Wray Wind Energy Project Environmental Assessment For Pre-Approval Review DOE/EA - 1884

Yuma County, Colorado

U. S. Department of Energy
Western Area Power Administration

February 2012

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1.0 Introduction

1.1 Background

Invenergy, LLC submitted an interconnection request to the U.S. Department of Energy (DOE), Western Area Power Administration (Western) to interconnect the proposed Wray Wind Energy Project (Proposed Project) to the existing Wray 115- kilovolt (kV) transmission line. The Proposed Project includes up to 56 wind turbines with a total project output capacity of up to 90 megawatts (MW). The Proposed Project is located northeast of the town of Wray, in Yuma County, Colorado.

The National Environmental Policy Act of 1969 (NEPA) and Council on Environmental Quality (CEQ) implementing regulations (40 CFR 1500-1508) establish procedures that ensure environmental information is available to decision makers, regulatory agencies, and the public before federal actions are implemented. Western is the lead federal agency for compliance for the NEPA. The DOE NEPA Implementing Procedures (10 CFR 1021) require that an Environmental Assessment (EA) be prepared for contracts for the addition of new generation resources of 50 average megawatts or less, such as the proposed Wray Wind Energy Project. Based on the wind regime at the site, the average daily MW output for the Proposed Project would be less than 50 MW. This EA identifies and analyzes the consequences of Western's Proposed Action and Invenergy's Wray Wind Energy Project on the human and natural environment and suggests mitigation strategies for potential adverse impacts. Throughout this EA the term "Proposed Project" means Invenergy's Wray Wind Energy Project.

1.2 Purpose and Need

Invenergy is the proponent of the Wray Wind Energy Project. The proponent's purpose and need for the Proposed Project is described in this section. Federal agencies needs for the action and a summary of the federal environmental process are also discussed.

1.2.1 Invenergy's Purpose and Need

Invenergy proposes to construct a 90-megawatt wind energy project and interconnect the project to the Western transmission system. The primary purpose of the Wray Wind Energy Project is to provide wind-generated electricity to an electric utility in Colorado by 2020 to help meet the 30% renewable energy standard enacted by the State Legislature in 2010. The Wray Wind Energy Project would also create local jobs, increase tax revenue, and generate economic development. In addition, fossil fuel emissions would be reduced, and the clean energy generated would help provide system reliability to the regional electric grid.

Invenergy needs Western to approve the interconnection request in order to transmit the output onto the regional grid.

1.2.2 Western's Purpose and Need

The proponent requests to interconnect its Proposed Project with Western's Wray Substation. Western's purpose and need is to approve or deny the interconnection request in accordance with its Open Access Transmission Service Tariff (Tariff) and the Federal Power Act, as amended (FPA).

Under the Tariff, Western offers capacity on its transmission system to deliver electricity when capacity is available. The Tariff also contains terms for processing requests for the interconnection of generation facilities to Western's transmission system. The Tariff substantially conforms to Federal Energy Regulatory Commission (FERC) final orders that provide for non-discriminatory transmission system access. Western originally filed its Tariff with FERC on December 31, 1997, pursuant to FERC Order

Nos. 888 and 889. Responding to FERC Order No. 2003, Western submitted revisions regarding certain Tariff terms and included Large Generator Interconnection Procedures (LGIP) and a Large Generator Interconnection Agreement (LGIA) in January 2005. In response to FERC Order No. 2006, Western submitted additional term revisions and incorporated Small Generator Interconnection Procedures (SGIP) and a Small Generator Interconnection Agreement (SGIA) in March 2007. In September 2009, Western submitted yet another set of revisions to address FERC Order No. 890 requirements along with revisions to existing terms.

In reviewing interconnection requests, Western must ensure that existing reliability and service is not degraded. Western's LGIP provides for transmission and system studies to ensure that system reliability and service to existing customers are not adversely affected by new interconnections. These studies also identify system upgrades or additions necessary to accommodate the Proposed Project and address whether the upgrades/additions are within the project scope.

Authority: Western must consider interconnection requests to its transmission system in accordance with its Tariff and the FPA. Western satisfies FPA requirements to provide transmission service on a non-discriminatory basis through compliance with its Tariff. Under the FPA, FERC has the authority to order Western to allow an interconnection and to require Western to provide transmission service at rates it charges itself and under terms and conditions comparable to those it provides itself.

1.3 Federal Environmental Process and Decisions to be Made

In order for Western to approve the interconnection request by Invenergy, potential environmental impacts from the project must be evaluated, and the public is provided the opportunity to participate and comment as directed by the National Environmental Policy Act (NEPA). The preparation of this EA to study the potential environmental impacts involves the following tasks:

- Identify issues;
- Conduct public informational meeting;
- Coordinate with other agencies and Tribes;
- Conduct biological, cultural, visual, and other environmental analyses;
- Analyze impacts and identify mitigation measures;
- Prepare draft EA document;
- Document results and public preview (public review EA for 30-day period); and
- If appropriate, issue "Finding of No Significant Impact" or FONSI.

This EA is prepared under NEPA to provide sufficient evidence and analysis to determine whether a proposed project would require preparation of an environmental impact statement or a FONSI.

If Western determines that a FONSI is appropriate, they would decide whether to proceed with the interconnection request from Invenergy. Invenergy would choose between the alternative substation locations, turbine locations, and would implement the various measures to mitigate construction and operational impacts.

1.4 Public Participation

Potential issues were identified for evaluation through agency coordination and a public informational meeting held in Wray, Colorado on May 11, 2011. These issues include the following:

- Impacts on wildlife and plants and threatened, endangered, sensitive, and other species of concern;
- Construction standards for wind project;
- Land use;

- Visual impacts;
- Cultural resources;
- Water resources;
- Air quality impacts;
- Noise; and
- Socio-economics.

During the public participation period 28 people attended the public meeting. In addition, the public was invited to comment on the project via email or written correspondence. No additional comments were received in the 30 day period following the public meeting.

1.5 Other Authorizations

Other federal, state, and local agencies that have jurisdiction over facets of the Proposed Project include:

Table 1.5-1 Federal, State, and Local Agencies with Jurisdiction

Statutory, Regulatory or Permit Requirements	**Responsible Agency**
National Environmental Policy Act	Western Area Power Administration (Western) *Lead Agency*
Clean Water Act (CWA), Storm Water Management Plan (SWMP), National Pollutant Discharge Elimination System (NPDES)	Western, its contractors and others undertaking covered construction projects, Colorado Department of Public Health and Environment (CDPHE)
Clean Water Act, Section 401, 404	U.S. Army Corps of Engineers (USACE)
Easement grants and road crossing permits	Private land owners, Colorado State Land Board, Yuma County Planning Department, Colorado Department of Transportation, Yuma County Road and Bridge
Review and approval of weed control plans	County Weed Control Boards (Yuma County, CO)
National Historic Preservation Act	Western, CO Historic Preservation Office
Compliance with Floodplain and Wetlands Environmental Review Requirements (10 CFR 1022)	Western
Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act	Western, U.S. Fish and Wildlife Service (USFWS), Colorado Division of Wildlife (CDOW)
Clean Air Act (CAA) (National Ambient Air Quality Standards)	Western, CDPHE
Environmental Justice	Western

Agency correspondence regarding the Proposed Project is provided in Appendix A.

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2.0 Description of Proposed Project and Alternatives

2.1 Description of the Proposed Project

2.1.1 Western's Proposed Action

Western's Proposed Action is to approve or disapprove Invenergy's Wray Wind Energy Project (Proposed Project) interconnection request (2008-G9). The description of the proposed Wray Wind Energy Project in the following sections describes each of the project features and includes standard mitigation actions to reduce environmental impacts. If the interconnection request is approved and the project proceeds, Western would own and operate and maintain a new three breaker ring bus at the point of interconnection at a new switchyard located north and west of Western's existing Wray Substation. Due to space constraints at the existing Wray Substation, the new switchyard is required. Western's new facilities and their impacts are described below along with Invenergy's project facilities and impacts.

2.2 Overview of the Proposed Project

The Proposed Project would include up to 56 General Electric (GE) 1.6 MW, or comparable wind turbines, with a total project output capacity of up to 90 MW. Based on the wind regime at the site, the average daily MW output (i.e., Net Capacity Factor) would be less than 50 MW. The GE 1.6MW wind turbine is a monopole tower design with a hub height between 80 meters (260 feet) and 100 meters (330 feet), and a rotor diameter of up to 100 meters (330 feet). Its total maximum blade tip height is up to 150 meters (490 feet) depending on specific turbine technology utilized. Figure 2.2-1 shows initial turbine locations, but exact placement of the turbines may nominally change for the final siting. To allow for flexibility of turbine placement, 11 alternate locations are considered and evaluated as part of the Proposed Project.

In addition to the wind turbines, permanent support facilities at the project site would include access roads, a communications and electricity collection system, a collector substation, an operations and maintenance facility, and an overhead transmission line that connects the collector substation to the new Western switchyard. The communications and electricity collection system would include a system of buried cables. Collector cables (34.5 kV) would transmit electricity from each turbine to the collector substation, which would then be stepped-up to 115-kV at the collector substation transformer. Fiber optic collector cables connecting to each turbine would provide operational data for the facility. Adjacent to the collector substation (Figure 2.2-1), a metal warehouse/garage-type operations and maintenance (O&M) building would be constructed to house the technical staff and the information technology infrastructure necessary to operate the wind facility.

From the 115-kV step-up transformer at the collector substation, a new project-owned approximate 9.5 mile overhead 115-kV transmission line would carry the electricity to the new Western switchyard (Figure 2.2-1). A short double-circuit 115-kV transmission line owned by Western would connect the new switchyard to Western's existing transmission network.

Equipment laydown yards and a concrete batch plant would be located on site during the construction phase, but would not be needed during the operation of the facility. The laydown yards would be used for equipment storage, staging, and a temporary on-site office.

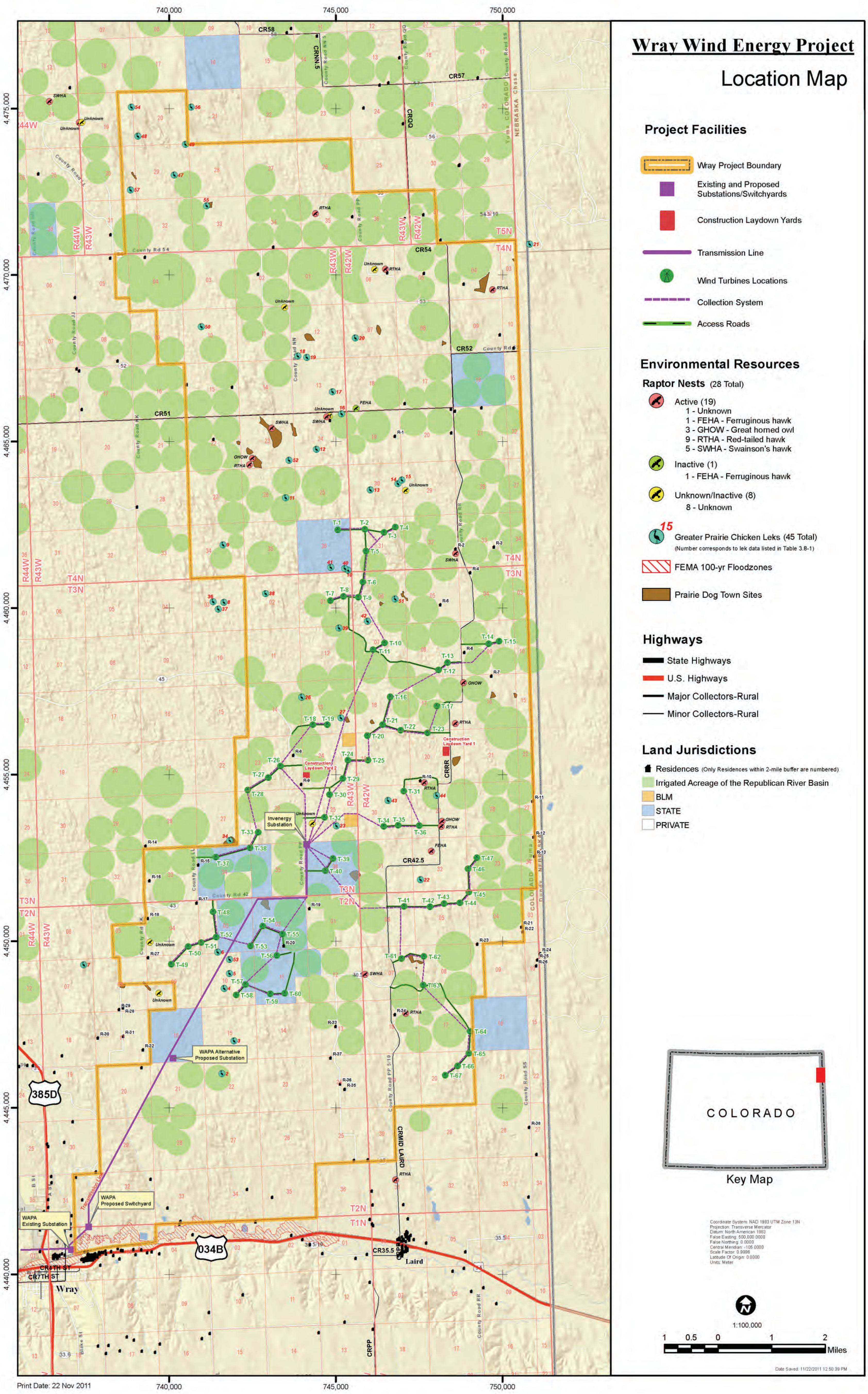
The total estimated temporary disturbed area during construction would be approximately 432 acres. The project footprint (area of permanent disturbance) after construction would be limited to the areas immediately adjacent to turbines, access roads, and other above ground facilities (Table 2.2-1) and is expected to be approximately 65 acres.

Table 2.2-1 Estimated Surface Disturbance

Disturbance Type	Temporary Disturbance 56-Turbine Project (acres)	Permanent Disturbance 56-Turbine Project (acres)
Turbine assembly areas/pads[1]	155	10
Existing roads to be upgraded[2]	8	0
New access roads to be constructed[3]	116	47
Batch Plant & Laydown Yard[4]	15	0
Collection system[5]	57	0
Overhead transmission line[6]	72	1
Switchyard, Substation, and O&M building[7]	9	7
Total	**432**	**65**

1 Assumes a 196-ft. radius laydown area centered on each turbine location during construction and a permanently maintained 100-ft. diameter area.
2 Assumes 8-mi of existing roads to be upgraded, 24 ft. wide (16 ft. existing width and an additional 8 feet upgrade) during construction, reclaimed to original 16 ft. width for the life-of-project.
3 Assumes 24-mi of new access roads to be constructed, 40 ft. wide during construction, reclaimed to 16 ft. wide for the life-of-project.
4 The laydown yard (staging area) and concrete batch plant location would be completely reclaimed.
5 Assumes 33.5-mi of collection system trenches, with disturbance up to 14 ft. wide during construction, completely reclaimed for the life-of-project.
6 Assumes 9.5-mi of overhead transmission line, with construction disturbance of an estimated 100 structures with 100 ft. radius (or 0.72 acre disturbance per structure location). Permanent disturbance for each structure is 3 ft. x 3 ft.
7 Assumes 4 acres for Western’s switchyard, 2.5 acres for the Invenergy substation, and 2.5 acres for the Invenergy O&M building. Portions of property to be reclaimed post-construction.

Figure 2.2-1 Location Map



2.2.1 Construction

The specific requirements of construction are site dependent. Construction of the project would involve the following major actions:

- Site access, clearing and grade alterations;
- Foundation excavations and installations;
- Tower erection and nacelle and rotor installation;
- Collection system, collector substation, padmount transformers, and operation and maintenance (O&M) building; and Western switchyard;
- Transmission line;
- Final road grading, erosion control, and site restoration; and
- Final testing.

2.2.1.1 Site Access, Clearing and Grade Alterations

An estimated eight miles of existing roads would be upgraded, as necessary, and 24 miles of new access roads would be constructed in accordance with landowner easement agreements, county regulations, and industry standards for wind farm roads (Figure 2.2-1 and Table 2.2-1). Roads would be constructed to withstand the expected weights of the trucks transporting turbine components and the construction and lifting equipment that would be used during construction. Roads would be located to minimize disturbance and maximize transportation efficiency and to avoid sensitive resources and steep topography, wherever possible.

Roads would be built and maintained to provide safe operating conditions at all times. Access roads would be 16 feet wide during the operations phase. During construction, primary component haul roads would typically be 24 feet wide and turbine/crane access roads would typically be 40 feet wide, providing the 35 feet needed for movement of the large crane and additional clearance area for crane operation and drainage features. (Table 2.2-1 and Figure 2.2-1). Disturbance width typically increases in steeper areas due to cuts and fills necessary to construct and stabilize roads on slopes.

Disturbed areas not required for operation of the facility would be reclaimed in accordance with landowner agreements. Approximately 80% of the areas disturbed for turbine assembly and site access would be reclaimed upon completion of construction.

During construction of the wind project, traffic on the project site would be restricted to the roads developed for the project. Signs would be placed along the roads, as necessary, to identify speed limits, travel restrictions, and other traffic control information.

2.2.1.2 Foundation Excavations and Installations

A preliminary geotechnical investigation was performed by Terracon at five boring locations to obtain a general understanding of the site (Williams 2011). Recommendations indicated that spread footer gravity foundations would be suitable for the project, but in some instances over excavation might be required. Over excavation would entail additional excavation by a backhoe and the placement of engineered aggregate material below and around the concrete foundation for additional support and drainage. The subsurface conditions varied across the project site, and ground water was not encountered during the geotechnical investigation.

Once the foundation areas have been excavated by the backhoe, forms and rebar cages with anchor bolts would be installed and concrete poured. The turbine towers are connected by anchor bolts to the underground concrete and rebar foundation. Additional geotechnical surveys completed at each turbine location and turbine tower load specifications would dictate final design parameters of the foundations. A spread footer, which is the typical gravity foundation design, has a similar footprint to the tower diameter at grade (17 feet), but spreads out four feet below ground to an octagon approximately 50 feet in diameter. The foundations would extend approximately eight feet below ground. It is anticipated that approximately 2.7 acres would be disturbed (Table 2.2-1) at each turbine location for material and equipment laydown and tower and component assembly.

Once the concrete has cured, the excavation would be backfilled with the excavated materials. While this would utilize much of the volume of the material initially excavated, some excavated material would remain and would be spread over the turbine/assembly pad area.

Throughout the period of foundation installation, precipitation or ground water that accumulates would be managed under the project's Storm Water Management Plan (SWMP) and Western's Standard Construction, Operation and Maintenance Practices.

If a suitable concrete facility is not available locally, then a temporary concrete batch plant would be constructed within the project area. The concrete components (aggregate, sand, and cement) would be hauled to the on-site batch plant from existing private sources. Water for concrete for foundations, would come from off-site existing municipal or other private sources in Wray or Holyoke, Colorado. Electrical power for the batch plant would be provided by a temporary connection to area power lines. The land area required for a batch plant and aggregate material storage areas are typically less than 10 acres. Surface vegetation would be removed; some grading of surface soils may be required. The batch plant and any excess concrete and aggregate would be removed once the concrete foundations have been poured and may be recycled or used on other projects by the construction contractor. The batch plant site would be reclaimed and revegetated in accordance with easement requirements.

Concrete slab foundations for the O&M building as well as pads for each electrical transformer (see 2.2.1.4) would be placed concurrent with tower foundation construction.

2.2.1.3 Tower Erection and Nacelle and Rotor Installation

Turbine tower assembly and erection would occur within the approximate 2.7 acre laydown area at each turbine site. The tubular sections of the turbine tower are made of steel. Tower bottom sections would be lifted with a crane and bolted to the foundation, and then the middle and top sections would be lifted into place and bolted to the section below. The nacelles would contain a pre-assembled drive-train. Once the tower has been erected, the nacelle and then the rotor are hoisted into place using a crane, and then bolted into the top tower section.

2.2.1.4 Collection System, Collector Substation, Padmount Transformers, O&M Building, and Western's Switchyard

Additional construction activities would include the installation of a collection system (communications and electric conducting cables), a collector substation, pad-mounted electric transformers, and an O&M building.

The collection system cables would be connected along turbine strings to the centrally located collector substation (Figure 2.2-1). These underground electrical and communications cables would be placed in 4 feet wide by 4 feet deep trenches usually located along the project access roads. In some cases, trenches would run from the end of one turbine string to the end of an adjacent string to link more turbines together via the underground network. Electric collection and communications cables would be placed in the trench using trucks. Electrical cables would be installed first and the trench partially backfilled prior to placement of the communications cables. Trenches would then be backfilled and the area revegetated concurrently with reclamation of other construction areas.

Conventional construction methods would be used to construct the collector substation. Vegetation would be cleared and graded, and crushed rock or gravel would be placed over the entire area to ensure proper drainage. The collector substation main transformer would be installed on an 11 by 17 foot concrete pad, and the main control building would be installed on a 15 by 33 foot concrete pad within a 2.5-acre parcel of land located within the project (Figure 2.2-1). The collector substation would step-up medium voltage power from the wind project's 34.5-kV collection system electrical circuits to the 115-kV voltage needed to transmit power along the transmission line (Figure 2.2-1). The collector substation would be fenced within a seven foot high chain-link fence topped with three strands of barbed wire, for a total fence height of eight feet. Access gates would be locked at all times and warning signs would be posted for public safety.

For protection, a metal grounding grid or metal net would be installed under the footprint of the substation. The grounding grid or net would also provide for lightning grounding. Each turbine tower would have similar lightning grounding protection. Either ground rods, grounding grids, or, if necessary, grounding wells would be installed for each turbine.

Concrete pads (6 by 6 feet) would be installed adjacent to the base of each turbine for the pad-mount transformers. The transformers would be sealed. Transformer bushings, switches, capacitors, and other dielectric fluid-containing electrical devices at all facilities would be mineral-oil-based dielectric oils with no polychlorinated biphenyls (PCBs).

