, below the threshold frequency of 2.5-Hz, indicating that seizures should not be an issue.

Wastewater

Especially during the construction and decommissioning phases, and, to a lesser extent, during the operational phase, sanitary wastewater is generated by the work crews or maintenance personnel present on-site. During the construction and decommissioning phases, work crews of 50 to 300 individuals may be present. During the operational phase, a maintenance crew of 10 to 12 individuals is likely to be present on the site daily during business hours. Wastewater would be collected in portable facilities and periodically removed by a licensed hauler and introduced into existing municipal sewage treatment facilities. A septic tank and drainage field would likely be included at the O&M building.

Storm Water and Excavation Water

Except in those instances of spills or accidental releases, storm water runoff and excavation waters from the site alternatives are not expected to have industrial contamination but may contain sediment from disturbed land surfaces.

4.12.3.1 Crow Lake Alternative

The health and safety risks to area residents and the general public for the Crow Lake Alternative would be restricted to short periods during construction, operation and decommissioning at small, individual sites. The included BMPs and APMs (as listed in **Chapter 2, Tables 2.2** and **2.3**) would be employed during all ground disturbing activities. Due to the low voltage at which turbines and overhead and underground collector lines operate, and the setback distances from roads and residences, the potential impacts associated with EMF would be minimal. Magnetic field exposure from the facilities would be minimal in close proximity, and both electric and magnetic fields would dissipate from the facility corridors. Further, the development of the Proposed Project Components would comply with applicable local, State and Federal regulations regarding handling, transport or containment of hazardous materials. For these reasons, impacts to human health and safety would be less than significant.

Western's Wessington Springs Substation is fenced and specific access is limited to authorized personnel. Western maintains a security plan for the facility and any intrusions would be

addressed by Western's security personnel and/or law enforcement personnel. The Wessington Springs Substation would be operated in accordance with Western's safety requirements; wastewater would be collected in portable facilities. Stormwater would be directed away from the site in accordance with the SWPPP, and BMPs and APMs (as listed in **Chapter 2, Tables 2.2** and **2.3**) would be employed. Impacts to human health and safety would be less than significant.

4.12.3.2 Winner Alternative

Impacts of the Winner Alternative would be similar to those identified for the Crow Lake Alternative. With the included BMPs and APMs (as listed in **Chapter 2, Tables 2.2** and **2.3**), impacts to health and safety would be less than significant.

Western's system modifications proposed for the Winner Substation would result in less than significant impacts, similar to the Wessington Springs Substation proposed for the Crow Lake Alternative.

4.12.3.3 No Action Alternative

Under the No Action Alternative, Western would not approve an interconnection request(s) and RUS would not provide financial assistance for the Proposed Project. For the purpose of impact analysis and comparison in this EIS, it is assumed that the Applicants' Proposed Project (and Wind Partners' proposed development as it pertains to the Crow Lake Alternative) would not be built and the environmental impacts, both positive and negative, associated with construction and operation would not occur. There would be no human health and safety impacts associated with the No Action Alternative.

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