The project O&M facility would be located on a 2.5-acre parcel of land within the project (see Figure 2.2-1) adjacent to the collector substation. The O&M building would be approximately 60 feet wide by 100 feet long and constructed of metal located on a concrete slab. The O&M building would contain all necessary plumbing and electrical connections needed for typical operation of offices and a maintenance shop. Utilities such as electric service, telephone service, as well as access to water and a septic system, would be required at the O&M facility, and would be supplied locally through the most practical method. Permits for the installation of the septic system and the well(s) would be acquired through the local health department and the Colorado Division of Water Resources. An exempt commercial water well would be installed at the O&M building for minor sanitation and operational purposes for the on-site O&M personnel. Estimated usage would be approximately 375 gallons per day during the O&M phase.

As with the collector substation, conventional construction methods would be used to construct Western's Switchyard. Vegetation would be cleared and graded and crushed rock or gravel would be placed over the entire area to ensure proper drainage. The circuit breakers, control building, and associated electrical equipment would be installed on concrete pads within the graded area on an approximate 5-acre parcel of land located at the southern extent of the project site (Figure 2.2-1). Two potential sites for this switchyard are being evaluated as part of this assessment. Western's Switchyard would loop in and out the existing Western 115-kV transmission line. The switchyard would serve as the point of interconnection for the generator lead line and also have the functions of switching and protection following good utility practice. Western's Switchyard would be fenced with a seven foot high chain-link fence topped with three strands of barbed wire, for a total fence height of eight feet. Access gates would be locked at all times and warning signs would be posted for public safety.

2.2.1.5 Transmission Line

A 115-kV overhead transmission line associated with the project would move power from the project collector substation south to the interconnection with Western's 115-kV transmission system at Western's new three breaker ring bus switchyard.

The transmission line would be approximately 9.5 miles long (Figure 2.2-1) and would be owned and operated by Invenergy. The ROW would be 100 to 120 feet wide with temporary disturbance occurring at each structure location. The line would be routed through previously impacted areas, where practicable, such as cultivated farmland and improved pasture ground. Streams, wetlands, and other natural resources would be spanned. The transmission line would be installed in conformance with Western's standards, the National Electric Safety Code, the American National Standards Institute, and Suggested Practices for Raptor Protection on Power Lines – the State of the Art in 1996 (Avian Power Line Interaction Committee 2006).

Approximately 100 transmission structures would be installed, with an average span between structures of approximately 500 feet. The transmission line would consist of primarily H-frame structures, secured as necessary with guy wires. Pole height would range from 65 to 90 feet. Poles would be set into a drilled hole in the soil or rock and then backfilled with select stone and granular soil fill. Final transmission line design could dictate the use of other similar structure types.

2.2.1.6 Final Road Grading, Erosion Control, and Site Restoration

Once construction is complete, all disturbed areas would be graded to the approximate original contour, and any remaining trash or debris would be properly disposed of off-site. Areas disturbed during construction would be stablized and reclaimed using appropriate revegetation and erosion control measures, including site-specific contouring, reseeding, or other measures agreed to by landowners and designed and implemented in compliance with the project's SWMP. Areas that are disturbed around each turbine during construction would revert to the original land use after construction except for a 50-foot radius area around each turbine location maintained for O&M purposes. Upon the completion of construction and restoration, the existing land use would have negligible impacts from the project.

During final road grading, surface flows would be directed away from cut-and-fill slopes and into ditches that outlet to natural drainages. Invenergy would prepare and implement a SWMP, which would include standard sediment control devices (e.g., silt fences, straw bales, netting, soil stabilizers, check dams) to minimize soil erosion during and after construction. Waste materials would be disposed of at approved and appropriate landfills, as necessary.

2.2.1.7 Final Testing

Testing involves mechanical, electrical, and communications inspections to ensure that all systems are working properly. Performance testing would be conducted by qualified wind power technicians and would include checks of each wind turbine and the Supervisory Control and Data Acquisition (SCADA) system prior to turbine commissioning. Electrical tests of the project (i.e., turbines, transformers, and collection system) and transmission system (i.e., transmission line and substation) would be performed by qualified electricians to ensure that all electrical equipment is operational within industry and manufacturer's tolerances and installed in accordance with design specifications. All installations and inspections would be in compliance with applicable codes and standards, including:

- National Electrical Safety Code (NESC);
- National Electrical Manufacturer's Association (NEMA);
- American Society for Testing and Materials (ASTM);
- Institute for Electrical and Electronic Engineers (IEEE);
- National Electrical Testing Association (NETA);
- American National Standards Institute (ANSI);
- State and Local Codes and Ordinances;
- Insulated Power Cables Engineers Association (IPCEA); and
- Occupational Safety and Health Administration (OSHA).

2.2.2 Public Access and Safety

Public access to private lands is already restricted by landowners and would continue to be restricted in accordance with easement agreements in place. The substations and O&M building would be fenced as required for public safety, but no other fencing is proposed at this time within the project area. The public would continue to have access to portions of the project area via public roads and private roads that are regularly open to the public.

All structures more than 200 feet tall must have aircraft warning lights in accordance with requirements specified by the Federal Aviation Administration (FAA). However, in the case of wind power developments, FAA allows a strategic lighting plan that provides complete visibility to aviators but does not require lighting every turbine. The lights would be installed on the nacelle prior to lifting the nacelle onto the turbine tower. An estimated 25% of the project's turbines would be designated for lighting with medium intensity dual red synchronously flashing lights for nighttime and daytime use, if needed.

The following security measures have been incorporated into the project to reduce the chance of physical and property damage, as well as personal injury, at the site:

- The towers would be placed in accordance with all Yuma County setback requirements, including a minimum of 1,000 feet from all residences and two times the total height from public road rights of way;
- At the turbines, the nacelle would sit on solid steel enclosed tubular towers in which all electrical equipment would be located, except for the padmount transformer. Access to the tower is through a solid steel door that would be locked when not in use by Invenergy personnel; and
- Safety warning signs would be posted around all towers, padmount transformers, and substation facilities in conformance with applicable state and federal regulations.

2.2.3 Operations and Maintenance

Invenergy plans to operate and maintain the wind project for the life-of-project, anticipated to be a minimum of 20 years. All turbines, collection and communications lines, and the substation and transmission line would be operated in a safe manner according to standard industry operation procedures. Routine maintenance of the turbines would be necessary to maximize performance and identify potential problems or maintenance issues. Each turbine would be remotely monitored daily to ensure operations are proceeding efficiently. Any problems would be reported immediately to O&M personnel, who would perform both routine maintenance and most major repairs. In addition, all roads, pads, and trenched areas would be regularly inspected and maintained.

All fuels and/or hazardous materials would be properly stored during transportation and at the project site. All on-site personnel would be instructed in good housekeeping practices in order to keep the job site clean in a sanitary and safe condition. Workers would respect the property rights of private landowners.

2.2.4 Work Force

During the construction of the 90-MW project, 150 to 200 construction jobs would be created and would last approximately six months. Construction crews would likely work 10- to 12-hour work days, six days per week depending on the weather. The project team would consist of qualified contractors and subcontractors who employ trained and competent personnel. All contractors, subcontractors, and their personnel are required to comply with all state and federal worker safety requirements, specifically all of the applicable requirements of the Occupational Safety and Health Administration (OSHA). Each contractor would be required to provide a site specific health and safety plan as required by Part 1910 – Occupational Safety and Health Standards. In addition, due to the multiple employers that would have employees on site, safety would be coordinated on a project-wide basis through activity-specific hazard assessments and Job Safety Assessments (JSAs).

When the project begins operating, 8 to 10 full-time Invenergy personnel would operate and maintain the facility. The operational staff is often hired from the surrounding community.

2.2.5 Traffic

A variety of vehicles and traffic volumes would be necessary to construct and operate the wind farm. Heavy equipment and materials needed for site access, clearing and grading, and foundation construction are typical of road construction projects and would include bulldozers, graders, excavators, front-end loaders, compactors, concrete trucks, and dump trucks. Delivery of erection cranes and wind turbine generators would occur during construction for the eight weeks after the access roads had been completed.

The expected daily volume of traffic during construction would be estimated at 60 vehicle trips per day. There are certain periods of construction (turbine delivery) when the traffic volume would be higher as well as periods (commissioning) where it would be lower.

Construction of access roads and preparation and construction of foundations would require approximately 4,000 vehicle trips. Delivery of components and concrete to the individual turbine locations would entail approximately 2,000 truckloads over the course of eight weeks following road completion. Throughout the construction process workers would arrive on-site each day and would carpool to and from the site whenever possible to reduce vehicle trips.

During normal O&M, three to five four-wheel drive pickup trucks would be involved in maintenance activity, infrequently. Snow removal equipment (pickup trucks equipped with wing-style blades) would be utilized as needed during winter.

2.2.6 Water Use

During construction water would be used for the turbine tower foundations, padmount transformers, substation foundations, O&M building foundation, and for dust control. For construction of the 90-MW project, Invenergy estimates that less than 25 acre-feet of water would be required as described above. Almost all of this water use would occur during the approximate six-month construction period. Minimal, if any, dust control is anticipated during the O&M phase of the project. Water would come from off-site existing municipal or private sources in Wray or Holyoke, Colorado.

The O&M building would require water for sanitation purposes during project life and would likely require a new small capacity water well. In order to obtain a permit for this well, the project would apply to the Division of Water Resources to obtain a new well permit within the Northern High Plains Designated Ground Water Basin, Sandhills Ground Water Management District. Sandhills Ground Water Management District sets an annual withdrawal cap of 80 acre-feet on any new small capacity well. The O&M building would use significantly less water than 80 acre-feet on an annual basis. The State Engineer has the authority to grant permits to construct small capacity wells.

2.2.7 Hazardous Materials

The only hazardous chemicals anticipated to be on-site are the chemicals contained in diesel fuel, gasoline, coolant (ethylene glycol), and lubricants in machinery. There could also be small amounts of herbicides, epoxies, and paints used during construction. Invenergy and its contractors would comply with all applicable hazardous material laws and regulations existing or hereafter enacted or promulgated regarding these chemicals and would implement a Spill Prevention, Control, and Countermeasure (SPCC) Plan, as necessary. Hazardous chemicals contained in diesel fuel, gasoline, coolant (ethylene glycol), lubricants, herbicides, epoxies, and paints would not be stored in or near any stream, nor would any vehicle refueling or routine maintenance occur in or near streams.

2.2.8 Reclamation and Abandonment

Reclamation would be conducted on all disturbed areas not needed for O&M to comply with easement agreements and the project’s Storm Water Management Plan (SWMP). Areas of temporary disturbance would be returned to pre-disturbance like conditions whenever possible.

Following construction, temporary work areas would be graded to be similar to the pre-disturbance contours and unless returning to cultivated agricultural use, the areas would be seeded with appropriate native seed mixtures to match or enhance the vegetative cover present prior to construction. Prior to development of the SWMP, Invenergy would consult with the local Natural Resources Conservation

Service (NRCS) office for recommendations on appropriate vegetation options and obtain approval from the landowners to implement the recommended practices. Specific reseeding recommendations would be included in the SWMP. During and after construction, slopes would be stabilized as provided in the SWMP. Post-construction revegetation would include scarifying soils to reduce compaction, amending the soil as necessary, and reseeding disturbed areas including portions of turbine pads not required for O&M, road cuts-and-fills, underground power line trenches, and overhead power line routes. The project would deactivate its SWMP once areas are revegetated to meet SWMP compliance and only after assuring that all silt fencing and other temporary sediment control measures have been removed from the project site.

At the end of the project's life, Invenergy would obtain any necessary authorization from the appropriate regulatory agency or landowners to either decommission or re-power the wind project. A Decommissioning Plan would be established with Yuma County, Colorado and would cover dismantling of the turbines and towers, as well as land reclamation, monitoring of revegetation success, and reseeding if needed to ensure revegetation success. An estimate of the decommissioning costs would be certified by an independent Professional Engineer every five years starting in year fifteen. Invenergy would meet all necessary financial assurance requirements of Yuma County.

2.2.9 Western and Invenergy's Standard Construction, Operation and Maintenance Practices

Invenergy plans to implement Western's Standard Construction, Operation and Maintenance practices, where applicable, to avoid and minimize impacts to the environment to the extent practicable (Table 2.2-2). Invenergy will also implement additional applicant-committed mitigation measures (Table 2.2-3). These measures are part of Invenergy's Proposed Project and are considered in this EA's impact analysis.

Western Standard Practices

Western's practices apply to the construction of transmission lines, access roads, substations, and facilities related to the interconnection of the Proposed Project. Invenergy will also follow Western's practices for all activities, where applicable, related to the construction of turbine pads and collection lines.

Table 2.2-2 Western Standard Construction Project Practices related to General Construction, Transmission Line and Interconnection Facilities

Practice Identifier	Practice
GEN-1	The construction contractor would limit the movement of crews and equipment to the ROW, including access routes. The contractor would limit movement on the ROW to minimize damage to residential yards, grazing land, crops, orchards, and property. Landowners would be reimbursed for crop damages and property damage.
GEN-2	The construction contractor would coordinate with the landowners to avoid impacting the normal function of irrigation devices and other agricultural operations during project construction.
GEN-3	ROW would be acquired based on fair market value and in accordance with applicable laws and regulations.

Practice Identifier	Practice
GEN-4	When weather and ground conditions permit, the construction contractor would obliterate construction caused deep ruts on or off road. Ruts would be leveled, filled, and graded. Ruts, scars, and compacted soils in pasture and cultivated lands would have the soil loosened and leveled by scarifying, harrowing, disking, or other approved methods. Damage to ditches, tile drains, terraces, roads, and other features would be corrected. At the end of each construction season and before final acceptance of the work in agricultural areas, ruts would be obliterated, and trails and areas that are hard-packed as a result of construction operations would be loosened and leveled. The land and facilities would be restored as nearly as practicable to the original grade. During inclement weather, construction activities may be stopped if conditions make landscape damage likely.
GEN-5	Construction roads and trails not required for maintenance access would be restored to the original contour, seeded, and left in a state acceptable to the landowner. The surfaces of these construction roads and trails would be scarified as needed to provide conditions that would facilitate natural revegetation, provide for proper drainage, and prevent erosion.
GEN-6	Construction staging areas on the ROW would be located and arranged to preserve trees and vegetation to the maximum practicable extent. On completion, storage and construction materials and debris would be removed from the site. The area would be regraded, as required, so that surfaces drain naturally, blend with the natural terrain, and are left in a condition that would facilitate natural revegetation, provide for proper drainage, and prevent erosion.
GEN-7	Borrow pits would be excavated so that water would not collect. The sides of borrow pits would be brought to stable slopes, with slope intersections shaped to carry the natural contour of adjacent, undisturbed terrain into the pit or borrow area, giving a natural appearance. Piles of excess soil or other borrow would be shaped to provide a natural appearance.
GEN-8	Approved mufflers and spark arrestors would be used as needed to control construction equipment noise and the risk of fire.
GEN-9	The ROW would be located to the extent practicable to avoid sensitive resources.
GEN-10	Transmission structures would be located to the extent practicable to avoid sensitive resources and, when possible, would span resources.
GEN-11	Topsoil would be removed, stockpiled, and respread in areas of disturbance.
EROSION-1	Water turnoff bars or small terraces would be constructed across ROW trails on hillsides to prevent water erosion and to facilitate natural revegetation.
EROSION-2	To the extent practicable, access roads and trails would follow contours in steeper topography to facilitate erosion control and minimize impacts to other resources such as surface water.
EROSION-3	Grading and vegetation clearing on access roads and trails would be limited to that necessary to allow equipment to pass and for the safe construction and maintenance of the facility.
ENV-1	The construction contractor would comply with applicable environmental protection requirements. Prior to construction, supervisory construction personnel would be instructed on the protection of cultural and environmental resources. To assist in this effort, the construction contract would address: a) federal and state laws regarding antiquities, plants, and wildlife, including disturbance, collection, and removal; and b) the importance of these resources and the purpose and need to protect them.
VEG-1	Seeding and mulch requirements would be specified. Seed mix would be approved by appropriate land management agencies, the landowner, or the Department of Agriculture. Seed, mulch, and hay approved for use would be certified weed-free.

Practice Identifier	Practice
VEG-2	Minimal removal of native vegetation would be done except where clearing is required for permanent works (such as structures, buildings, access roads) or to protect the transmission facility from trees and other vegetation. To the extent practicable and considering the need to protect transmission lines from encroaching vegetation and vegetation hazards, ensure access to facility for maintenance, and reduce wildfire fuel loads along the ROW, vegetation management would emphasize maintaining native vegetation to reduce visual impacts and maintain natural communities.
VEG-3	The contractor would comply with federal, state, and local noxious weed control regulations and provide a “clean vehicle policy” when entering and leaving construction areas to prevent transport of noxious weed plants and seed. The contractor would transport only construction vehicles that are free of mud or vegetation debris to staging areas and the project ROW.
CULT-1	Prior to construction, Invenergy would survey the project area. The surveys would be completed in compliance with Section 106 of the National Historic Preservation Act (NHPA) and coordinated with appropriate federal land management agencies and the State Historic Preservation Office (SHPO). Tribes would be consulted for activities on tribal lands and regarding potential effects on ancestral lands. Mitigation would be implemented as agreed on.
CULT-2	As agreed to with the consulting parties, Invenergy would monitor construction activities, flag and avoid cultural sites, or mitigate cultural sites through data recovery. During inclement weather, construction activities may be stopped if snow cover prevents the adequate protection of cultural resources.
CULT-3	Construction contractors would be advised of the need to avoid impacting cultural sites, prohibit removal of artifacts, and other protective actions.
CULT-4	If previously unrecorded cultural sites or artifacts are encountered during construction activities, construction activities would be stopped in the vicinity of the discovery. Invenergy would consult with the SHPO and other parties in accordance with the NHPA and implement agreements made.
SOLID WASTE-1	Construction activities would be performed by methods that prevent accidental spills of solid matter, liquids, contaminants, debris, and other pollutants and wastes into flowing streams or dry water courses, lakes, playas, and underground water sources. These pollutants and wastes include, but are not restricted to, refuse, garbage, cement, concrete, sanitary waste, industrial waste, oil and other petroleum products, aggregate processing tailings, mineral salts, and thermal pollution.
SOLID WASTE-2	Burning or burying of waste materials on the ROW or at the construction site would not be allowed. The construction contractor would remove waste materials from the construction area. Materials resulting from the contractor's clearing operations would be removed from the ROW and disposed of in accordance with applicable regulations.
WATER-1	Excavated material or other construction materials would not be stockpiled or deposited near or on stream banks, lake shorelines, or other water course perimeters where they could be washed away by high water or storm runoff or could encroach on the actual water source itself. As required by state agencies, the contractor would comply with NPDES requirements and obtain the appropriate permits.
WATER-2	Waste water from construction operations would not enter streams, water courses, or other surface waters without use of turbidity control methods such as settling ponds, gravel-filter entrapment dikes, filter fences, approved flocculating processes that are not harmful to fish, recirculation systems for washing of aggregates, or other approved methods. Waste water discharged into surface water would be essentially free of suspended material. These actions would comply with applicable NPDES permitting requirements.

Practice Identifier	Practice
WATER-3	Activities in riparian areas and wetlands would be minimized and these areas would be spanned whenever practicable. Disturbance to riparian vegetation and wetlands would be avoided whenever practicable. Narrow flood-prone areas would be spanned whenever practicable.
WATER-4	Construction activities would use methods that prevent water pollution. Accidental spills of contaminants, debris, and other objectionable pollutants and wastes into streams, watercourses, lakes, playas, wetlands, etc. would be prevented. Refueling and staging would occur at least 300 feet from the edge of all stream channels.
WATER-5	Structure sites, new access routes, and other disturbed areas would be located away from rivers, streams, ephemeral streams, ponds, lakes, reservoirs, and playas, whenever practicable.
WATER-6	When needed, culverts, low water crossings, and other devices of adequate design to accommodate estimated peak flow of the water way would be installed at crossings of perennial, intermittent, and ephemeral streams. Construction disturbance of the banks and beds would be minimized. The mitigation measures listed for soil and vegetation would be implemented as applicable on disturbed areas.
AIR-1	The contractor would use reasonably available, practicable methods and devices to control or prevent emissions of air contaminants including dust, diesel exhaust, and other identified emissions.
AIR-2	The contractor would prevent nuisance dust from affecting persons and their homes, damaging crops, or impairing the safe use of adjacent public roadways. Oil and other petroleum derivatives would not be used as dust control. Speed limits would be enforced to reduce dust problems on dirt roads.
AIR-3	Equipment with excessive emissions of exhaust gases—especially particulates—would not be operated until repairs or adjustments were made.
TRANSPORTATION-1	Construction-caused delays to the operation of in-service railroads would be minimized and coordinated with the railroad operators. During conductor and static-wire stringing, appropriate methods would be used to avoid impacting railroad operations.
TRANSPORTATION-2	The construction contractor would be responsible for ensuring traffic safety on public roads. To the extent practicable, obstruction to traffic and inconvenience would be minimized. Passage of emergency response vehicles would be ensured.
EMF-1	Transmission lines would be designed to minimize noise while energized. Transmission lines would be designed to adhere to applicable electric and magnetic field (EMF) standards.
PALEO-1	To prevent impacts to important paleontological resources the contractor would implement agreements such as avoidance and use of infield monitors if appropriate.
WILDLIFE-1	The project would implement Avian Power Line Interaction Committee recommendations to ensure that designs minimizing collision and electrocution risks are incorporated into electrical generation, transmission, and distribution. In addition, the transmission line would be designed in conformance with Suggested Practices for Protection of Raptors on Power Lines (APLIC 1994) and Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (APLIC 2006).
WILDLIFE-2	Western and Invenergy would comply with the Endangered Species Act, Migratory Bird Treaty Act, and other requirements identified through consultation with federal and state wildlife agencies and land management agencies.

Invenergy Committed Practices

Invenergy proposes to implement Applicant-Committed Mitigation Measures (Table 2.2-3) that are in addition to, or explained in more detail, than the construction practices listed in Table 2.2-2. The practice identifier listed in the table is preceded by an "I" to indicate Invenergy's Applicant-Committed Mitigation measures.

Table 2.2-3 Invenergy Applicant-Committed Mitigation Measures

Practice Identifier	Practice
IGEN-1	Invenergy would reclaim temporarily disturbed areas and has agreements in place with landowners to perform such obligations. See GEN-2.
IEROSION-1	A Storm Water Management Plan (SWMP) would be prepared with Colorado Department of Public Health and Environment (CDPHE), approved coverage under the Storm Water Construction General Permit, to ensure that erosion is minimized during storm events. Invenergy and its contractors would implement the SWMP per National Pollutant Discharge Elimination System (NPDES) regulations. Soil erosion control measures would be monitored, especially after storms (per SWMP), and would be repaired or replaced if needed.
IWATER-1	Invenergy would comply with all federal regulations concerning the crossing of Waters of the U.S. as listed in Title 33 *Code of Federal Regulations* [C.F.R.] Part 323. The wind turbines and ancillary facilities would be built in areas which avoid the surface water features and designated floodplains. Structure sites, new access routes, and other disturbed areas would be located away from rivers, streams, ephemeral streams, ponds, lakes, reservoirs, and playas, whenever practicable. Wind turbines would not be placed within Waters of the U.S.
IAIR-1	If needed, a construction-related concrete batch plant would acquire the appropriate authorization for operation from the Colorado Department of Transportation. Authorization would be acquired prior to the commencement of construction.
INOISE-1	Invenergy would require construction contractors to comply with federal limits on truck noise. Effective exhaust mufflers would be installed and properly maintained on all construction equipment.
INOISE-2	Construction activities would take place mostly during daylight hours. Nighttime construction work would be minimized and limited to relatively quiet activities.
INOISE-3	Invenergy would perform a noise analysis at each proposed turbine location and use results as part of the final design process.
IWILDLIFE-1	Invenergy would prohibit hunting, fishing, dogs, or possession of firearms by its employees and contractors in the project area during construction and operation and maintenance. If violations are discovered, the offense would be reported to the appropriate agency and offending employee or contractor would be prosecuted and may be dismissed by Invenergy.
IWILDLIFE-2	Invenergy project personnel would observe 25 mph speed limits on roads to minimize wildlife mortality due to vehicle collisions.
IWILDLIFE-3	The project incorporates recommendations found in the U.S. Fish and Wildlife Service (USFWS) document *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines*, the Wind Turbine Guidelines Advisory Committee recommendations (USFWS 2010). The project also incorporates state-of-the-art turbine technology, including unguyed, tubular towers and slow-rotating, upwind rotors.
IWILDLIFE-4	The project avoids fragmentation of wildlife habitat to the extent commercially practicable through the use of lands already disturbed, minimizes new roads by using existing roadways, and addresses the accumulation of standing water through the use of a SWMP.

Practice Identifier	Practice
IWILDLIFE-5	Invenergy commissioned avian and bat risk assessments as well as preconstruction avian and bat surveys of the project area. Based on the results of these studies Invenergy included CDOW recommended buffers and seasonal restrictions around certain species when designing the facility and construction timeline. Based on the environmental surveys and consultation with the CDOW the following mitigation is planned. Wind turbines would be sited a minimum of 0.6 mile from identified greater prairie chicken leks to the extent possible. Turbine locations closer than 0.6 mile from identified leks were reviewed and approved in the field by the CDOW. No construction would occur within 0.6 mile of identified greater prairie chicken leks between March 1 and May 15. No construction traffic would occur on new project constructed access roads within 0.6 mile of leks from 1 hour before sunrise to 2 hours after sunrise between March 1 and May 15. Wind turbines would be sited a minimum of 0.25 mile from identified active Swainson's hawk nests, and construction would not occur within 0.25 mile between April 1 and July 15. Wind turbines would be sited a minimum of 0.33 mile from identified active great horned owl and red-tailed hawk nests, and construction would not occur within 0.33 mile between February 15 and July 15. Wind turbines would be sited a minimum of 0.5 mile from identified active ferruginous hawk nests, and construction would not occur within 0.25 mile between February 1 and July 15; Construction would not occur within 150 feet of burrowing owl nests between March 15 and October 31. Surveys indicated that all burrowing owl nests are located within prairie dog colonies. Construction would avoid all prairie dog colonies. No construction traffic would occur on new project constructed access roads within established buffer zones for active nests during the breeding periods identified above. Surface disturbance would be avoided or minimized in areas of high wildlife value, such as, prairie dog colonies, playas, shelterbelts, and stock ponds.
ISAFE-1	Invenergy would prepare emergency response plans that comply with Occupational Safety and Health Administration (OSHA) regulations. All construction and operational personnel would be trained to handle emergency situations that could arise at the site.
ISAFE-2	Construction facilities would be marked by safety and no-trespassing signs. The construction of the proposed wind energy project would comply with all applicable federal, state and local safety requirements.
ISAFE-3	All turbines would be constructed with vibration sensors that trigger automatic shut-off caused by icing-induced imbalance on the rotor blades. Invenergy expects there would be little danger to public safety from ice shedding because all turbines are further than 1,000 feet from any residence.
IFIRE-1	Invenergy would design, install, and implement a fire protection system in accordance with all applicable fire safety codes. Invenergy would coordinate with fire, safety, and emergency personnel during all stages of the project, as necessary, to promote efficient and timely emergency preparedness and response.
IFIRE-2	Invenergy would designate a representative to be in charge of fire control during construction. The fire representative would ensure that each construction crew has the appropriate firefighting tools and equipment, such as extinguishers, shovels, and axes available at all times.
IFIRE-3	Invenergy would require that satisfactory spark arresters be maintained on internal combustion engines at all times.

Practice Identifier	Practice
IWETLAND -1	Prior to construction, Invenergy would complete a field survey to determine the presence of jurisdictional wetlands and streams and the results of the field surveys and a summary of impacts would be submitted to the USACE, and the required authorizations/permits would be obtained.
IVISUAL-1	To limit adverse aesthetic effects of the wind farm, the turbines would be lighted as required by FAA regulations, plus a low voltage light on a motion sensor at the entrance door to each turbine.
IVISUAL-2	Turbines would be coated/painted a non-reflective white.
IVISUAL-3	Existing roads would be used for construction and maintenance wherever practicable. Access roads created for the project would minimize visible cuts and fills wherever possible.
IVISUAL-4	Invenergy would conduct a shadow flicker assessment at each proposed turbine location and use results as part of the final design process.

2.3 Alternatives to the Proposed Project

2.3.1 Alternative Turbine and Facility Locations

The project proposed 11 alternative turbine locations in the project study area to allow for flexibility during the final design and siting process. Based on agency comments on potential resource impacts and the results from environmental and cultural surveys, particularly to raptor nests and leks, alternative turbine arrays were designed and adopted as described above under the Proposed Project.

2.4 Alternatives Considered and Eliminated from Detailed Study

2.4.1 Alternative Project Generation Capacity

Invenergy originally submitted a proposal for a project with 100 MW of capacity to Western in 2009. The interconnection study showed that a 100 MW project would require expensive system upgrades to mitigate undesirable electrical system performance. Based on powerflow analysis, the maximum wind farm design to be considered and installed in this area for interconnection with Western's system was recommended at 90 MW, to avoid adverse effects on Western's 115-kV transmission system and other systems in the area. The 100 MW project proposal was eliminated in favor of the 90 MW project alternative because expensive system upgrades would be avoided.

2.4.2 Alternative Electrical System Interconnections Facilities

There are other electrical transmission systems in the area owned by different entities, but those facilities were determined not to be viable, due to insufficient capacity. Interconnection to the other systems was abandoned, and interconnection to the Western system was pursued.

2.4.3 Alternative Project Locations

Wind project developers conduct an extensive site characterization study and financial analysis to identify potentially economically feasible wind sites. Invenergy identified many potential sites, but one of the important limiting factors for site development is the availability of economical transmission capability to get the energy from the project to a buyer. The combination of a suitable, developable site with good wind conditions, willing landowners, public acceptance, economic feasibility, and relatively low environmental impacts narrows the opportunities for sites. The availability of economically feasible and accessible transmission further limits the development potential of these sites. This proponent-initiated project is part of a discrete proposal for Western to consider under the requirements of its Tariff. No other alternative sites to the location of the project are addressed in this EA.

2.5 No Action Alternative

Under the No Action Alternative, Western would not execute an interconnection agreement with Invenergy and the wind project would not be constructed or interconnected with Western's transmission system. Western's determination not to approve the interconnection request could make the Proposed Project infeasible. Invenergy could continue to pursue the project by applying for interconnection with another transmission provider in the vicinity. The electrical generation capacity of the project could change depending on the transmission capacity of any alternative transmission provider and other factors. For the purposes of this EA, the No Action Alternative is considered to result in the project not being constructed, and the environmental impacts associated with the project would not occur.

3.0 Affected Environment and Environmental Consequences

3.1 Overview of Analysis Approach

Potential impacts are described in terms of type, context, duration, and intensity. General definitions of these terms are below.

- Type describes the impact as beneficial or adverse, direct or indirect.
  - Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
  - Adverse: A change that moves the resource away from a desired condition or detracts from its appearance or condition.
  - Direct: An effect on a resource by an action at the same place and time. For example soil compaction from construction traffic is a direct impact on soils.
  - Indirect: An effect from an action that occurs later or perhaps at a different place and often to a different resource, but is still reasonably foreseeable. For example, removing vegetation may increase soil erosion and cause increased sediment in a stream.
  - Cumulative: Impacts to resources that are added to existing impacts from other actions. For example, surface water sediment runoff from the project, added to the sediment load from other unrelated projects in the area, may produce additional decrease in surface water quality.
- Context describes the area (site-specific) or location (local or regional) in which the impact will occur.
- Duration is the length of time an effect will occur.
  - Short-term impacts generally occur during construction or for a limited time thereafter, generally less than two years, by the end of which the resources recover their pre-construction conditions. For example, increased traffic during construction activities would be short-term since traffic return to normal levels once construction has been completed.
  - Long-term impacts last beyond the construction period, and the resources may not regain their pre-construction conditions for a longer period of time. For example, visual impacts from the transmission line would be long-term since they continue as long as the project is in place.

The intensity of an impact is based on how the Proposed Project would affect each resource. The levels used in this EA are:

- Negligible: Impact at the lowest levels of detection with barely measurable consequences.
- Minor: Impact is measurable or perceptible, with little loss of resource integrity and changes are small, localized, and of little consequence.
- Moderate: Impact is measurable and perceptible and would alter the resource but not modify overall resource integrity, or the impact could be mitigated successfully in the short term.
- Major: Impacts would be substantial, highly noticeable, and long term.

3.2 Climate and Air Quality

3.2.1 Affected Environment – Environmental Setting for the Proposed Project

3.2.1.1 Climate

The project area is located between Wray, Colorado and Holyoke, Colorado and the climate is semi-arid. The average annual precipitation is approximately 18 inches. Typically, 80% of the annual precipitation falls between April and October. The warmest months of the year are July and August when average maximum temperatures are recorded in the high 80 to low 90 degree F range. January is the coldest month of the year with the average temperatures ranging from lows around 13 degrees F to highs around 43 degrees F (High Plains Regional Climate Center (HPRCC) 2010).

The closest published wind data is available from the Akron, Colorado airport. Average wind speed is 12.2 mph from a period of record from 1996 through 2006. April has the highest average monthly wind speed at 14.2 mph (HPRCC 2011a). Prevailing wind direction at the Akron Airport is from the west (HPRCC 2011b).

The project area is in a region of the high plains and uplands of eastern Colorado characterized as having good wind power development potential (Class 4 annual average wind power). Wind speeds at 164 feet above ground average 16.6 to 17.7 mph (NREL 1986).

3.2.1.2 Air

Federal actions are required to conform to the Clean Air Act (CAA, 1970, as amended). The CAA is implemented at the federal, state, and local government levels. The Environmental Protection Agency (EPA) has primary federal responsibility for implementation of the CAA, and in Colorado the Colorado Department of Public Health and Environment Air Pollution Control Division (CDPHE-APCD) has responsibility for its administration. To comply with the requirements of the CAA, the State of Colorado developed a State Implementation Plan (SIP). The SIP outlines the steps and timelines that Colorado will follow to assure compliance with the requirements of the CAA.

The affected air environment can be characterized in terms of concentrations of criteria pollutants carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (PM), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb). The EPA has established National Ambient Air Quality Standards (NAAQS) for these pollutants. The goal of the air quality regulatory programs is to ensure that concentrations of pollutants in the air do not exceed these standards. Areas where air quality meets the NAAQS are called attainment areas, and where air quality exceeds the NAAQS are called nonattainment areas.

Regional air basins are classified by the CDPHE-APCD. The project is located within the Eastern High Plains Region (CDPHE-APCD 2010). This region is considered an attainment area.

Under the CAA, proposed new sources of air pollutants are required to obtain construction and then operating permits for the sources in question. Sources required to obtain permits must address Prevention of Significant Deterioration (PSD), New Source Performance Standards (NSPS), visibility protection, and the general conformity provisions of the CAA as part of their permitting effort.

However, the act delineates between type and size of sources and exempts many sources from permitting requirements altogether. The Proposed Project is one of these exempt sources and is not required to obtain federal or state air quality permits.

Of the air pollutants listed above, those of potential concern are particulate matter, diesel particulates, and carbon monoxide. The source of these pollutants can come from construction, oil and gas development, agricultural activities, dust and particulate emissions from roads, tailpipe emissions, and off-road vehicle traffic.

3.2.2 Environmental Impacts and Mitigation Measures

3.2.2.1 Issues and Significance Criteria

Impacts to air quality would be considered significant if:

- construction or maintenance and operation of the Proposed Project or alternatives would cause or contribute to a violation of federal or state standards.

3.2.2.2 Impacts of the Proposed Project

The Proposed Project would have no impact on climate.

The project would comply with National Ambient Air Quality Standards and the Colorado State Implementation Plan. There are no federal or state permitting requirements for this source type.

Construction impacts associated with the project would be similar to any other commercial or light industry construction activities. The predominant air pollutant that would be released into the atmosphere would be particulate matter (dust) associated with soil disturbances including windblown dust and diesel particulate emission from vehicle exhaust. In addition, there would be some gaseous pollutants released into the air, such as CO, also from the vehicle exhaust of the construction equipment. Impacts during construction would only occur during the work day.

Construction of the project would result in an increase of particulate matter in the immediate vicinity of project activities from the movement of vehicles and equipment and soil disturbances during construction resulting in a minor, short-term adverse impact to air quality. Adverse impacts from emissions of diesel particulate matter, nitrogen oxides, hydrocarbons, carbon monoxide, and sulfur dioxide from construction and maintenance vehicles would also be minor and short-term.

Operation of the Proposed Project to generate electric power from wind turbines would have a minor, beneficial long-term impact on air quality since no emission would occur during the 20-year life of electricity production.

3.2.2.3 Impacts of the No Action Alternative

Since there would be no project development with the No Action Alternative, there would be no impacts to air quality, nor would there be a beneficial impact from the generation of wind power.

3.2.2.4 Mitigation Measures

Implementation of Western's Standard Construction Practices AIR-1, AIR-2 and AIR-3 (Table 2.2-2) and Invenergy's Applicant-Committed Mitigation Measures IAIR-1 (Table 2.2-3) would ensure that short-term air quality impacts are minimized and that no violations or contributions to violations of the NAAQS or Colorado State Implementation Plan occur.

3.3 Geology and Paleontology

3.3.1 Affected Environment – Environmental Setting for the Proposed Project

3.3.1.1 Geology

Except for two small bedrock outcrops of the Ogallala Formation of Miocene age along both sides of Hayes Creek about two miles north of the North Fork Republican River, the entire project area is mapped by the USGS as being underlain by eolian sand of Holocene and Pleistocene age (Scott 1978). The sand comprises part of the Wray dune field, the largest eolian sand body in Colorado and southwestern Nebraska.

South of the town of Wray, the North Fork Republican River has cut into and exposed bedrock of the Ogallala Group and underlying White River Group, of Miocene and Oligocene age. Cretaceous rocks of the Pierre Shale underlie the White River Group and are also exposed along the river banks. These bedrock units are overlain by unconsolidated deposits of the Peoria Loess that are Pleistocene in age.

Hill and Tompkin (1953) classified upper Pleistocene sediments in the Wray area as “sandy silt and clay,” “valley fill,” and the “Sand Hills Formation.” Dune sand in the project area belongs to the Sand Hills Formation, as described by Lugn (1934) for northwest-trending sand ridges (seif) that have developed north of the Republican River in Nebraska. There, as in Wray and Wauneta, the sand is massive and unbedded and occurs in ridges up to ten miles long, like the areas in Wray and Wauneta. The ridges are made up of innumerable individual hills, elongate crests, and depressions. Parabolic dunes (Muhs 1985) occur locally and are aligned to the northwest. Although both Hill and Tompkin (1953) and Larsen (1980) record a maximum thickness of 100 feet of dune sand, they record sand hills reaching up to 170 feet in height.

The dune sediment in the Wray area consists of pale brown, yellowish-brown, and dark yellowish-brown, locally silty, well-sorted, fine-grained sand (diameters 0.1 to 0.5 mm). Locally, this sand forms sheets. While some interdune areas and blowouts are still active, many areas have been stabilized by vegetation and the development of brown calcareous soils, especially in the upper part of the unit (Scott 1978). On flats and in low interdune areas, these soils may be dark and contain some organic matter. Larsen (1980) notes that sand dune soils in the reported area are well to excessively drained valent soils, lying on one-to-45% slopes. Interdune depressions may be filled with Haxtun loamy sand or Marter loamy sand. Weist (1960) observed that most of the sand lies above the local water table and contributes no water to wells. The dunes provide an important catchment for recharge from precipitation due to their high permeability.

Muhs and others (1999) distinguished three eolian units in a parabolic dune near Wray. Each eolian unit is associated with a paleosol, a layer of ancient soil, all of which formed during the late Holocene. The lowermost of these is thought to be about 800 to 1,400 years old.

3.3.1.2 Paleontology

Although northeastern Colorado is well known for fossil vertebrates (e.g., Matthew 1901; Galbreath 1953; Wilson 1960), the vast majority of those are known from the upper Miocene Ogallala Formation and older rocks. These units are not exposed within the project area. The Pleistocene and Holocene dune sands found in the Wray area appear to be nearly devoid of fossils of any kind; however, a few vertebrate remains are known to be associated with archaeological sites (Graham 1981). Northeastern Colorado and the Wray area are well known for archaeological materials ranging in age from prehistoric (Folsom and Yuma) to Pawnee (Gebhard 1949; Myers 1987) or encompassing some 10,000 years. Muhs and others (1999) noted that Loope (1986) identified a possible bison foot print preserved a half meter above the lowest of the three paleosols they found on the parabolic dune they described near Wray.

3.3.1.3 Geologic Hazards

There are no known faults or folds underlying the project area that show Quaternary movement (USGS 2011a). The USGS seismic hazard map (USGS 2011b) depicts the project area as having peak acceleration (%g) with 2% probability of exceedance in 50 years as 2, which is very low. Additionally, USGS epicenter records note the occurrence of two earthquake epicenters about 40 miles from the project area in extreme southwest Yuma County with a magnitude (mbgs) of 4.6 and 4.1 dating to the 1980’s. It is unclear if these are actually earthquakes or related to some other activity.

The project area is underlain by bedrock of the White River and Ogallala Groups of late Tertiary age. Well cemented sandstones that comprise these geological units form a relatively flat high plains surface across most of the area which is overlain by sand dunes and some loess. Geological hazards in the project area are related chiefly to the presence of sand dunes and loess. There is, however, potential for minor undercutting and minor slumping along the North Fork Republican River which could affect the bedrock.

The major creek tributaries drain southeastward into the North Fork Republican River where there is the potential for erosion and flooding along these tributaries and the river during heavy downpours.

Sand dune geological hazards are caused by wind or water erosion and flooding. Undercutting by any erosional agent can cause collapse. Disturbance of natural vegetation can cause extensive sand blowing and sand shifting. The naturally shifting of sands due to wind and water action can also result in burial or exposure of existing topography, man-made installations, and roads. Dry loess can sustain nearly vertical slopes; however, it can disaggregate instantaneously when saturated. This could lead to slope failure. In addition, gully erosion of loess terrain can yield very high sediment volumes downstream that could potentially dam streams and bury structures (Derbyshire 2001).

3.3.2 Environmental Impacts and Mitigation Measures

Construction of the wind farm, transmission line, and ancillary facilities include various levels of surface disturbance. Surface disturbance can impact the geologic and paleontologic environment directly or indirectly and have adverse or beneficial impacts.

3.3.2.1 Issues and Significance Criteria

Geological Environment

Impacts to the geological environment would be significant if:

- construction modifies terrain to increase water erosion and runoff leading to increased water erosion that causes undercutting, mass movements, or downstream deposition and damming of side tributaries; or
- construction leads to destabilization of existing stabilized sand dunes leading to increased wind erosion and dune migration. Dune migration could bury new and existing structures or drainages.

Paleontology

Impacts to paleontology would be significant if:

- construction results in the direct damage or destruction of fossils of scientific significance;
- construction modifies terrain to increase erosion that results in the damage or destruction of fossils of scientific significance; or
- construction results in the discovery of new fossils of scientific significance.

3.3.2.2 Impacts of the Proposed Project

Geological Environment

As discussed in the Section 3.4, surface water drainage patterns may be altered in the short-term during construction; however, the impacts would be minor and drainage patterns would be restored to pre-construction conditions at the completion of construction, and surface flows would be routed to natural drainages. There may be negligible, short-term, indirect adverse impacts to the geological environment caused by disturbance during construction. Sediment and water control devices including silt fences, straw bales, netting, soil stabilizers, and check dams will be used to minimize erosion during and after construction and are described in the SWMP.

Paleontology

Although stabilized dunes present in the project area are too young at the surface to preserve fossils, it is unknown at what depth below the surface sediment of sufficient age (>10,000 years old) to preserve fossils of scientific significance could be encountered, if it could be encountered at all.

Excavation for shallow spread footer wind turbine foundations is unlikely to penetrate sediments of sufficient age for fossils of scientific significance to be present. If fossils are encountered, they could be adversely affected by being damaged, destroyed, or illegally collected resulting in the subsequent loss of scientific information. Impacts associated with the destruction of fossils could range from negligible to major depending on the nature of the fossils involved.

Western's construction adoption of a paleontological resources plan described in Appendix B, including a discovery contingency in the unlikely event that scientifically significant fossils are discovered during construction, would reduce impacts to fossils. If fossils were discovered, they would be properly collected, prepared, identified, and curated into an acceptable repository. This would result in a beneficial impact.

3.3.2.3 Impacts of the No Action Alternative

Since there would be no project development with the No Action Alternative, there would be no adverse or beneficial geological or paleontological impacts with this alternative.

3.3.2.4 Mitigation Measures

Geological Environment

Implementation of Western's Standard Construction Practices EROSION-1, EROSION-2, EROSION-3, and PALEO-1 (Table 2.2-2) would ensure that short-term impacts would reduce the effects to the geologic environment to negligible.

As discussed in Section 3.4, Water Resources, a Storm Water Management Plan would also be implemented.

Paleontology

Western's Mitigation Practice PALEO-1 (Table 2.2-2) would reduce the effects to the paleontologic environment to negligible levels.

3.4 Water Resources and Floodplains

Federal regulations that ensure the protection of water resources include the Safe Drinking Water Act (SDWA) and the Clean Water Act (CWA). The SDWA protects drinking water resources and requires strategies to prevent pollution. The CWA regulates pollutant discharge into streams, rivers, and wetlands. The EPA has established primary and secondary standards to guarantee quality drinking water. The Colorado Department of Health and Environment (CDPHE) implements the standards set by the EPA and regulates the discharge of pollutants into surface and ground water and enforces the Primary Drinking Water Regulations.

Section 402 of the CWA authorizes discharges of storm water under the National Pollutant Discharge Elimination System (NPDES). The State of Colorado is delegated the NPDES program under the CWA in 1974 and 1975, respectively, and has adopted its own state Pollutant Discharge Elimination System program. Invenergy would prepare a Storm Water Management Plan (SWMP). The SWMP includes stabilization practices, structural practices, storm water management, and other controls.

Floodplains are land areas adjacent to rivers and streams that are subject to recurring flooding. Floodplains typically help moderate flood flow, recharge ground water, spread silt to replenish soils, and provide habitat for a number of plant and animal species. Executive Order 11988, Floodplain Management, requires federal agencies to ensure their actions minimize the impacts of floods on human health and safety and restore the natural and beneficial values of floodplains.

3.4.1 Affected Environment – Environmental Setting for the Proposed Project

The project area includes the Proposed Project wind turbine locations, access roads, transmission line and ROW, and substation site.

3.4.1.1 Surface Water

The North Fork Republican River flows through Wray, Colorado, along the southern border of the Proposed Project area. Irrigated lands are found near sand hills north of the town of Wray, and along the eastern edge of the project boundary. The North Fork Republican River is tributary to the Republican River after its confluence with the Arikaree River, near Haigler, Nebraska, and is ultimately tributary to the Missouri River.

All watersheds located within the project area boundary are ephemeral or intermittent, except the North Fork Republican River.

Surface water runoff in much of the project area infiltrates to ground water without entering stream channels. There are few streams with a bed and bank in the project area. Streams reaching closest to the North Fork Republican River, within 1 to 2 miles north of the river, may have discernable bed and banks.

The beneficial use water quality classification system implements the Water Quality Control Act in Colorado and ensures suitability for designated beneficial uses (CDPHE 2011). The water quality in Colorado streams and rivers is classified by the CDPHE (2011). The North Fork Republican River has designated use classifications shown in the following table.

Table 3.4-1 Designated Beneficial Uses for Streams in the Republican River Basin, Colorado

Stream Segment Description	Designation	Beneficial Use Classification
Segment 3. Mainstem of the North Fork of the Republican River from the source to the Colorado-Nebraska border and the mainstem of Chief Creek.	None	Aquatic Life Cold 1 Recreation E Water Supply Agriculture
Segment 6. All tributaries to the Republican River system in Colorado, including all wetlands, except for specific listings in Segments 1, 3, 4, and 5	Use Protected	Aquatic Life Warm 2 Recreation N Agriculture

These beneficial uses have the following definitions (CDPHE 2009):

- Aquatic Life Cold, 1- These are waters that (1) currently are capable of sustaining a wide variety of cold water biota, including sensitive species, or (2) could sustain such biota but for correctable water quality conditions. Waters shall be considered capable of sustaining such biota where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of species.
- Aquatic Life Warm, 2- These are waters that are not capable of sustaining a wide variety of cold or warm water biota, including sensitive species, due to physical habitat, water flows or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species.
- Recreation E - These surface waters are used for primary contact recreation or have been used for such activities since November 28, 1975.
- Recreation N - These surface waters are not suitable or intended to become suitable for primary contact recreation uses. This classification shall be applied only where a use attainability analysis demonstrates that there is not a reasonable likelihood that primary contact uses will occur in the water segment(s) in question within the next 20-year period.
- Water Supply - These surface waters are suitable or intended to become suitable for potable water supplies. After receiving standard treatment (defined as coagulation, flocculation, sedimentation, filtration, and disinfection with chlorine or its equivalent) these waters will meet Colorado drinking water regulations and any revisions, amendments, or supplements thereto.

- Agriculture - These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado and which are not hazardous as drinking water for livestock.
- Use Protected - These are waters that the Commission has determined do not warrant the special protection provided by the outstanding waters designation or the antidegradation review process.

Section 303(d) of the federal CWA requires that states list waters that do not fully support existing or designated uses and require development of a Total Maximum Daily Load (TMDL). There are no 303(d) listed waters requiring TMDLs along the North Fork Republican River watershed (CDPHE 2008).

3.4.1.2 Floodplains

The Federal Emergency Management Agency (FEMA) maps show designated 100-year floodplain delineations along the North Fork Republican River. Figure 2.2-1- shows the location of primary floodplains in the area (FEMA 1985).

Designated floodplains are limited to the southern-most boundary of the project area, associated with the North Fork Republican River.

3.4.1.3 Ground Water

The High Plains aquifer underlies 174,000 square miles of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming. The aquifer underlies one of the major agricultural regions in the United States. About 20 percent of the irrigated land in the United States is in the High Plains, and about 30 percent of the ground water used for irrigation in the United States is pumped from the High Plains aquifer. The project area is located within the Northern High Plains Region of this massive aquifer (McGuire 2009). The Ogallala is the principal water-yielding unit of the High Plains aquifer in the Northern High Plains Region and is composed of a variety of materials, including clay, silt, sand, and gravel. Water-level declines began in parts of the High Plains aquifer soon after the beginning of substantial irrigation with ground water in the aquifer area (Dugan et al. 1994, McGuire 2009).

Because of ground water level declines over time, surface water resources in the Republican River basin have also been impacted. The Republican River Compact allocates the waters of the Republican River between the states of Colorado, Kansas, and Nebraska.

The Republican River Water Conservation District (District) was created by the Colorado State Legislature in 2004 to assure local involvement in the State's effort to comply with the Republican River Compact between Colorado, Kansas, and Nebraska. The District offers financial incentives to upstream water users in Colorado to voluntarily retire water rights (wells) to reduce consumptive use to the stream flows and help to conserve the Ogallala aquifer.

Many of the retired wells are located in lower lying areas within the project area. Some of these previously irrigated lands would return to native vegetation after irrigation ceases.

Geotechnical investigation has been completed within topographically higher zones of the project area that would be likely sites for turbine locations. Borings drilled to approximately 50 feet below ground surface were completed, and ground water was not observed in any of the borings (Williams 2011).

3.4.2 Environmental Impacts and Mitigation Measures

3.4.2.1 Issues and Significance Criteria

Surface Water

Impacts to surface water would be significant if:

- water quality and instream flows are modified by construction or accidental contamination so water users are measurably affected; or

- impacts from the project cause downstream effects to fish populations or other aquatic life.

Floodplains

Impacts to floodplains would be significant if:

- siting of the turbines, transmission line structures, access roads, or substations in a floodplain would increase the potential for flooding or violate applicable floodplain protection standards.

Ground Water

Impacts to ground water would be significant if:

- construction of foundations for the turbines or transmission line structures measurably impacts the quantity and quality of ground water used for public water supplies and irrigation, or the water quality violates state water quality criteria.

3.4.2.2 Impacts of the Proposed Project

Surface Water

There would be no expected impacts to surface water quantity and quality or downstream effects to fish population or other aquatic life because there are no surface water features located in the area where turbines, access roads, transmission line structures, substations, switchyards, or other structures are located. Holy Joe Creek immediately above the confluence with the North Fork Republican River would be spanned by a transmission line from the new proposed Western switchyard substation to a tie-in location on Western's existing transmission line located northeast of the Wray and north of the North Fork Republican River.

Surface water drainage patterns may be altered in the short-term during construction, however, the impacts would be minor and drainage patterns would be restored to pre-construction conditions at the completion of construction, and surface flows would be routed to natural drainages. There may be negligible, short-term, and indirect adverse impacts to water quality from sedimentation caused by disturbance during construction. Sediment control devices including silt fences, straw bales, netting, soil stabilizers, and check dams would be used to minimize soil erosion during and after construction and are described in the SWMP.

Best management practices would be implemented to mitigate impacts from accidental contamination and are also described in the SWMP. All hazardous materials including fuels, coolants, or lubricants would be stored within secondary containment features. Vehicle refueling and handling of hazardous materials would be performed outside of any drainage areas.

Floodplains

There are no Proposed Project components located in designated floodplains. All of the proposed facility locations are located north of the North Fork Republican River. The transmission line would span Holy Joe Creek just northwest of the designated floodplain associated with the North Fork Republican River (Figure 2.2-1). There would be no adverse impact to floodplains from the Proposed Project.

Ground Water

Spread footer foundations would be used for the wind turbines. These foundations would extend 8 feet below the ground surface and spread out below ground in the shape of an octagon with a diameter of 50 feet. All but the footprint of the tower would be covered with the material excavated prior to placement of the foundation. Borings drilled during preliminary geotechnical investigations to depths of 50 feet did not encounter ground water. It is unlikely that ground water would be encountered during the excavation of the shallow spread footer foundations. Any precipitation or ground water that does accumulate at the construction sites would be managed under the SWMP and Western's Standard Construction and Operation and Maintenance Practices.

Turbine tower foundations, padmount transformers, substation foundations, and the O&M building foundation would require water for mixing concrete. Water would also be required for dust control during construction. Invenergy estimates that less than 25 acre-feet of water would be required for construction of the Proposed Project. Water for concrete and dust control would come from off-site existing municipal or private sources in Wray or Holyoke. Based on the relatively limited quantity of water needed, these sources would not be required to increase water production to meet the project needs, and the project would not infringe on existing water rights or cause undue depletion of these sources.

The O&M building would require that an exempt commercial water well be installed for sanitation and operational purposes for personnel at the building. Estimated water usage would be approximately 375 gallons per day (less than 0.5 acre-feet/year). A septic system would also be constructed at the O&M building. The water use at the O&M building would not infringe on existing water rights or cause undue depletion of ground water.

3.4.2.3 Impacts of the No Action Alternative

Since there would be no project development with the No Action Alternative, there would be no impacts to surface water, floodplains, or ground water with this alternative.

3.4.2.4 Mitigation Measures

Implementation of Western's Standard Construction Practices GEN-7, EROSION-1, EROSION-2, EROSION-3, WATER-1, WATER-2, WATER-3, WATER-4, WATER-5, WATER-6 (Table 2.2-2), and Invenergy's Applicant-Committed Mitigation Measures IEROSION-1 and IWATER-1 (Table 2.2-3) would ensure that short-term impacts to surface water and ground water would be minimized.

3.5 Wetlands

3.5.1 Affected Environment – Environmental Setting for the Proposed Project

Wetland and other Waters of the U. S. resource information for the project area was initially developed from a review of National Wetland Inventory (NWI) maps prepared by the U. S. Fish and Wildlife Service (2011). A site reconnaissance survey was conducted in May 2011 on accessible lands under contract to field check the characteristics of the wetlands identified on the NWI maps.

Forty wetlands were identified on NWI maps within the project area (Table 3.5-1). These wetlands are concentrated along the eastern border of the project area near the Nebraska state line and along the southern project border in association with the North Fork Republican River. See Figure 3.6-1 for locations of wetlands within the study area. Wetlands and other Waters of the U. S. are essentially absent from the remainder of the project area.

The wetlands in the eastern one-half of the project area occur in association with agricultural development and appear in many cases to be supported primarily by irrigation runoff. These wetlands are typically small, isolated, widely dispersed, and characterized by herbaceous vegetation communities growing in hydrologic conditions classed as temporarily or intermittently flooded. No creeks or streams were observed in this area during the reconnaissance survey. Two wetlands (PUSA) identified on the NWI maps were found to exhibit upland conditions.

Wetlands identified along the southern project border are associated with the North Fork Republican River, creeks and drainages tributary to the North Fork Republican River, and meadows and depressions adjacent to or abutting the river proper. Soil hydrologic regimes range from temporarily to intermittently to seasonally flooded. Where observed, these wetlands exhibited saturated to semi-saturated soil conditions. Open water was noted in portions of the tributary creeks and drainages. The North Fork Republican River was flowing at the time of the reconnaissance survey. Mixed herbaceous wetland vegetation communities composed of species typical for the area dominated the creeks and swales as well as the understories of the wetlands classed as “forested.” Willow (*Salix* sp.) stands were noted along some drainage courses. Forested wetlands are typically characterized by mature stands of plains cottonwood (*Populus deltoides* ssp. *sargentii*) and willow tree species.

Table 3.5-1 Pertinent Baseline Characteristics of Wetlands Identified Within the Project Area by the U. S. Fish and Wildlife Service

NWI Classification (Map Nomenclature)	Number in Project Area	Location in Section, Township, Range	Wetland Descriptive Summary
Palustrine, Emergent, Temporarily Flooded (PEMA)	4	5,1N,43W; 32,2N,43W; 33,2N,43W; 34,2N,43W	Wetlands less than 2.0 meters deep; erect rooted herbaceous plants; surface water present for brief periods during the growing season
Palustrine, Emergent, Seasonally Flooded (PEMC)	8	26,5N,43W; 25,2N,43W (2) 30,2N,42W; 19,2N,42W; 27,2N,43W; 35,2N,43W; 36,2N,43W	Wetlands less than 2.0 meters deep; erect rooted herbaceous plants; surface water present for extended periods during the growing season but absent by end of growing season in most years
Palustrine, Emergent, Intermittently Flooded (PEMJ)	4	21,3N,42N (2); 28,4N,42W; 32,3N,42W	Wetlands less than 2.0 meters deep; erect rooted herbaceous plants; substrate usually exposed but surface water present for variable periods without seasonal periodicity
Palustrine, Emergent, Artificially/ Seasonally Flooded (PEMKC)	1	6,1N,43W	Wetlands less than 2.0 meters deep; erect rooted herbaceous plants; flooding controlled by pumps in combination with dams; surface water present for extended periods during the growing season but absent by end of growing season in most years
Palustrine Emergent, Intermittently Flooded / Temporary (PEMW)	1	26,2N,43W	Wetlands less than 2.0 meters deep; erect rooted herbaceous plants; intermittently flooded / temporary
Palustrine Wetland with Exposed Substrate, Temporarily Flooded (PUSA, formerly PFLW)	5	21,4N,42W (2); 16,3N,42W (2); 33,3N,42W	Wetlands less than 2.0 meters deep; surface water present for brief periods during the growing season
Palustrine, Forested / Emergent, Seasonally Flooded (PFO/EMC)	1	6,1N,43W	Wetlands less than 2.0 meters deep; woody vegetation greater than 20 feet tall and erect rooted herbaceous plants; surface water present for extended periods during the growing season but absent by end of growing season in most years
Palustrine, Forested, Intermittently Flooded / Temporary (PFOW)	5	31,2N,43W; 33,2N,43W; 6,1N,43W (3)	Wetlands less than 2.0 meters deep; woody vegetation greater than 20 feet tall; intermittently flooded / temporary

Table adapted from: U. S. Fish and Wildlife Service 1993 and 2011.

3.5.2 Environmental Impacts and Mitigation Measures

3.5.2.1 Issues and Significance Criteria

Impacts to wetlands would be significant if:

- there is an indirect loss of wetlands or riparian areas (greater than 0.10 acre) caused by degradation of water quality, diversion of water sources, or erosion and sedimentation resulting from altered drainage patterns; or
- there is a wetland or other Waters of the U.S. fill impact of greater than 0.5 acre, thereby requiring a Section 404 Individual Permit application to the U.S. Army Corps of Engineers.

3.5.2.2 Impacts of the Proposed Project

Invenergy has committed to avoid and minimize impacts to wetlands and other Waters of the U. S. to the extent practical for all Proposed Project components. Wind turbines would be located across elevated positions. Waters of the U. S., including wetlands, would be avoided. Transmission lines would span wetlands whenever possible. Invenergy contractors would be required to span riparian areas located along the transmission line ROW and avoid disturbance of riparian vegetation. Equipment and vehicles would not cross riparian areas along the ROW during operation and decommissioning activities. Existing bridges and fords would be used to access the ROW. Refueling and staging would occur at least 300 feet from the edge of a channel bank at all stream channels. Prior to construction, Invenergy would complete a field survey of wetlands occurring within the footprints of wind turbines and any new access roads to be constructed. When the project layout has been completed, the results of the pre-construction wetland survey would be submitted to the U. S. Army Corps of Engineers, and the required permits and authorizations would be obtained based on the acreage of wetlands to be impacted.

Wetlands within the project area are typically located across lower topographies, are often isolated, and occur adjacent to streams and the North Fork Republican River. Given these considerations, along with the commitments noted above, it can be reasonably assumed that impacts to wetlands and other Waters of the U.S. will be minor, if such occur at all.

No additional disturbances beyond those described for the Proposed Project are anticipated. It can be assumed that construction and decommissioning activities, as well as applicant-committed practices, described for the Proposed Project will be employed for all alternate turbine locations.

3.5.2.3 Impacts of the No Action Alternative

Since there would be no project development with the No Action Alternative, there would be no impacts to wetlands with this alternative. Project area wetlands would continue to develop in response to natural climatic, hydrologic, and topographic influences as well as current and future land use activities.

3.5.2.4 Mitigation Measures

Implementation of Western’s Standard Construction Practices GEN-6, WATER-3, WATER-4, WATER-5 (Table 2.2-2), and Invenergy’s Applicant-Committed Mitigation Measures IWETLAND-1, IEROSION-1 and IWATER-1 (Table 2.2-3) would ensure that short-term impacts to wetlands would be minimized.

3.6 Vegetation

3.6.1 Affected Environment – Environmental Setting for the Proposed Project

The project boundary that was evaluated for the Wray Wind Energy Project contains approximately 80,000 acres. The study area, which includes lands under contract with Invenergy, consists of approximately 40,000 acres. Vegetation/land use mapping of the entire study area was initially completed by delineating vegetation/land use polygon boundaries on U.S. Department of Agriculture (USDA)

National Agriculture Imagery Program (NAIP) 2009 high resolution (1 meter) aerial photography available online (USDA 2011). Mapped boundaries and vegetation types were then verified in the field on May 9 through 11, 2011, and final revisions to the mapped vegetation communities and boundaries were completed. Vegetation community/land use type mapping of the study and project area is shown on Figure 3.6-1, Vegetation Community and Land Use Type Mapping.

Study and project area vegetation communities consist predominantly of a mosaic of irrigated cropland/adjacent agricultural disturbance (31,116.85 acres or 39.33% of project boundary), sandhill steppe (43,442.13 acres or 54.91% of the project boundary), and native grassland (3,363.23 acres or 4.25% of project boundary) (see Table 3.6-1). The remainder of the area within the project boundary is made up of agricultural modifications and disturbances including: farmsteads, shelterbelts, tree plantings, fallow cropland, dryland agriculture, riparian areas, wetlands, moist meadows associated with drainages, stock ponds and ponds, and non-native grassland (see Table 3.6-1).

Table 3.6-1 Acreage of Vegetation / Land Use Types Within the Wray Wind Energy Project Boundary

Vegetation Type/Land Use	Acres	Percent of Area within Project Boundary
Sandhill Steppe	43,442	54.91
Irrigated Cropland/Adjacent Agricultural Disturbed	31,117	39.33
Native Grassland	3,363	4.25
Riparian/Wetland/Moist Meadow	391	0.49
Farmsteads & Residential w/Shelterbelts	390	0.49
Disturbed/Developed (includes feedlots, stock tanks, farm buildings, corrals, substations, and oil/gas wells)	254	0.32
Shelterbelts & Tree Plantings	64	0.08
Fallow Cropland/Tree Plantings	42	0.05
Dryland Agriculture	33	0.04
Stockponds and Ponds with Trees	14	0.02
Non-native Grassland	7	0.01
Total	**79,117**	**100.00**

Principal crops grown in the center-pivot irrigated cropland in Yuma County and the study area are corn and winter wheat. Other irrigated crops include sunflowers, pinto beans, sugar beets, alfalfa, and potatoes. Because of the sandy soils in the study area, center-pivot irrigated plots, adjacent edges, and corners are often planted to a cover crop such as rye or other cereal grains for cattle grazing and to stabilize soils between crop plantings.

The sandhill steppe community is the dominant native vegetation type in the study area, and it is supported in areas of sandy soils and broken terrain of rolling hills and low ridgelines. Characteristic species in this community include sand sagebrush (*Artemisia filifolia*)[1], broom snakeweed (*Gutierrezia sarothrae*), soapweed (*Yucca glauca*), plains pricklypear (*Opuntia polyacantha*), prairie sagewort (*Artemisia frigida*), prairie phlox (*Phlox andicola*), threadleaf sedge (*Carex filifolia*), prairie sandreed

[1] Nomenclature for plants follows USDA, NRCS. 2011. The PLANTS Database (http://plants.usda.gov, 29 July 2011). National Plant Data Team, Greensboro, NC 27401-4901 USA.

(*Calamovilfa longifolia*), blue grama (*Bouteloua gracilis*), sand dropseed (*Sporobolus cryptandrus*), little bluestem (*Schizachyrium scoparium*), and annual buckwheat (*Eriogonum annuum*).

Native grassland parcels are located primarily in the valley bottoms associated with less broken terrain and more stable (less sandy) soils than sandhill steppe. Although minor amounts of sand sagebrush, soapweed, and plains pricklypear are present to varying degrees in native grassland, these parcels are dominated primarily by native grassland species. Dominance by native grass species varies from communities supporting primarily short-grass species such as blue grama, buffalograss (*Bouteloua dactyloides*), western wheatgrass (*Pascopyrum smithii*), little bluestem, and sand dropseed to more mid-grass stands supporting primarily switchgrass (*Panicum virgatum*), prairie sandreed, indiangrass (*Sorghastrum nutans*), sand bluestem (*Andropogon hallii*), big bluestem (*Andropogon gerardii*), sand lovegrass (*Eragrostis trichodes*), green needlegrass (*Nasella viridula*), and needle and thread (*Hesperostipa comata*) depending on soil type. A few native grassland parcels were dominated almost entirely by little bluestem.

Wetland, riparian, and moist meadow communities are confined primarily to the south end of the study area and are found in association with the Republican River and tributary drainages (see Figure 3.6-1). These communities are outside of the project area, and none would be affected by project development.

3.6.2 Environmental Impacts and Mitigation Measures

3.6.2.1 Issues and Significance Criteria

Impacts to vegetation would be considered significant if:

- construction results in the long-term loss of more than 5% of existing native sandhill steppe or native grassland within the study area,
- construction causes a long-term loss of agricultural production that jeopardizes a ranch or farm’s existence, or
- construction or operation results in the invasion of non-native weedy species in temporarily disturbed areas of native sandhill steppe or native grassland.

3.6.2.2 Impacts of the Proposed Project

Direct impacts to vegetation would include surface disturbance of 432 acres during construction (see Table 2.1.1 and 3.6-2) resulting in a short-term loss of 376 acres of sandhill steppe, 52 acres of irrigated cropland/adjacent agricultural disturbance, and 4 acres of native grassland. Most of the disturbed area would be reclaimed and revegetated after completion of construction, and there would be a long-term loss of 65 acres associated with new access roads, turbine foundations, and other project facilities for the life-of-project (52 acres of sandhill steppe, 12 acres of irrigated cropland/adjacent agricultural disturbance, and 1 acres of native grassland). Overall the long-term footprint of facilities would be relatively small in relation to the extent of existing vegetation types within the study area and long-term loss of native vegetation types (less than 1% of existing sandhill steppe and native grassland within the study area) would be relatively minor. Loss of agricultural land and related production would also be very minor, constituting well under 1% of existing agricultural land, and it would not create an economic hardship for any existing farm or ranch.

Figure 3.6-1 Vegetation Communities and Land Use Type Mapping

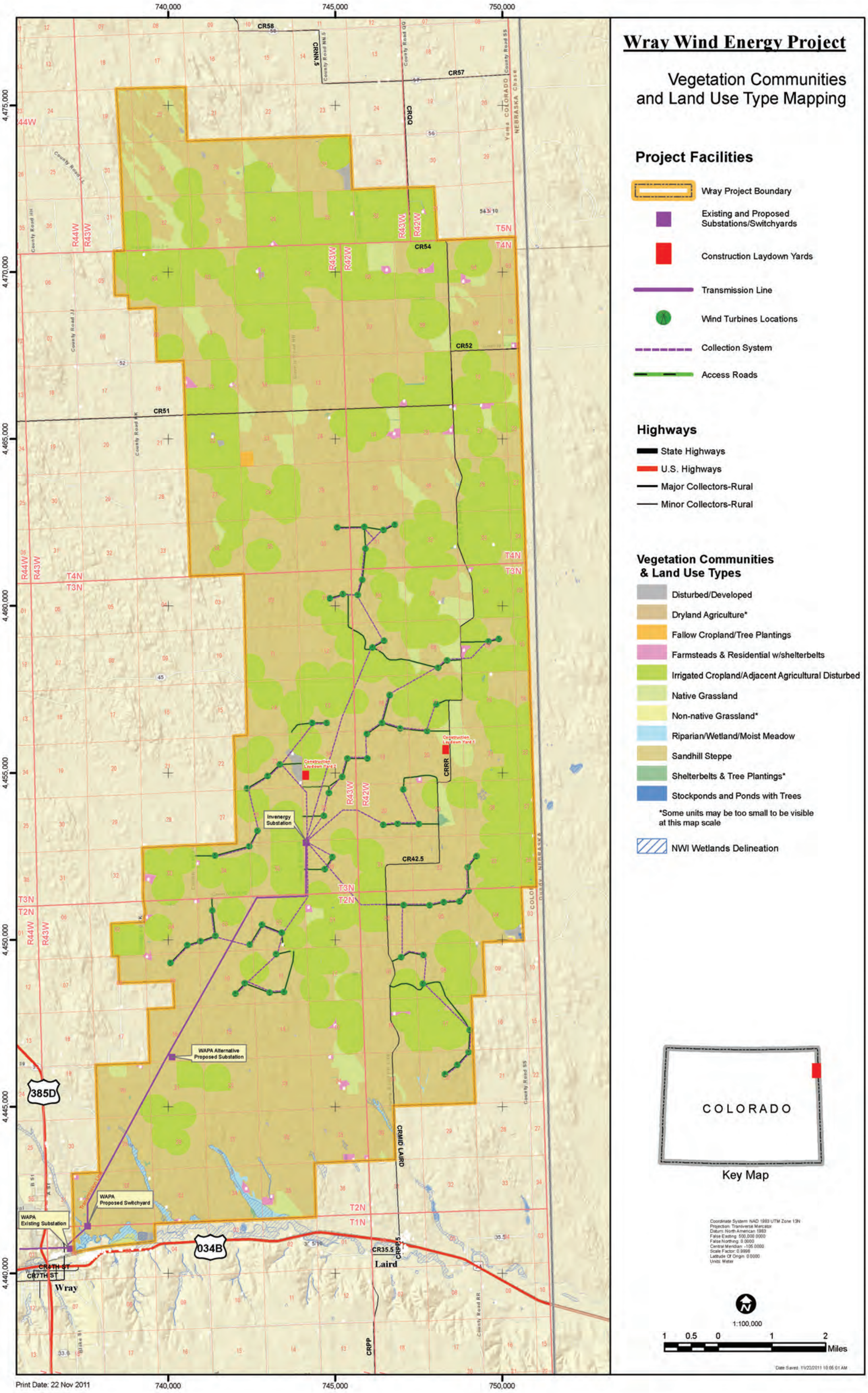


Table 3.6-2 Surface Disturbance Acreage by Vegetation Type

Disturbance	Temporary Disturbance by Vegetation Type (acres)	Long-term Disturbance by Vegetation Type (acres)
Turbine assembly areas/pads	8 - Irrigated Cropland/Adjacent Disturbance 147 - Sandhill Steppe 155 - Total	1 - Irrigated Cropland/Adjacent Disturbance 9 - Sandhill Steppe 10.0 - Total
Existing roads to be upgraded	8 - Sandhill Steppe	0
New access roads to be constructed	1 - Developed Farm Areas 3 - Native Grassland 24 - Irrigated Cropland/Adjacent Disturbance 88 - Sandhill Steppe 116 - Total	1 - Developed Farm Areas 1 - Native Grassland 10 - Irrigated Cropland/Adjacent Disturbance 35 - Sandhill Steppe 47 - Total
Laydown Yard and Batch Plant	15 - Sandhill Steppe	0
Collection system (buried cables)	1 - Developed Farm Areas 1 - Native Grassland 12 - Irrigated Cropland/Adjacent Disturbance 43 - Sandhill Steppe 57 - Total	0
Overhead transmission line	6 - Irrigated Cropland/Adjacent Disturbance 66 - Sandhill Steppe 72 - Total	1 - Sandhill Steppe 1 - Total
Substation and O&M building	9 - Sandhill Steppe	7 - Sandhill Steppe
Totals	432	65

Weed infestations could constitute an adverse effect, but applicant-committed mitigation measures (e.g., washing construction vehicles before going on-site, avoiding weedy areas once on-site, and controlling weeds in accordance with landowner wishes or easement agreements) should minimize impacts from weeds infestations. Further, applicant committed mitigation measures would preclude any access or construction impacts to wetlands, moist meadows, and riparian areas.

Therefore adverse, direct impacts to vegetation resources from the Proposed Project would be short-term and long-term but minor.

3.6.2.3 Impacts of the No Action Alternative

Since there would be no project development with the No Action Alternative, there would be no impacts to vegetation with this alternative.

3.6.2.4 Mitigation Measures

It is recommended that a weed control plan be implemented as part of Invenergy's reclamation plan (IGEN-1 Table 2.2-3). The weed control plan would be used to monitor areas of reclamation and conduct appropriate remedial measures, as necessary, to control and minimize the invasion of weedy species on reclaimed disturbance areas. Implementation of Western's Standard Construction Practices VEG-1, VEG-2, VEG-3 (Table 2.2-2), would ensure that short-term impacts to vegetation would be minimized.

3.7 Soils

3.7.1 Affected Environment – Environmental Setting for the Proposed Project

Map unit descriptions, pedon descriptions, chemical and physical data, and use interpretations for the soils described below were taken from Natural Resource Conservation Service (NRCS) sources. These sources included Yuma County mapping information at Soil Data Mart (NRCS 2011) and the document entitled *Soil Survey of Yuma County, CO* (Larsen 1981).

Fifteen dominant soil map units, including one complex, were mapped within the project area (Appendix C). These soils occur primarily on nearly level to gently sloping upland topographic positions such as sandhills, sandhill valleys, valley swales, and smooth plains. The soils are deep and typically well to excessively drained except for soils overlying some floodplains and terraces where somewhat poorly to poorly drained soils occur. Sand, loamy sand, and sandy loam textures dominate resulting in very low to low to moderate available water capacities. Runoff is predominantly slow. The pH values of these soils typically range from 6.6 to 8.4. These soils are primarily non- to slightly saline and non-sodic. The risk of corrosion to concrete ranges from low to moderate. The water erosion hazard is typically classed as low to moderate reflecting the gentle nature of the slopes within the project area. Conversely, the wind erosion hazard for project area soils, with few exceptions, is classed as severe due to sand-dominated soil textures. Areas of soil "blowouts" are common to map units having surficial sand textures. As a "Potential Source of Topsoil," the fifteen map units are primarily rated as poor where sand and loamy sand textures dominate and as fair to good where heavier textures occur. It was noted in the field that soil map units rated as poor but supporting vigorous vegetation communities are classed by the NRCS as having an average rangeland productivity potential for Yuma County.

Hydric soils are present in the project area but are not common. Soil map units identified as hydric include the Inavale loamy sand (Map Unit 21), Las Animas loam (MU 28), and Platte fine sandy loam (MU 36). Typically associated with riverine conditions, these soils exhibit high seasonal water tables and are subject to ponding or flooding.

No soil map units within the project area boundaries are considered to be "Prime Farmland." "Farmland of Statewide Importance" includes soils that nearly, but do not, meet the criteria of "Prime" or "Unique" farmland but economically produce high yields of crops when properly managed. Map units within the project area that are considered to be Farmland of Statewide Importance include the Haverson loam (MU 17), Haxton loamy sand (MU 18), Julesburg loamy sand, 0 to 3 percent slopes (MU 22), Manter loamy sand (MU 29), and the Manter sandy loam, 2 to 5 percent slopes (MU 30).

3.7.2 Environmental Impacts and Mitigation Measures

3.7.2.1 Issues and Significance Criteria

A significant impact on soils would result if the following were to occur from construction or operation of the Proposed Project:

- severe erosion due to disturbance of areas overlain by highly erodible soils;

- compaction or mixing of soils that would result in long-term loss of productivity or significantly alter current use or revegetative growth; or
- loss of soils that uniquely support threatened or endangered plant species or contamination of soils that support an existing sensitive ecosystem.

3.7.2.2 Impacts of the Proposed Project

Impacts to the soil resource resulting from the Proposed Project are discussed below for the temporary disturbances associated with the 20-year (minimum) project life. The impacts and mitigation measures discussed would also apply to the permanent disturbances following future, final project termination whereby all project disturbances are decommissioned and reclaimed.

Invenergy has committed to a number of mitigation measures to reduce and mitigate impacts to the soil resource. These commitments include limiting surface disturbances, reclaiming all areas not required for operations, employing best management practices (BMPs), developing appropriate lease agreements with landowners, instituting a storm water management plan (SWMP), and consulting with the Natural Resources Conservation Service with respect to appropriate revegetation materials and techniques.

The dominant soils to be impacted are typically rated as having a “slight” to “moderate” water erosion hazard and a “severe” wind erosion hazard (see Appendix C). The hazard for wind erosion is of primary concern. The potential for wind erosion would increase as vegetation is removed from the surface of construction sites and the bare soil is exposed to wind. This potential is ameliorated given the limited acreage of individual disturbances coupled with the presence of established vegetation of surrounding areas which would reduce wind speed and subsequent erosion potential. However, soil loss via wind erosion will occur. Invenergy’s commitments to promptly revegetate disturbed areas not required for operations utilizing BMPs to control erosion will serve to reduce soil loss and promote successful revegetation. The “poor” topsoil rating noted above will be addressed via Invenergy’s mitigation commitments with respect to fertilization and soil stabilization technique application. This impact is rated as adverse, short- to long-term and moderate being essentially reversible with the proper, timely, and aggressive application of revegetation techniques.

During project construction, soil profile materials will be mixed. Mixing will result in both chemical and physical impacts. Profiles of the soils proposed to be impacted have soil pH values ranging from 6.6 to 8.4 and are non- to slightly saline and non-to slightly sodic. As such, mixing would not result in soil chemical degradation that would preclude successful vegetation establishment. Soil organic matter content of the surface soils would be diluted as a result of mixing. However, Invenergy has committed to fertilizing soils to be revegetated to provide the nutrients necessary for plant establishment and growth. Similarly, soil surface profile textures are predominantly sandy with sandy and loamy subsoil textures predominating. Profile mixing would not result in soil textures that would vary appreciably from existing soils or inhibit revegetation. The loss of soil profile structure would also occur. However, the dominant profiles exhibit single grain or a granular structure that would be similar to that exhibited by the soils subject to revegetation. The impacts of profile mixing are adverse, short-term, minor to moderate, and reversible with the application of revegetation techniques.

Compaction will occur across the majority of disturbed sites as a result of construction and operational activities. The level of compaction will likely vary from light at transmission line pole sites to heavy along access road beds and the concrete batch plant. The results of compaction typically include a reduction in infiltration, permeability, and soil pore space leading to a decrease in revegetation potential. Invenergy has committed to rip or otherwise treat compacted soils to relieve this condition as a part of the revegetation techniques to be applied. It also may be noted here that the soil profile sand textures common to the majority of the soils to be impacted could benefit to some degree from compaction in that the water holding capacity of such soils could be increased. The impacts related to compaction are therefore considered to be short- to long-term (depending upon disturbance type), typically adverse, minor, and reversible.

Soil stockpiling associated with road and collection system construction, along with the construction of facility foundations, will lead to a decrease and potential elimination of soil microflora and fauna that support vegetation establishment and growth in endemic soils. Given that the proposed impacted sites are limited in size, surrounded by undisturbed land supporting such soil microflora and fauna promoting the invasion of such, and Invenergy's commitment to fertilize and revegetate disturbed areas, this adverse impact is considered to be short- to long-term, minor, and reversible.

During construction and associated activities, fuels, lubricants, and other materials may be accidentally spilled causing a potential degradation of the soil resource. Invenergy has committed to implementing a SWMP to address such impacts. Given that occurrences would be rare and the affected areas would be properly treated, this adverse impact is considered to be negligible to minor and long-term.

A loss of soil productivity would occur in association with this Proposed Project. The dominant soils to be impacted exhibit average range productivity potentials for the soils mapped in Yuma County. The acreage of soils associated with "permanent" disturbances would be lost for the 20-year (minimum) life of the project. In addition, soil productivity would be lost at all temporary disturbance sites until such disturbances are successfully revegetated (see Table 2.2-1). If the project is terminated at the end of the 20-year life of the project, it can be assumed that all disturbances associated with the project would be revegetated, possibly excepting existing road upgrades, and pre-disturbance soil productivity levels would essentially be restored, in time. If, however, the project is renewed, soil productivity would continue to be lost until such time as the project is terminated in the future. Given the limited size of project components and their dispersed nature, the impacts related to a decrease in soil productivity are considered to be adverse, long-term, and moderate in intensity.

No threatened or endangered plant species or their habitat are known to occur within the footprints of the Proposed Project elements. Therefore, no soil loss would occur that would affect the continued existence of such species or their habitat. There is no known mechanism whereby the soils proposed to be impacted by this project would impact an existing sensitive ecosystem.

3.7.2.3 Impacts of the No Action Alternative

Since there would be no project development with the No Action Alternative, there would be no impacts to soils with this alternative.

3.7.2.4 Mitigation Measures

Implementation of Western's Standard Construction Practices GEN-4, GEN-5, GEN-6, GEN-11 (Table 2.2-2) and Invenergy's Applicant-Committed Mitigation Measures IEROSION-1 (Table 2.2-3) would ensure that short-term impacts to soils would be minimized.

3.8 Wildlife

Wildlife monitoring surveys for the Wray project study area were initiated by SWCA in late summer 2010 and were continued through July 2011 (SWCA 2011). Wildlife species of concern for the Proposed Project and survey protocols were determined in consultation with the Colorado Division of Wildlife (CDOW) and U.S. Fish and Wildlife Service (USFWS) (SWCA 2011). Survey design and protocols were approved by the CDOW and USFWS. Wildlife species or species groups of concern for the Wray Wind Energy Project include: greater prairie chicken; migratory and resident raptors; songbirds; black-tailed prairie dog; and mountain plover. Black-tailed prairie dog, American peregrine falcon, bald eagle, burrowing owl, ferruginous hawk, and mountain plover are discussed in Section 3.9.

3.8.1 Affected Environment – Environmental Setting for the Proposed Project

3.8.1.1 Greater Prairie-chicken

Greater prairie-chickens (*Tympanuchus cupido*) prefer mid-grass sand sagebrush grasslands on sandhills mixed with cornfields and cereal grain crops (Van Sant and Braun 1990). They were not historical residents in eastern Colorado and probably spread westward into the state as small grain cultivation occurred along the South Platte, Republican, and Arikaree river drainages in the late nineteenth century (Jones 1998). Populations increased into the 1920s and early 1930s and then decreased after the mid-1930s until 1973, when the CDOW estimated the statewide population had declined to about 600 birds (CDOW 2010). Between 1973 and 1993, the greater prairie-chicken was listed by Colorado as an endangered species. Through CDOW recovery efforts, including cooperative habitat projects with eastern Colorado land owners, greater prairie-chicken numbers have grown substantially since that time. The birds were delisted to threatened in 1993, and in 1998 they were delisted to special concern/non-game status (CDOW 2010). They are currently managed as a small game species without special status, and current fall population numbers are estimated at 10,000 to 12,000 birds (CDOW 2010). The greater prairie-chicken is now considered a fairly common local resident in the sandhills of northern and central Yuma County, extreme eastern Washington County, and extreme southern Phillips County (CDOW 2010).

From early March into late May, male birds gather at booming grounds (leks) where they conduct elaborate breeding displays to attract and breed to females. After mating, females disperse into nearby grasslands to nest, but males will remain on the leks until the end of the breeding season.

Leks are often on rises or hilltops with reduced vegetation cover where displaying males and hens have a clear view of surrounding terrain. Larger leks with several displaying males are used year after year, while smaller "satellite" leks are used only periodically by a few males. The locations may change in response to population cycles. The larger, more established leks are considered important habitat components for the survival of local populations of greater prairie-chicken.

SWCA conducted greater prairie-chicken lek surveys in conjunction with CDOW personnel over lands leased by Invenergy as well as an additional 0.6-mile buffer zone in April 2011. A total of 45 active leks were located by these surveys. Table 3.8-1 shows the maximum number of males and females observed at leks located during SWCA and CDOW surveys. Male lek attendance ranged from 1 to 3 males (lek 48: one male; leks 9, 17, 34, and 42: three males) at the low end to more than 25 males (lek 7: 26 males; lek 52: 27 males; lek 43: 28 males). Several lek sites consisted of two or three leks in close proximity, within several hundred feet (leks 14 and 15; 18 and 19; 36 and 37; and 10, 40, and 41). Lek sites were concentrated within sandhill steppe habitat and along the margins of agricultural fields. Lek locations are shown on Figure 2.2-1.

Table 3.8-1 Maximum Number of Greater Prairie-chickens at Leks Surveyed on Leased Lands and within a 0.6-mile Buffer Zone

Lek Number	Maximum Number of Males Observed	Maximum Number of Females Observed	Unknown	Maximum Number Observed
2*	20	1		21
3*	5	1		6
4	13	1		14
5	12	2		14
6	6			6

Lek Number	Maximum Number of Males Observed	Maximum Number of Females Observed	Unknown	Maximum Number Observed
7*	26	3		29
8*	11	2		13
9	3			3
10	13	6		19
11	20			20
12	5			5
13	8			8
14	7			7
15	24	1		25
16	12			12
17	3			3
18	14	3		17
19	4			4
20	19	2		21
21*	14			14
22	13			13
23	5	2		7
26	5		1	6
27	11			11
34*	3			3
36*	4			4
37*	7			7
38*	20	5		25
39	12			12
40	5			5
41	7			7
42	3			3
43	28	7		35
44	10	2		12
47	21	10		27
48	1		3	4
49	4	2	2	8
50	17	10		27

Lek Number	Maximum Number of Males Observed	Maximum Number of Females Observed	Unknown	Maximum Number Observed
51	9	3		12
52	27			27
53	4			4
54	11	2		13
55	7			7
56*	9			9
57*	8			8

* Indicates leks within 965-meter (0.6-mile) buffer zone of leased lands.

3.8.1.2 Raptors

Raptors are protected under state and federal laws including the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Raptor use of the study area is restricted primarily to open-country associated species. Raptor species potentially present as year-long residents or summer breeders within the project area include golden eagle (*Aquila chrysaetos*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsonii*), ferruginous hawk (*Buteo regalis*), American kestrel (*Falco sparverius*), prairie falcon (*Falco mexicanus*), sharp-shinned hawk (*Accipiter striatus*), burrowing owl (*Athene cunicularia*), great-horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), and short-eared owl (*Asio flammeus*). Two other species, broad-winged hawk (*Buteo platypterus*) and rough-legged hawk (*Buteo lagopus*), occur in the study area as migrants or winter visitors, respectively.

Seasonal surveys for raptor presence in the study area were conducted by SWCA from late summer/fall 2010 through June 2011 on 12 avian fixed-radius plots within the study area. Survey design and protocols are described in SWCA (2011). The term "mean use" was used by SWCA to characterize avian use within the study area. This term has been widely applied in avian studies at other wind projects in the U.S. (see Erickson et al. 2002). Mean use is reported as number of individuals/plot/20-minute survey. In addition to mean use, "species frequency %" is used to define the percentage of surveys in which a species is detected. This term is important when considering avian use of an area, or mean use, as it relates to how often a species occurred in the area. For example, Species A and B both have a mean use of 1.0 bird/plot/survey but differing species frequency % values of 25% and 100%, respectively. Therefore, Species A was detected in higher numbers per occurrence; an average of one bird per survey but only on one fourth of the surveys. This would equate to an average count of four birds on each survey. While for Species B, one individual was observed on each survey, one bird per survey for 100% of surveys. This comparison suggests that Species A is an uncommon species in the project area, but it exhibited flocking behavior when present. Species B was recorded on all surveys but in low numbers, indicating a lack of flocking behavior. Finally, SWCA discussed "species richness" which is defined as the number of species observed for comparisons between seasons.

SWCA late summer/fall 2010 raptor surveys documented four species of raptors within the study area. They were American kestrel, northern harrier, red-tailed hawk, and ferruginous hawk. The total number of observations for each species was relatively low at one to three for all species except northern harrier which had seven observations.

Raptor surveys completed from mid-December 2010 through March 2011 documented five raptor species in the study area: prairie falcon, golden eagle, northern harrier, rough-legged hawk, and sharp-shinned hawk. Northern harrier was, again, the most frequently observed species with five observations. All other species accounted for only one observation each. Rough-legged hawk is only a winter visitor in the region. The other species are year-round residents.

A total of 102 800-meter fixed radius spring surveys were completed by SWCA for raptors in the study area from April through May 2011. Table 3.8-2 presents the number of observations, species frequency, and mean use for raptors observed during the spring 2011 survey period. Swainson's hawk and red-tailed hawk were the most frequently observed raptors during this spring period. Interestingly, even though northern harrier is a year-round resident in the region, there were no observations of this species during the spring survey period; although, it was the most commonly observed species during the fall 2010 and winter 2010/2011 survey periods. All species except broad-winged hawk are potential breeders in the study area. Broad-winged hawk is a relatively rare migrant in northeast Colorado and breeds farther north into Canada.

Based on the number of raptor species and individuals observed during the SWCA fall and spring survey periods, the study area does not appear to serve as a major migration corridor for raptor species.

Table 3.8-2 Number of Observations, Species Frequency (n = 102), and Mean Use of Raptor Species for All Fixed-Point Survey Plots, April–May 2011

Species	Number of Birds	Species Frequency (%)	Mean Use
Swainson's hawk	16	13	0.16
Red-tailed hawk	16	12	0.16
American kestrel	6	6	0.06
Ferruginous hawk	5	4	0.05
Broad-winged hawk	1	1	0.01
Buteo sp.	1	1	0.01
Total***** (5 species)	45	31*	0.44

* Total Species Frequency (%) represents the percentage of all surveys (n = 102) with at least one raptor detection. For the entire study period, zero raptors were recorded on 70 surveys and the Total Species Frequency (%) was therefore ([102 – 70]/102)*100 = 31%.

Note: Because of rounding error, values may not equal total shown

During the summer season between June 1 and July 1, 2011, 64 surveys were conducted at the 13 fixed-point plots. Table 3.8-3 presents the number of observations, species frequency, and means use for raptors observed during the summer 2011 survey period. Results were somewhat similar to the spring 2011 survey period, and Swainson's hawk and red-tailed hawk again accounted for the majority of the raptor observations.

Table 3.8-3 Number of Observations, Species Frequency (n = 64), and Mean Use of Raptor Species for All Fixed-Point Survey Plots, June–July 2011

Species	Number of Birds	Species Frequency (%)	Mean Use
Swainson's hawk	15	22	0.23
Red-tailed hawk	14	14	0.22
American kestrel	1	2	0.02
Ferruginous hawk	5	8	0.08
Raptor sp.	2	3	0.03
Total***** (4 species)	37	42*	0.58

* Total Species Frequency (%) represents the percentage of all surveys (n = 64) with at least one raptor detection. For the entire study period, zero raptors were recorded on 27 surveys and the Total Species Frequency (%) was therefore ([64 – 37]/64)*100 = 42%.

Note: Because of rounding error, values may not equal total shown

Overall, raptor mean use of the study area was relatively low at 0.37 for all seasons combined. Seasonal use was highest (0.58) during the summer survey period and lowest (0.15) in winter. This difference likely reflects the presence/absence of common breeding species, such as American kestrel, red-tailed hawk, and Swainson's hawk. The only observations of golden eagle, prairie falcon, rough-legged hawk, and sharp-shinned hawk occurred in winter, and only one individual of each species was observed. Species richness was similar across all seasons, varying from three to five species, with ten species observed over the course of the entire survey period. Overall mean use did not substantially differ between agriculture (0.38) and sandhill steppe (0.34) plots. Furthermore, plots in both habitats had higher use in the spring and summer than the fall and winter periods, suggesting that seasonal occurrence influenced survey results more than habitat differences.

SWCA completed an aerial survey and follow-up ground surveys for raptor nests within and near the study area. Details on survey methodology and coverage are provided in SWCA (2011). Raptor nest surveys located 28 nests on leased lands, within a 1.6-km buffer zone of leased lands, and along the approximate overhead transmission line corridor. Nineteen of these nests were active and included: red-tailed hawk, nine nests; Swainson's hawk, five nests; great-horned owl, three nests; and ferruginous hawk, one nest. One nest was determined to be active based on signs of activity at the nest site and nest condition during the aerial survey, but because of land access constraints, species ownership was not determined. All nests located within the study area and 1.6-km buffer zone were stick nests in live deciduous trees (cottonwood or Siberian elm), except for a single Swainson's hawk nest, which was located on the crossbar of a utility line pole. No golden eagle nests were located inside of the study area or in suitable nesting habitat within four miles of the study area. Raptor nest locations within the study area are shown on Figure 2.2-1.

Similar to the results of the avian fixed-radius plot surveys, red-tailed hawk and Swainson's hawk were the two most common species observed nesting within and adjacent to the project area. The low number of nests detected across the project area is indicative of the general lack of suitable nesting structures such as trees, cliffs, and rock outcrops found in the agricultural and sandhill steppe habitats that dominate the study area.

3.8.1.3 Songbirds and Other Non-raptor Avian Species

A number of songbird and other bird species may occur in the study area, although songbird diversity is restricted by relatively low vegetation species diversity and structure, except in riparian habitats along the North Fork Republican River drainage. Most songbirds are open-country species associated with grassland and shrubland habitats. The majority migrate to and from the area and occur only as summer residents. Many of the summer residents are Neotropical migrants that winter in Central and South America.

The Migratory Bird Treaty Act (MBTA) provides federal legal protection for bird species listed at 50 CFR 10.13. The USFWS places the highest management priority on Birds of Conservation Concern (BCC) identified in USFWS (2008). The list of BCC was developed as a result of a 1988 amendment to the Fish and Wildlife Conservation Act. This Act mandated that the USFWS "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973." The goal of the BCC list is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions. These species would be consulted on in accordance with Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds (January 10, 2001).

The habitats and ranges of BCC listed for Shortgrass Prairie (BCR-18) (USFWS 2002) were reviewed to create a list of BCC potentially using habitats found within the study area (Table 3.8-4).

Table 3.8-4 BCC Species Potentially Present in the Wray Wind Energy Project Study Area

Common Name	Scientific Name	Comments on Presence
Northern harrier	*Circus cyaneus*	Documented in study area (see Section 3.8.1.2).
Ferruginous hawk	*Buteo regalis*	Documented in study area (see Sections 3.8.1.2 & 3.9).
American peregrine falcon	*Falco peregrinus anatum*	Unlikely (see Section 3.9).
Prairie falcon	*Falco mexicanus*	Documented in study area (see Section 3.8.1.2).
American golden plover	*Pluvialis squatarola*	Rare, migrant only in study area. Not documented by SWCA surveys.
Mountain plover	*Charadrius montanus*	Potential breeder but presence not documented by SWCA surveys (see Section 3.9).
Solitary sandpiper	*Tringa solitaria*	Migrant only. Not documented by SWCA surveys.
Long-billed curlew	*Numenius americanus*	Migrant only. Not documented by SWCA surveys (see Section 3.9).
Buff-breasted sandpiper	*Tryngites subruficollis*	Rare, migrant only in study area. Not documented by SWCA surveys.
Burrowing owl	*Athene cunicularia*	Documented in study area (see Section 3.9).
Lewis's woodpecker	*Melanerpes lewis*	Rare and unlikely. No records for Yuma County (Kuenning 1998). Not documented by SWCA surveys.
Bell's vireo	*Vireo belli*	Rare, only suitable habitat along N. Fork Republican River. Not documented by SWCA surveys.
Sprague's pipit	*Anthus spragueii*	Rare, migrant only in study area. Not documented by SWCA surveys.
Cassin's sparrow	*Aimophila cassinii*	Likely breeder in study area. Spring and summer presence documented by SWCA surveys.

Common Name	Scientific Name	Comments on Presence
Lark bunting	*Calamospiza melanocorys*	Likely breeder in study area. Spring and summer presence documented by SWCA surveys.
McCown's longspur	*Calcarius mccownii*	Migrant only in study area. Breeding range to the north. Species observed by SWCA surveys in both fall and spring.
Chestnut-collared longspur	*Calcarius ornatus*	Migrant only in study area. Breeding range to the north. Species observed by SWCA surveys in both fall and spring.

Seasonal surveys for non-raptor avian presence, habitat use, and seasonal use patterns in the study area were conducted by SWCA from late summer/fall 2010 through June 2011 on 12 avian fixed-radius plots within the study area. SWCA performed 324 fixed-point avian surveys (108 hours of survey time) from August 2010 through June 2011. Survey design and protocols are described in SWCA (2011).

SWCA surveys recorded 3,008 non-raptor avian individuals representing 48 species on the 324 fixed-point bird surveys conducted. Mean use of the project area was 9.28 birds/plot/20-minute survey period. Horned lark accounted for 1,156 individuals (38% of non-raptor observations) with a mean use of 3.57. Horned lark was also recorded on more surveys (196 of 324 or 60.5%) than any other species. Western meadowlark ranked second in mean use at 0.99 (a value 3.5 times lower than for horned lark) and was observed on 40.1% of surveys. Observations of other species dropped off considerably after western meadowlark with total observations of fewer than 200 individuals, mean use values below 0.6, and frequency of observation per survey mostly below 20%.

During the spring (April–June 2011) survey period, SWCA conducted 102 surveys and recorded 793 individuals representing 38 species. Mean use for the season was 7.77 birds/plot/20-minute survey period. Horned lark and western meadowlark accounted for 174 (22%) and 163 (21%), respectively, of the 793 individuals. Compared to the full-year results, horned lark was less prevalent in spring (mean use was 1.71 in spring and 3.57 for all seasons). Western meadowlark, in contrast, had a higher mean use in spring (1.60) than observed for all seasons combined (0.99). BCC species observed during this period were:

- Cassin's sparrow, 18 observations for a mean use of 0.18;
- lark bunting, 98 observations for a mean use of 0.96;
- chestnut collared longspur, 9 observations for a mean use of 0.09; and
- McCown's longspur, 2 observations for a mean use of 0.02.

Chestnut collared longspur and McCown's longspur are only migrants in the study area and were not recorded during the early summer 2011 surveys.

Of the SWCA early summer June 1–July 1, 2011 season surveys, 64 surveys recorded 552 individuals representing 25 species. Horned lark accounted for 24% of all sightings, 135 of 552 individuals, and had a mean use of 2.11. It was recorded on nearly 60% of surveys. Other species expected as common summer residents in the study area habitats in northeastern Colorado (Andrews and Righter 1992; Kingery 1998) and documented by the SWCA summer surveys included:

- grasshopper sparrow, 84 observations for a mean use of 1.31;
- lark bunting, 48 observations for a mean use of 0.75;
- lark sparrow, 45 observations for a mean use of 0.70;
- Cassin's sparrow, 41 observations for a mean use of 0.64; and
- western meadowlark, 33 observations for a mean use of 0.52.

These summer resident species accounted for 46% of all sightings: 251 of 552 individuals.

There were 787 non-raptor avian individuals representing 28 species recorded during 96 late summer/fall SWCA surveys. Mean use of the study area was 8.20. Horned lark, again, was the most commonly recorded species, accounting for 44% (349) of the total observations (787) with a mean use of 3.64. Western meadowlark had the second highest mean use at 1.10 with 106 individuals. Horned lark and western meadowlark combined accounted for 58% of all non-raptor detections. Fall migrants (chestnut collared longspur, 62 observations for a mean use of 0.65, and McCown's longspur, 4 observations for a mean use of 0.02) were the only BCC species recorded during this survey period.

SWCA conducted 62 surveys during the winter period (December 14-March 27, 2011) and recorded 876 individuals representing eight non-raptor species. Mean use of the study area was 14.13. Horned lark and Lapland longspur, combined, accounted for 770 individuals and 88% of the project area's mean use. A number of the horned lark and Lapland longspur observations were recorded as mixed flocks, and all the mixed flocks observed were composed of these two species.

Habitat Use and Summary

When plots were aggregated by habitat type, mean use values for the five agriculture and eight sandhill steppe plots were 13.51 and 6.49, respectively. Examination of the seasonal summaries and species composition indicates that agriculture plots were strongly influenced by horned lark and Lapland longspur numbers during the winter season. Five of six plots with the highest mean use were in agriculture during the winter season, ranging from 6.60 to 65.20. The one exception was a sandhill steppe plot with a mean use of 21.40. Of the 107 individuals observed at that plot in winter, 105 were either horned lark or Lapland longspurs. For all other sandhill steppe plots, mean use ranged from 1.40 to 3.80 during winter.

Agriculture plots, collectively, also had higher mean use values during the spring, summer, and fall seasons. Mean use values for agriculture and sandhill steppe plots, respectively, were 9.69 and 6.59 in the spring, 9.76 and 7.90 in the summer, and 10.93 and 6.25 in the fall. Reasons for these differences are uncertain, but possible explanations include: 1) higher abundance and/or availability of food items such as seed in agriculture areas, and 2) higher detectability of individual birds foraging at ground level in harvested agriculture sites compared to the vegetated sandhill steppe plots.

Seasonal variation in mean use was evident in the one year of data collected for the Wray Wind Energy Project. Mean use was highest in winter (14.13) and lowest in spring (7.77) indicating that while fewer species were observed in winter, mean use of the area was higher than in spring when more species were detected. Mean use values in summer and fall were similar to the spring mean use at 8.63 and 8.20, respectively.

Species richness was highest during the spring season (April–May) with a total of 38 species observed and lowest in winter (December–March) with eight species observed. The summer and fall migration seasons were similar with 25 and 28 species, respectively.

3.8.1.4 Avian Flight Height Evaluation

SWCA (2011) evaluated observed heights of raptor and non-raptor species during the fixed-point surveys against two possible wind turbine generator heights, one with a hub height of 80 meters (260 feet) and one with a hub height of 100 meters (330 feet). The rotor diameter for the Wray Wind Energy Project would be up to 100 meters. Therefore, the rotor-swept zone for two general ranges were evaluated from 30 to 130 meters above ground level and 50 to 150 meters above ground level.

For the 3,115 birds (raptors and non-raptors) observed during the fixed-point surveys, 174 (6%) had flight height estimates between 30 and 130 meters above ground level. Horned lark had the highest absolute number of individuals observed within this height range, but that total accounted for only 5% of all horned lark observations. Swainson's hawk had the highest number of raptor observations (24), which accounted for 77% of all observations for this species.

A total of only 82 observations (3%) were made within the rotor-swept area (50 to 150 meters above ground) of a 100-meter tower. A single flock of 37 red-winged blackbirds accounted for 45% of all observations in that height range and 65% of all observations of red-winged blackbirds. Single observations of three horned larks accounted for the remaining non-raptor observations. Of the 42 raptor observations within 50 to 150-meter rotor-swept area, 55% (23) were Swainson’s hawks and 31% (13) were red-tailed hawks.

Table 3.8-5 summarizes the number of individuals and percentage of species observed within the two rotor-swept zones. Six species, all non-raptors, were observed within the 30 to 130-meter range but not at the 50 to 150-meter range. Three species, red-winged blackbird, sharp-skinned hawk, and turkey vulture, had no change in numbers between the two rotor-swept zones. There were large declines in observations for horned lark and American kestrel in the 50 to 150-meter zone, with 95% and 75% fewer total observations, respectively. Swainson’s hawk observations for the two rotor-swept zones were relatively similar.

In summary, SWCA's avian flight height evaluation surveys indicate that increasing turbine hub height may reduce the risk of songbird collisions with rotor blades since substantially fewer songbird individuals were observed above the 50-meter rotor-swept zone. However, increasing turbine hub height may have little effect on the risk for raptor collisions with rotor blades since raptor observation frequencies were relatively similar between the lower and higher rotor-swept zones evaluated.

Table 3.8-5 Comparative Analysis of Species Detected on Fixed-Point Surveys with Flight Height Estimates from 30 to 130 meters and 50 to 150 meters Above Ground Level, August 2010–July 2011

Species	30 to 130 m		50 to 150 m		Comparative Difference	
	Number of Observations	% of Species	Number of Observations	% of Species	Dif. Number of Birds	Dif. % of Species*
Horned lark	63	5	3	<1	-60	-95
Red-winged blackbird	37	65	37	65	0	0
Swainson's hawk	24	77	23	74	-1	-4
Red-tailed hawk	16	47	13	38	-3	-19
Lapland longspur	15	9	0	0	-15	-100
Common nighthawk	5	83	0	0	-5	-100
American kestrel	4	36	1	9	-3	-75
Ferruginous hawk	3	27	2	18	-1	-33
American goldfinch	1	3	0	0	-1	-100
Barn swallow	1	3	0	0	-1	-100
Chestnut-collared longspur	1	1	0	0	-1	-100
Sharp-shinned hawk	1	100	1	100	0	0
Turkey vulture	1	50	1	50	0	0

Species	30 to 130 m		50 to 150 m		Comparative Difference	
	Number of Observations	% of Species	Number of Observations	% of Species	Dif. Number of Birds	Dif. % of Species*
Blackbird sp.	1	100	0	0	-1	-100
Raptor sp.	1	50	1	50	0	0
Total	174	6	82	3	-92	-50

*The difference in % of species is calculated on a relative basis between the 30- to 130-m and 50- to 150-m values. Thus, in the total row the absolute difference between 6% and 3% of all bird observations is 3%. However, on a relative basis, this difference would be stated as 50% since 3% is half of 6%. Thus, at 50- to 150-m, 50% fewer birds were observed than in the 30- to 130-m range.

3.8.1.5 Bats

Vegetation mapping and analysis indicates that suitable foraging and roosting habitat for bats is limited within the study area. Most bats occurring as summer breeders or migrants in the study area require trees for roost sites and riparian habitats and water for foraging habitat. Stream and riparian/wetland systems exist only along the North Fork Republican River and its larger tributaries along the southern edge of the study area. Other areas with trees are present only as widely scattered shelterbelts and tree plantings associated with farmsteads and agricultural fields. Additional surface water sources are restricted to a few stock ponds and stock tanks. Based on the extent of trees, water sources, and riparian systems mapped within the study area (see Table 3.6-1), only about 900 acres (or 1%) of the area within the project boundary provides suitable habitat for foraging or roosting bats.

SWCA conducted seasonal bat surveys from September 2010 through July 2011 using Anabat recording equipment. SWCA bat survey data were collected at two meteorological (MET) towers established by Invenergy to collect wind data and with two mobile units at selected locations within the study area. At each of the two MET towers, two Anabat recording devices were attached, one at 3 meters high and one at 45 meters high. Details on the timing, location, and duration of bat surveys using Anabat equipment are provided in SWCA (2011).

The Anabat bat detection system uses a broadband microphone and a data storage unit to detect and record ultrasonic sounds. Bats use ultrasonic calls to navigate and to find their insect prey. Once the recordings from the units are downloaded and analyzed out of the field, the number of bat passes can be determined and categorized, occasionally by species, but usually only by a characteristic frequency range. Table 3.8-6 groups bat species known to occur in northeastern Colorado by the frequency range for the sounds they produce.

Table 3.8-6 Northeastern Colorado Bats Grouped by Sound Frequency Class

Low Frequency (< 30 kHz)	Mid-Frequency (30-40 kHz)	High Frequency (> 40 kHz)
Hoary bat	Fringed myotis	Western small-footed myotis
Silver-haired bat	Townsend’s big-eared bat	Little brown myotis
Big brown bat	Eastern red bat	

Three northeastern Colorado bat species are categorized as low frequency bats: hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionicteris noctivagans*), and big brown bat (*Eptesicus fuscus*). Of these, only the big brown bat’s breeding range extends into northeastern Colorado (Adams 2003). Hoary and silver-haired bats likely only occur as migrants in the region (Adams 2003).

Mid-frequency bats occurring in northeastern Colorado include eastern red bat (*Lasiurus borealis*), fringed myotis (*Myotis thysanodes*), and Townsend's big-eared bat (*Corynorhinus townsendii*). The breeding range of eastern red bat overlaps the study area region, but in Colorado it has only been found along riparian corridors (Adams 2003). Riparian habitat along the North Fork Republican River represents the only potential breeding habitat for eastern red bat in the study area. Townsend's big-eared bat and fringed myotis are not known to breed in the study area region, but they are likely migrants through the area because known breeding areas exist to the north and south of the study area (Adams 2003).

Western small-footed myotis (*Myotis ciliolabrum*) and little brown myotis (*Myotis lucifugus*) are the only two high frequency species potentially occurring in the study area. Their known breeding ranges do not include eastern Colorado, but they are likely migrants through the study area because known breeding areas exist to the north and south of the study area (Adams 2003).

In general, SWCA Anabat surveys confirmed a relatively low level of bat use of the study area from mid-August 2010 through mid-August 2011, as expected, because of the relative lack of suitable bat habitat. A summary of the annual survey results is provided in Tables 3.8-7 and 3.8-8.

Table 3.8-7 Total Bat Passes by Frequency and Unclassified for the Mobile Anabat Unit Bat Survey Locations - September 22, 2010 through August 15, 2011

Location	Dates of Survey (total survey nights)	Low Frequency	Unclassified	Total Bat Passes (per survey night)
Bat Survey Location 1	Sep 22–Oct 6, 2010; Oct 22–Nov 1, 2010; Mar 18–Apr 6, 2011; Jun 23–Jul 12, 2011 (66)	2	0	2 (0.03)
Bat Survey Location 2	Oct 7–21, 2010; May 27–Jun 9, 2011 (29)	0	0	0
Bat Survey Location 3	Apr 7–26, 2011; Jul 13-24, 2011 (32)	20	3	23 (1.15)
Bat Survey Location 4	Apr 27–May 12, 2011 (15)	6	1	7 (0.47)
Bat Survey Location 5	May 13–23, 2011 (11)	0	0	0
Bat Survey Location 6	Jun 10–22, 2011 (13)	0	0	0
Bat Survey Location 7	Jul 25–Aug 15, 2011 (22)	0	0	0
Totals		28	4	32

Table 3.8-8 Total Bat Passes by Frequency and Unclassified for MET Tower Anabat Units - August 19, 2010 through August 15, 2011

Location (nights surveyed)	Low-Frequency	Mid-Frequency	High-Frequency	Unclassified	Total Bat Passes
Met North - 45m (220)	34	2	1	4	41
Met North - 3m (220)	1	3	0	2	6
Met South - 45m (175)	21	1	1	6	29
Met North - 3m (144)	9	0	0	2	11
Totals	65	6	2	14	87

The mobile Anabat units recorded a total of 32 bat passes at seven survey locations. The Bat Survey Location 3 accounted for 72% of all passes recorded by the mobile units, with 23 bat passes. This location was surveyed twice in 2011 from April 7–26 and July 13–24. Bat passes were only recorded during the April survey dates, indicating that most or all of these individuals may have been migrants passing through the area since no activity was recorded during the July survey period. Seven bat passes were recorded at the Bat 4 location, six of which were of low-frequency bats and one was unclassified. The two bat passes at the Bat 1 location were of a low-frequency bat species, one on September 26, 2010 and the other on October 6, 2010.

The number of total bat passes at the MET-based units ranged from six to 41 (Table 3.8-8). For all MET-based units combined, 87 bat passes were recorded (Table 3.8-8). Three times as many low frequency bat passes were recorded than all other frequency groups and unclassified calls combined. All of the bat calls recorded in 2011 were low frequency or unclassified bats. Very little bat activity was recorded in August and October 2010 and March, June, and July 2011. August 2011 accounted for 15% (13 of 87) of all bat detections. The September 2010 survey period accounted for the greatest number of bat detections at 47% (41 of 87). May 2010 was the third highest detection period with 14% (12 of 87) of all bat detections.

The Anabats at the 45-meter level recorded higher numbers of low frequency bats, 46 bat passes, than the 3-meter units (10 bat passes). This difference is expected since low frequency bat species tend to forage at greater heights above ground level than higher frequency bats. This is the result of differences in wing morphology and echolocation (Norberg and Rayner 1987). Higher frequency bats have average to high wing loading, or high body mass to wing area, which indicates slow but agile flight. This flight style may make it more difficult for them to maneuver in open spaces with wind. Conversely, low frequency bats generally have lower wing loading and larger wings in relation to body mass, which allows for fast flight but less maneuverability (Norberg and Rayner 1987).

Seasonal differences in collected data suggest that the study area experiences some bat migration in spring and fall, but summer bat populations are sparse. Overall, bat use of the study area, even during the migration periods, appears to be relatively low since the average detection rate over 759 survey nights was only 0.11 bat/survey night. These data suggest that the study area is not within a major migratory corridor for bats.

3.8.2 Environmental Impacts and Mitigation Measures

3.8.2.1 Issues and Significance Criteria

Impacts to wildlife resources would be considered significant if:

- construction activities occur on established greater prairie-chicken leks or breeding grounds during the nesting season;
- mortality of birds from collisions with wind turbines reduced local numbers of the affected species to the point where there are measurable population declines; or
- mortality of bats from collisions with wind turbines reduced populations to the point where a species needs protection under state or federal law.

3.8.2.2 Impacts of the Proposed Project

Potential impacts to wildlife from the Proposed Project may result from direct mortality, habitat loss, and indirect habitat loss. Direct mortality is the result of collisions with turbines, meteorological towers, overhead power lines, and substation structures, and, additionally for bats, may be caused by rapid reduction in air pressure close to the turbine blades resulting in barotrauma-related lung injuries (Baerwald et al. 2008). Habitat loss is due to the footprint of turbine pads, other infrastructure, and roads. Indirect habitat loss is loss of use of seemingly suitable habitat because man-made structures or human activity result in wildlife avoidance of disturbance sites beyond the boundaries of the actual disturbance.

Ground disturbance impacts would include temporary and permanent loss of habitats for wildlife in general. Initial direct habitat disturbance would include construction laydown areas and turbine assembly pads, new access roads, upgrades to existing access roads, trenching for burying collection system cables, laydown yard and batch plant, overhead transmission line, and substation (see Table 3.6-2). Upon completion of construction, turbine footprints would be reduced to a 100-foot diameter area, road widths would be reduced from 24 feet to 16 feet, and collection system trenches and laydown areas would be reclaimed. The timing of reclamation and revegetation of temporary disturbances would be variable; depending on the time of year construction is completed.

Long-term impacts include permanent loss of habitat and habitat fragmentation due to the presence of the new facilities, as well as regular disturbance from humans during periodic maintenance. Invenergy has attempted to avoid new disturbance and habitat fragmentation to the extent commercially possible by using existing roadways and previously disturbed surface areas wherever possible (IWILDLIFE-4, Section 2.2.9).

Specific impacts of the Proposed Project are addressed under the four species or species group categories identified as the wildlife areas of greatest concern for the Proposed Project: greater prairie chicken, raptors, songbirds and other non-raptor avian species, and bats.

Greater Prairie-chicken

Invenergy has sited its turbine locations to be outside of the 0.6-mile buffer zone recommended by the CDOW wherever possible, given private land access and project development constraints. Invenergy reviewed turbine locations with J. Melby, District Wildlife Manager of CDOW in the field. The few turbine locations sited within the 0.6-mile buffer zone were determined to be acceptable by the CDOW, based on topographic shielding and line-of-sight considerations. Invenergy has also committed to keeping all construction activities outside of the 0.6-mile buffer zone during the greater prairie-chicken breeding period from March1 through May 15. Based on these considerations, the Proposed Project would have little to no direct effect on greater prairie-chicken breeding activity.

Potential indirect effects of project development on greater prairie chicken, in terms of habitat loss and avoidance, are more difficult to predict, since few wind farm projects have been developed in greater prairie-chicken population areas similar to the Wray Wind Energy Project site. The Meridian Way Wind Farm in north-central Kansas has been developed in greater prairie-chicken habitat, and a team of researchers from Kansas State University is studying the effects of the wind farm on the local greater prairie-chicken population. At the end of October 2011, the study will have accumulated three years of pre-construction and three years of post-construction data, and the research team plans to conduct comprehensive analyses on this data. Unfortunately, plans for publishing the results as multiple manuscripts to wildlife journals for peer review will not occur until mid-2012 (NWCC 2011).

The potential for impacts to the local greater prairie-chicken population was discussed with Marty Stratman with the CDOW in Brush (Stratman 2011). Stratman indicated that keeping new roads to a minimum and keeping disturbance activities out of the 0.6-mile lek buffer zone during breeding activities were probably the most important mitigation measures for minimizing impacts to the local greater prairie-chicken population. He also indicated that monitoring populations and assessing impacts could be difficult since lek activity is very dynamic, and locations and attendance at smaller leks can be highly variable from year to year. Locations and use of the larger more established leks are more consistent, however. In general, Stratman indicated that project development might cause some loss of smaller leks and breeding activity in the short-term, but that local populations are likely to acclimate to turbine presence and return to pre-construction levels over the long-term.

The risk of greater prairie-chicken fatalities due to collisions with turbine blades is not a concern associated with the potential development of the Proposed Project because they remain close to the ground when flying. Their flight patterns are not within the rotor-swept area of newer generation turbines, and the fatality rate for collisions with turbine blades would be zero.

One additional area of concern is construction of the new overhead transmission line (which would be adjacent to an existing power line) from the proposed Wray Wind Energy Project substation to Western's substation near Wray. As indicated on Figure 2.2-1, the proposed transmission line would pass near four greater prairie-chicken leks in Section 10 near the north end of the line. Poles constructed for the transmission line could create new raptor perch sites and possibly make breeding greater prairie-chickens more vulnerable to predation by raptors. Increased predation opportunities and pressure could have negative effects on nearby greater prairie-chicken populations.

In summary, Invenergy has committed to keeping all construction activities outside of the 0.6-mile buffer zone during the greater prairie-chicken breeding period. Based on these considerations, the Proposed Project would have negligible to no short-term or long-term direct effects on greater prairie-chicken breeding activity.

Potential indirect effects of project development on greater prairie chicken, in terms of habitat loss and avoidance, are more difficult to predict, since few wind farm projects have been developed in greater prairie-chicken population areas similar to the Wray Wind Energy Project site. Invenergy has committed to following these mitigation recommendations, but it is possible that project development may cause minor loss of smaller leks and breeding activity in the short-term. However, local populations are likely to acclimate to turbine presence and return to pre-construction levels over the long-term.

Raptors

Potential impacts to local populations of raptor species would include loss of habitat for hunting, disturbance to or near active nest sites resulting in loss of production, and direct fatalities through collisions with wind turbine blades. The risk of raptor and other non-raptor bird fatalities from collisions with wind turbine blades is discussed in the following section. Direct or indirect impacts to active raptor nests from project construction and operation would not be likely since Invenergy has agreed to all CDOW recommended guidelines for seasonal restrictions and buffer zones relating to active raptor nests (see IWILDLIFE-5 in Section 2.2.9).

Direct and indirect habitat loss of hunting habitat for raptors would likely have negligible effects on resident, breeding populations of raptors since, even during construction disturbance, less than 1% of the project study area would be disturbed. The additional indirect effect of possible raptor avoidance of human disturbance areas over the short-term would also be relatively minor given the amount of remaining undisturbed habitat within the study area. Once construction and reclamation are complete, long-term habitat losses would be negligible for wide-ranging raptor species.

Songbirds and Other Non-raptor Avian Species

Potential impacts to local populations of songbird and other non-raptor avian species would include loss of habitat, disturbance to or near active nest sites resulting in loss in production, and direct fatalities through collisions with wind turbine blades.

Direct habitat loss would be relatively minor for bird species within the study area since there would be less than one percent of the study area affected during construction, and long-term, direct habitat loss would be well below that amount, less than 0.1% (65 acres of approximately 79,000 acres). Although a number of studies have reported on fatality rates for birds from turbine blade collisions, few wind farm studies have addressed the effects of direct and indirect habitat loss in grassland and shrub steppe communities. The few studies available have reported mixed results in this regard.

Osborn et al. (1998) found significantly fewer birds and significantly fewer species in the vicinity of turbine strings than at control sites, and noted that birds adjusted their flight behavior to avoid the turbines. While TRC (2008a) grassland bird surveys before and after construction of the Judith Gap Energy wind farm in Wheatland County, Montana, suggest that there was actually an increase in the numbers of some species of grassland birds and overall counts were higher along transects near turbines after construction compared to bird data on control transects at distance from turbines. Studies of grassland bird species near a wind farm in grassland habitat in Oklahoma (O'Connell and Piorkowski 2006) determined that only one species' (western meadowlark) density, out of 23 species, was lower at turbine sites versus control sites away from turbine locations. Other studies (Leddy et al. 1999, Johnson et al. 2000, and Erickson et al. 2004) have indicated small-scale decreases in grassland breeding bird populations near turbines. Based on these existing studies, it seems reasonable to expect some reductions in breeding bird populations near developed turbine sites, at least for a few species. These declines would be for relatively common and widespread grassland avian species, and potentially small and localized population reductions would not have a measurable effect on population viability.

A number of mortality studies have been conducted for wind farm developments in grassland and shrub steppe communities and agricultural grassland habitats. Erickson et al. (2002) completed one of the more thorough reviews of these studies in recent years. This paper reviewed avian mortality and risk (use) data from 26 studies conducted at 22 U.S. wind facilities, 19 of which were located in landscapes dominated by grassland, agricultural grassland, and/or shrub-steppe habitats. Based on their review, mortality rates at U.S. wind facilities average 2.19 bird fatalities/turbine/year (with a range of 0 to 4.45). Songbirds accounted for the majority at 82% of these fatalities. Outside the California wind farms, (Altamont Pass, Montezuma Hills, San Gorgonio, and Tehachapi Pass), higher number of fatalities for raptors and other larger avian species have been documented.

Data available from more recent studies of western wind farm projects in open habitats similar to the Wray Wind Energy Project study area (Erickson et al. 2003, Johnson et al. 2003, Young et al. 2003, Brown and Hamilton 2006, TRC 2008a, TRC 2008b) provide avian fatality rates for all species ranging from 1.9 to 4.67 avian fatalities/turbine/year. All fatality rate estimates in these studies were corrected for observer search efficiency as well as carcass removal rates by scavengers. The highest bird mortality rate of 4.67 was reported (TRC 2008b) for the Spring Canyon Wind Project located in Logan County approximately 65 miles northwest of the Wray Wind Energy Project area. Fatality rates for raptors, where they were provided as a separate group (Erickson et al. 2003, Johnson et al. 2003, Young et al. 2003, Brown and Hamilton 2006), were very low, ranging from 0.0 to 0.065 raptor fatalities/turbine/year, which corresponds to one of the conclusions of Erickson et al. (2002) that raptor mortality has been absent to very low at all newer generation wind plants they studied.

The review of data presented by Erickson et al. (2002) indicated that horned lark accounted for a majority of the fatalities for songbirds followed by nocturnal migrants. They suggested that aerial displays performed by horned larks may make this species more vulnerable to turbine blade collisions, but their vulnerability may also simply be a function of being the most dominant species present in many of the studies. They also indicated that studies of nocturnal migration at several wind plants suggest that mortality for these migrants appears to be very low compared to the rates of birds passing through the area.

SWCA (2011) yearlong point count surveys have demonstrated relatively low raptor and non-raptor avian use of the study area for most species (see Sections 3.8.1.2 and 3.8.1.3). Low raptor mean use numbers calculated by SWCA (2011) for the study area are likely a fairly good predictor for low fatality rates if the Wray Wind Energy Project is constructed. Unfortunately, Johnson and Erickson (2008) determined that, for a number of wind farms in the Columbia Plateau region of eastern Washington and Oregon, there is little correlation between total numbers of songbirds observed during pre-construction surveys and post-construction mortality. They suggested this was because many of the collision fatalities are nocturnal migrants, which are not accounted for during diurnal surveys. It is reasonable to assume that non-raptor mortality rates for the Wray Wind Energy Project would be somewhere in the range of fatality rates, 0 to 4.67 fatalities/turbine/year, determined for other existing projects in similar habitats. This range of fatality rates is not likely to impact local populations of non-raptor avian species to the point where there are measurable population declines.

SWCA's (2011) evaluation of avian flight heights in the study area indicates that tower hub heights of 100 meters or more would substantially reduce the risk of avian/turbine blade collisions for most songbirds, but only slightly for raptors. What is uncertain, however, is whether increasing turbine hub height to 100 meters or more would increase the fatality rate for nocturnal migrants.

In summary, potential impacts to local populations of songbird and other non-raptor avian species would include loss of habitat, disturbance to or near active nest sites resulting in loss of production, and direct fatalities through collisions with wind turbine blades. Direct habitat loss would be relatively minor for bird species within the study area since less than 1 percent of the study area would be affected during construction, and long-term, direct habitat loss would be well below that amount (less than 0.1% or 65 acres of approximately 79,000 acres).

Bats

Bats may be impacted due to collision-related mortality, and some wind projects are known to cause substantial bat mortality (Arnett et al. 2008, Kunz et al. 2007, Erickson et al. 2002). Recent findings indicate that the reduced air pressure in the vicinity of turbine blades causes internal trauma leading to death for bats without direct contact with turbine blades (Baerwald et al. 2008). Bat mortality studies at operating wind farm projects indicate that the large majority of bat fatalities at wind plants involve migratory tree and foliage roosting bats such as hoary and silver-haired bats during the late summer and fall in the western U.S. (Erickson et al. 2002, Pirokowski 2006, Cryan 2011). Impacts to local breeding populations of bats appear to be relatively rare except where wind farms have been developed in close proximity to known maternal colonies (Erickson et al. 2002, Piorkowski 2006). Unfortunately, few, if any, studies have correlated bat baseline activity studies (prior to construction) with fatality rates once a project becomes operational. When they have, there has been little correlation between bat activity at turbines and the number of bat fatalities (Erickson et al. 2002). Since the majority of fatalities are for migrant species, this lack of correlation may be a result of migrants not using echolocation for navigation or flying too high for bat detectors to record their echolocation calls but still within the zone of collision risk (Erickson et al. 2002). None of the studies reviewed by Arnett et al. (2008) found differences in bat fatalities between turbines without lighting versus turbines equipped with lighting required by the Federal Aviation Administration.

Data available from recent studies of western wind farm projects in open habitats similar to the Wray Wind Energy Project study area (Erickson et al. 2003, Johnson et al. 2003, Young et al. 2003, Brown and Hamilton 2006, TRC 2008a, TRC 2008b) provide bat fatality rates ranging from 1.2 bat fatalities/turbine/year to as high as 18.48 bat fatalities/turbine/year. All fatality rate estimates were corrected for observer search efficiency as well as carcass removal rates by scavengers. At the Spring Canyon Wind Project located in Logan County approximately 65 miles northwest of the Wray Wind Energy Project area, bat fatality surveys identified 16 hoary bat fatalities for an estimated fatality rate of 2.88 bats/turbine/year (TRC 2008b).

Based on information presented in Section 3.8.1.5, hoary, silver-haired, and eastern red bats are the most likely migrant tree and foliage roosting bats to fly over the Wray Wind Energy Project study area. SWCA (2011) baseline bat activity surveys recorded low frequency bats such as hoary and silver-haired as the most commonly occurring bats, and the majority of detections were during the spring and fall migration period. Overall, however, the total number of seasonal bat detections for the study area was very low. This suggests that potential bat fatalities at the Wray Wind Energy Project would likely be at the lower range of bat fatality rates, 1.2 to 2.88 bat fatalities/turbine/year, reported for other western wind farm projects, and that hoary bat and silver-haired bats may be at highest risk for turbine blade collisions.

Populations of hoary bat and silver-haired bat are not considered at risk, and neither species is federal listed as threatened, endangered, proposed, or candidate or state listed as threatened, endangered, or species of special concern. Therefore, the relatively low level of bat fatalities projected for these species with development and operation of the Wray Wind Energy Project is not likely to reduce populations to the point where these species need protection under state or federal law. Therefore impacts would be considered minor to negligible for the long-term.

3.8.2.3 Impacts of the No Action Alternative

Since there would be no project development with the No Action Alternative, there would be no impacts to wildlife with this alternative.

3.8.2.4 Mitigation Measures

In order to preclude raptor perching on overhead transmission line poles within 1 mile and in direct line-of-sight of greater prairie-chicken leks, Invenergy should install raptor anti-perch devices on any new transmission line poles within 1 mile and in direct line-of-sight of known lek locations. Since the potential indirect effects of project development on local greater prairie-chicken is uncertain, it is recommended that greater prairie-chicken lek monitoring surveys be continued after construction, in coordination with the CDOW.

Implementation of Western's Standard Construction Practices WILDLIFE-1, WILDLIFE-2 (Table 2.2-2), and Invenergy's Applicant-Committed Mitigation Measures IWILDLIFE-1, IWILDLIFE-2, IWILDLIFE-3, IWILDLIFE-4, IWILDLIFE-5 (Table 2.2-3) would ensure that short-term impacts to wildlife would be minimized.

3.9 Special Status and Sensitive Species

The USFWS Mountain-Prairie Region website was accessed to obtain its most recent (July 2010) list of threatened, endangered, candidate, and proposed species by county for Colorado (USFWS 2011a). The State of Colorado's list of threatened, endangered, and special concern species was reviewed on the CDOW's website (CDOW 2001). State listed species with ranges that include the study area are addressed in this section.

3.9.1 Affected Environment – Environmental Setting for the Proposed Project

3.9.1.1 Federal Threatened, Endangered, Proposed, and Candidate Species

Based on the USFWS listing by county, there are no federal threatened, endangered, proposed, or candidate plant or wildlife species occurring in Yuma County. The mountain plover was formerly listed as proposed for listing as threatened, but the USFWS recently (May 12, 2011) withdrew its proposal for listing based on its determination that the mountain plover is not endangered or threatened throughout all or a significant portion of its range (USFWS 2011b).

3.9.1.2 State Threatened, Endangered, and Special Concern Species

Colorado threatened, endangered, and special concern species potentially occurring in the study area are listed in Table 3.9-1. As indicated in Table 3.9-1, two reptile, three amphibian, and five fish species occur in the project area but only in association with aquatic habitat along the North Fork Republican River and its perennial tributaries. Since the Proposed Project would not directly or indirectly have any effect on these drainages, no further analysis is provided for these 10 species in this document. Analysis for the other species listed in Table 3.9-1 is provided in the following text.

Table 3.9-1 State Listed Endangered, Threatened, and Special Concern Species Potentially Occurring in the Wray Study Area

Common Name	Scientific Name	State Status[1]	Comments
Mammals			
Black-tailed prairie dog	*Cynomys ludovicianus*	SC	Documented presence in study area.
Swift fox	*Vulpes velox*	SC	Potential inhabitant of study area.
Birds			
American peregrine falcon	*Falco peregrinus anatum*	SC	May occasionally fly over study area, but no suitable foraging or nesting habitat present in study area.
Bald eagle	*Haliaeetus leucocephalus*	SC	May occasionally fly over study area, but no suitable foraging or nesting habitat present in study area.
Burrowing owl	*Athene cunicularia*	ST	Documented presence in study area at prairie dog towns.
Ferruginous hawk	*Buteo regalis*	SC	Documented presence and nesting in study area.
Long-billed curlew	*Numenius americanus*	SC	Possible spring and fall migrant
Mountain plover	*Charadrius montanus*	SC	Prairie dog towns and short-grass prairie communities represent potential habitat in study area, but SWCA surveys have not documented this species' presence.

Common Name	Scientific Name	State Status[1]	Comments
Reptiles			
Common garter snake	*Thamnophis sirtalis*	SC	Republican River and its perennial tributaries are the only suitable habitats in study area. No suitable habitat affected by Proposed Project. No further analysis.
Yellow mud turtle	*Kinosternon flavescens*	SC	Same comment as for common garter snake.
Amphibians			
Northern cricket frog	*Acris crepitans*	SC	Same comment as for common garter snake.
Northern leopard frog	*Rana pipiens*	SC	Same comment as for common garter snake.
Plains leopard frog	*Rana blairi*	SC	Same comment as for common garter snake.
Fish			
Brassy minnow	*Hybognathus hankinsoni*	ST	Same comment as for common garter snake.
Plains minnow	*Hybognathus placitus*	SE	Same comment as for common garter snake.
Plains orangethroat darter	*Etheostoma spectabile*	SC	Same comment as for common garter snake.
Stonecat	*Noturus flavus*	SC	Same comment as for common garter snake.
Suckermouth minnow	*Phenacobius mirabilis*	SE	Same comment as for common garter snake.

[1]Status Codes: SE = State Endangered; ST = State Threatened; SC = State Special Concern (not a statutory category).

Black-tailed Prairie Dog

The U.S. Fish and Wildlife Service (USFWS) had been petitioned to list the black-tailed prairie dog as threatened or endangered. On December 3, 2009, the USFWS published notice in the Federal Register (USFWS 2009) that listing the black-tailed prairie dog as either threatened or endangered is not warranted at this time. Black-tailed prairie dog is currently listed by Colorado as a species of special concern.

Black-tailed prairie dogs inhabit grasslands and sparse shrub lands. Their colonies are important to a variety of wildlife, and more than 60 vertebrate species are associated with prairie dog colonies (Campbell and Clark 1981). These species include the burrowing owl (state threatened) and mountain plover (state special concern). Black-tailed prairie dogs are also preyed on by a variety of predators including eagles, hawks, badgers, coyotes, and foxes.

Prairie dogs feed on a variety of grasses, forbs, and woody plants. Overgrazing by livestock may favor increases in prairie dog density on favorable sites (Fitzgerald et al. 1994). Because of their potential to damage crops as well as compete with livestock for forage, private landowners often employ eradication methods in agricultural areas. In addition, conversion of native grasslands to agricultural uses and commercial and residential developments has reduced available habitat for prairie dogs. As a result, the range and population numbers of prairie dogs have been reduced substantially in the Northern Great Plains and Colorado.

Ground and aerial field surveys completed by SWCA (2011) have identified 28 black-tailed prairie dog colonies in the study area ranging from 0.4 acre to 52.1 acres. Twenty-three of these towns were active and five were inactive. The locations of these towns are depicted on Figure 2.2-1.

Swift Fox

The swift fox (a species of special concern in Colorado) resides in shortgrass and mid-grass prairies over most of the Great Plains including eastern Colorado (Fitzgerald et al. 1994). The swift fox will also use agricultural lands and irrigated meadows. Swift foxes prey on a variety of small rodents, lagomorphs, and birds. In many areas, cottontails and jackrabbits constitute the bulk of their diet (Cameron 1984, as cited in Fitzgerald et al. 1994). Swift foxes excavate their own dens, and dens are typically constructed in areas dominated by blue grama or buffalo grass (Fitzgerald et al. 1994). Dens used for whelping have multiple entrances, while dens used by solitary foxes have only one or two entrances (Fitzgerald et al. 1994).

Range of the swift fox overlaps most of eastern Colorado, including the study area, but population densities vary depending on location and extent of native shortgrass and mid-grass prairie habitats. Researchers have found there is a wide distribution of swift fox throughout eastern Colorado with many abundant local populations (Covell 1992 & Kitchen 1999 as cited in CDOW 2003). Swift fox presence in the study area is uncertain, but if this species is present, the population is likely small since no observations of this species have been recorded by SWCA surveys (Faulkner 2011). Small population size or lack of presence of swift fox in the study area may be due to the relative lack of native grassland (about 4 percent) within the study area (see Table 3.6-1). CDOW personnel J. Melby and M. Stratman indicted they believe the study area to be outside of the swift fox occupied range (CDOW 2010).

American Peregrine Falcon and Bald Eagle

The peregrine falcon's preferred nest sites are rugged, remote cliffs (100 to 300 feet in height) that usually overlook water, marshes, or riparian areas where prey is abundant (USFWS 1984). Preferred hunting areas include cropland, meadows, river bottoms, marshes, and lakes that attract abundant bird life.

Summer bald eagle nesting habitat consists of large trees, cliffs, or sheltered canyons associated with preferred food sources consisting of fisheries or waterfowl concentration areas along large rivers, lakes, or reservoirs. During the non-breeding season (fall and winter), bald eagles forage along rivers and over uplands with big game carrion or prairie dog populations. Winter roosting sites are generally large trees protected from the weather along open water portions of rivers or on lakes and reservoirs where waterfowl are available as prey.

American peregrine falcon and bald eagle may occasionally fly over the study area but preferred nesting and foraging habitat is generally lacking. Peregrines may forage in riparian habitats along the North Fork Republican River, but the Proposed Project would not have any direct or indirect effect on these habitats or the river. Avian surveys completed by SWCA (2011) did not record any observations of either of these species in the study area, and no further analysis of American peregrine falcon or bald eagle is provided in this document.

Burrowing Owl

Burrowing owls are a migratory species in Colorado and reside in the state from early March through October. Summer residents typically reside in grasslands and mountain parks in or near prairie dog towns. Abandoned prairie dog holes are used for cover and nesting, and burrowing owls hide in burrows when they feel threatened (Andrews and Righter 1992). Families of owls remain together in a prairie dog town until they migrate south to Mexico and Central America to spend the winter.

SWCA surveyed for burrowing owls in May 2011 using CDOW (2007) protocols, and documented burrowing owl presence at 20 of the 28 prairie dog towns that SWCA had previously mapped within the study area (SWCA 2011). The number of burrowing owls observed at each prairie dog town ranged from one to four. Documented burrowing owl presence at these prairie dog towns indicates likely nesting use of these towns by burrowing owls.

Ferruginous Hawk

Ferruginous hawks inhabit grasslands, shrublands, and steppe-deserts of the western United States. During the winter months, they migrate to similar habitats in the southwestern United States and northern Mexico. Foraging habitat consists of non-forested, non-mountainous areas such as desert shrub and grassland communities. Nesting habitat consists of low shrub or grassland communities with isolated trees, bluffs, buttes, rock outcrop, and open country with rolling topographic relief (Andrews and Righter 1992). This hawk nests on a variety of substrates including rock outcrops or pillars, high points on open ground, and low trees or shrubs. Because of their habit of nesting on or near the ground, nest sites are often vulnerable to predation and disturbance.

SWCA's spring 2011 avian surveys recorded three observations of ferruginous hawk, one over agricultural habitat and two over sandhill steppe habitat (SWCA 2011). In addition, SWCA spring 2011 raptor nest surveys (both aerial and ground) located one active and one inactive ferruginous hawk nest within the study area.

Long-billed Curlew

This Neotropical migrant winters along beaches and mudflats on the California coast and as far south as Honduras and Costa Rica (Ehrlich et al. 1988). In summer, this species nests in shortgrass prairie, rangeland, and meadows, usually near water (Nelson 1998). Nesting in eastern Colorado is confined primarily to the southeastern corner of the state (Nelson 1998, Andrews and Righter 1992), and this species would likely only occur in the study area as a spring or fall migrant. No observations of long-billed curlew have been recorded by SWCA's late summer/fall 2010, winter 2010/2011, and spring 2011 avian surveys in the study area (SWCA 2011).

Mountain Plover

Mountain plover is one of the few shorebirds that do not occur in habitats near or associated with water but inhabit arid shortgrass prairie. They seem to prefer shortgrass prairie areas with sparse cover and are often found in association with overgrazed sites, prairie dog towns, old burns, and other disturbances that reduce vegetation cover. Potential mountain plover habitat within the study area includes black-tailed prairie dog towns and parcels of native grassland dominated by blue grama or buffalograss (see Section 3.6, Vegetation). Although potential habitat exists for mountain plover in the study area, no observations of this species were recorded by presence/absence surveys conducted by SWCA (2011) in the spring of 2011 using USFWS (2002) survey protocols or by other field surveys completed by SWCA (2011). CDOW personnel (J. Melby and M. Stratman) indicted they believe the study area to be outside of the mountain plover's occupied breeding range (CDOW 2010).

3.9.2 Environmental Impacts and Mitigation Measures

3.9.2.1 Issues and Significance Criteria

Impacts to state threatened, endangered, or special concern species would be considered significant if:

- effects from the Proposed Project would result in a trend toward federal listing for any of these species.

3.9.2.2 Impacts of the Proposed Project

Federal Threatened, Endangered, Proposed, and Candidate Species

Since no federal threatened, endangered, proposed, or candidate species or their habitats exist within the study area, there would be no impacts to these species or their habitats from the Proposed Project.

State Threatened, Endangered, and Special Concern Species

Black-tailed Prairie Dog

All black-tailed prairie dog town locations have been mapped within the study area by SWCA (2011), and Invenergy has committed to avoiding any direct disturbance to these towns by avoiding construction of wind turbines and associated facilities in or near these towns (IWILDLIFE-5, Section 2.2.9). Therefore there would be no direct impacts to prairie dog towns in the study area from project development. One of the prairie dog towns in the study area is in close proximity to the proposed overhead transmission line. Pole structures established for the overhead transmission line would create raptor perch sites near this prairie dog town and could result in increased predation of prairie dogs in this town by local raptor populations. Increased raptor predation at one prairie dog town would have relatively minor effect on the prairie dog population at this town and the overall prairie dog population within the study area.

Swift Fox

Development of the Proposed Project would result in the short-term and long-term loss of only 4 and 1 acres of native grassland, respectively. These relatively minor losses of suitable swift fox habitat would have only minimal impacts on regional populations of swift fox since swift fox apparently do not inhabit the study area. During construction, mobile animals such swift fox may be indirectly affected by displacement from disturbance sites, but displacement would be short-term and localized. Short-term and localized displacement of swift fox near construction sites would not have any adverse effect on local populations because of the extent of available undisturbed habitat remaining within the study area.

Burrowing Owl

Invenergy has committed to avoiding to any direct disturbance to prairie dog towns by avoiding construction of wind turbines and associated facilities in or near these towns (IWILDLIFE-5, Section 2.2.9). As a result, burrowing owl nesting use of prairie dog towns and burrowing owl populations in the study area would not be adversely affected by project development. Burrowing owls generally remain close to the ground and would not be a likely candidate for mortality because of collisions with wind turbine blades once the Proposed Project is operational.

Ferruginous Hawk

Construction and project operation could result in minor displacement of foraging ferruginous hawks in the study area. Minor displacement of foraging birds would have no adverse effect on a mobile wide-ranging species such as ferruginous hawk.

Two ferruginous hawk nest sites have been located in the study area. The CDOW considers ferruginous hawk to be especially prone to nest abandonment during incubation if disturbed, and it recommends no structures or other permanent developments (beyond that which historically occurred in the area) within 0.5 mile radius of the nest site or associated alternate nests. The CDOW also recommends a seasonal restriction to human encroachment within 0.5 mile of a nest or alternate nests from February 1 to July 15 (CDOW 2002). The one inactive ferruginous hawk nest is located more than 2 miles from any component of the Proposed Project and would not be affected by project development. The active nest is located slightly over 0.5 mile from the nearest proposed development site (turbine location) and should be protected from disturbance activities based on CDOW recommendations (IWILDLIFE-5, Section 2.2.9).

The potential for ferruginous hawk mortality because of collision with wind turbine blades is addressed along with other avian species in Section 3.8.2.2.

Long-billed Curlew

Development of the Proposed Project would result in the short-term and long-term loss of only 4 and 1 acres of native grassland, respectively. These relatively minor losses of suitable long-billed curlew habitat could result in relatively minor displacement of spring and fall migrants, but displacement would be short-term and localized and would not have any adverse effect on populations of long-billed curlew. Once construction is complete, the risk of loss of long-billed curlews to collisions with wind turbine blades would be relatively low since their presence has not been documented in the study area.

Mountain Plover

SWCA baseline monitoring surveys (SWCA 2011) indicate a lack of presence of mountain plover in the study area, and therefore, impacts to this species are unlikely. In addition, Invenergy's commitment to avoiding any project construction in prairie dog towns (IWILDLIFE-5, Section 2.2.9) would preclude any direct impact to potential mountain plover nesting habitat. Once construction is complete, the risk of loss of mountain plovers to collisions with wind turbine blades would be relatively low since their presence is not likely in the study area.

In summary, for state threatened, endangered, and special concern species potentially affected by the Wray Wind Energy Project, impacts would be considered minor to non-existent since Invenergy has committed to avoiding direct disturbance to the affected species. Therefore, there would be no adverse short-term or long-term direct impacts for prairie dogs and burrowing owls, and negligible to minor short-term and long-term impacts to swift fox, long-billed curlew, and ferruginous hawks.

3.9.2.3 Impacts of the No Action Alternative

Since there would be no project development with the No Action Alternative, there would be no impacts to state threatened, endangered, and special concern species with this alternative.

3.9.2.4 Mitigation Measures

No measures are required beyond Invenergy's commitment to avoid construction near prairie dog towns and to follow CDOW recommended buffer guidelines and timing restrictions for active raptor nests (IWILDLIFE-5, Table 2.2-3).

3.10 Cultural Resources

Cultural resources are historical or architectural objects, sites, structures, or places with potential public or scientific value, including Traditional Cultural Properties (TCPs), which are locations of traditional cultural, ethnic, or religious significance to a specific social or cultural group. Fragile and irreplaceable cultural resources represent an integral part of American heritage (National Historic Preservation Act [NHPA] of 1966, as amended [16 U.S.C. 470]). Archaeological resources are defined in 43 CFR 7.3 (as amended) as a subset of cultural resources that are at least 50 years old and represent the physical locations of human activity, occupation, or use as identified through field inventories, historical documentation, or oral evidence.

Cultural resources that are listed in or eligible for listing in the National Register of Historic Places (NHRP) are called ***historic properties***. A cultural resource may be considered eligible for listing on the National Register if it retains sufficient integrity (of location, design, setting, materials, workmanship, feeling, and/or association) and meets a specific set of criteria, described below:

- that are associated with events that have made a significant contribution to the broad patterns of our history;
- that are associated with the lives of persons significant in our past;

- 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
- that have yielded, or may be likely to yield, information important in prehistory or history (Anonymous 1991).

The National Historic Preservation Act (NHPA) of 1966 and the Archaeological Resource Protection Act of 1979 provide for the protection of significant cultural resources. Section 106 of the NHPA describes the process that federal agencies must follow to identify, evaluate, and coordinate their activities and recommendations concerning cultural resources. Section 106 of the NHPA requires federal agencies to account for the effects of their activities on historic properties.

3.10.1 Affected Environment – Environmental Setting for the Proposed Project

The Wray Wind Energy Project is situated near Wray, Colorado in eastern Yuma County. Regional reviews of the history and prehistory of the region can be found in "Colorado Prehistory: A Context for the Platte River Basin" (Gilmore et al. 1999), "Colorado History: A Context for Historical Archaeology" (Church et al. 2007) and "Colorado Plains Historic Context" (Mehls 1984). Because no prehistoric resources were located in the project area (Table 3.10-1), readers are referred to the above documents for those specific details.

From AD 1540–1860 there was considerable interaction between a large number of mobile historical Native American groups, such as Plains Apache, Arapaho, and Cheyenne, and Euro-Americans. The increased presence of Euro-Americans led to the northward diffusion of the horse from Spanish Mexico, and the southern diffusion of the gun from northern fur traders. In 1848, the Treaty of Guadalupe Hidalgo ended the Mexican-American War and opened Colorado to further exploitation and exploration by fur trappers, hide-traders, and government expeditions. The increased United States presence on the Plains led to a deterioration of Native American relations with Euro-Americans through the 1840s and 1850s. The gold rush of 1859 led to the largest Euro-American population increase along the Front Range of Colorado. Open range cattle ranching on the northeastern plains dates to the 1860s as commercial markets were developed to support mining camps in the Colorado Rockies. Euro-American settlement of northeastern Colorado was facilitated by the establishment of early transportation routes and the presence of large tracts of arable land that could be maintained with large irrigation projects. Demand for agricultural products increased during World War I, but the Depression years of the 1930s and several years of drought created Dust Bowl conditions on the eastern plains of Colorado. The federal government purchased marginal farmland in the 1930s and resettled farmers onto productive lands elsewhere while converting the purchased properties back into grasslands. Post-Depression economic revival at the start of World War II revived the agricultural economy of northeastern Colorado.

3.10.2 Environmental Impacts and Mitigation Measures

3.10.2.1 Issues and Significance Criteria

Impacts to cultural resources that are caused, directly or indirectly, by project activities would be significant if:

- an historic property is disturbed during construction or operation of the wind project.

As discussed above, historic properties are a subset of cultural resources that are considered eligible for the NRHP based on their research value and tangible links to important persons or historical events. Disturbance to a historic property is an adverse effect and should be avoided or mitigated.

3.10.2.2 Impacts of the Proposed Project

The wind project has the potential to impact historic properties. Specific disturbances include road construction, turbine construction, and installation of a buried electrical collection network. Road construction generally disturbs historic properties when vegetation is cleared and when the route is bladed with heavy machinery. Turbine construction involves clearing a work area with heavy equipment and excavating foundations, both of which create ground disturbances. Ground disturbance associated with the construction of the electrical collection network involves clearing of vegetation, trenching, and burying of the electrical conduit.

Six cultural resources (Table 3.10-1) were identified in the project area (Hurlburt et al 2011). None of the cultural resources are considered eligible to the NRHP (historic properties) and, therefore, require no additional consideration in this document. No TCPs are known to occur within the project area, and no TCPs were identified during the current inventory.

Table 3.10-1 Cultural Resource Sites in the Project Area

Site Number	Cultural Affiliation	Site Type	NRHP Eligibility
5YM292.1	Historic	Holy Joe Reservoir and Canal	Not Eligible
5YM293	Historic	Dugout	Not Eligible
5YM294	Historic	Artifact Scatter	Not Eligible
5YM295	Historic	Foundation and Artifact Scatter	Not Eligible
5YM296	Historic	Windbreak	Not Eligible
5YM297	Historic	Homestead	Not Eligible

As no historic properties exist in the project area, there would be no impacts from the Proposed Project.

3.10.2.3 Impacts of the No Action Alternative

Since there would be no project development with the No Action Alternative, there would be no impacts to cultural resources with this alternative.

3.10.2.4 Mitigation Measures

Because no historic properties are impacted, no additional mitigation measures are proposed.

If a previously undiscovered site or TCP is exposed and discovered during construction, all activity would be halted. The site would be inspected and evaluated to determine if the site is eligible for the NRHP and the treatments necessary, in consultation with the SHPO, to avoid further impacting the site. This standard approach to handling unanticipated cultural resource discoveries within the project area would ensure that impacts to historical properties due to the Proposed Project would be negligible.

Implementation of Western’s Standard Construction Practices CULT-1, CULT-2, CULT-3, and CULT-4 (Table 2.2-2) would ensure that short-term impacts to cultural resources would be minimized.

3.11 Land Use

3.11.1 Affected Environment – Environmental Setting for the Proposed Project

The approximate 56 wind turbines and support facilities for the Wray Wind Energy Project would be built in Yuma County, Colorado within a project area of approximately 40,000 acres. Jurisdictions with lands potentially affected by the wind project include the City of Wray, Yuma County, the State of Colorado, Republican River Conservation District, various farm corporations, and private land owners. The Proposed Project would predominately be built on irrigated and non-irrigated agricultural land and Western Great Plains Sandhill Steppe.

Existing Land Uses

The project area is primarily agricultural land including cropland pivot irrigation, dryland farming, and grazing lands (17,016 acres) (SWCA 2010). Primary agricultural production includes corn, winter wheat, dry beans, hogs, cattle, potatoes, and sugar beets. Rural residences associated with the agricultural land are found throughout the area. Most of the leased project area land is private with a few sections of state land. Large expanses of mixed grasses, some shortgrass prairie, and steppes are also evident throughout the area (24,764 acres) (SWCA 2010). Recreational use is minimal.

The town of Wray is located approximately five miles southwest of the project area. U.S. Highway 385 is located to the west and US Highway 34 to the south. Linear county roads criss-cross the entire project area. One transmission line (Tri-State Generation and Transmission) and one pipeline cross the study area. Oil and gas pumping units and some drilling operations are also located within the project boundary.

In or near the few urban areas (Wray, Laird), other land uses include commercial and industrial uses such as utility substations, utilities and pipelines, railroad yards, gravel and sand mining pits, storage, office warehouse, general highway, commercial, industrial activities, commercial retail, and residential uses.

The landscape is typical of northeastern Colorado with rolling plains; wooded areas are restricted to riparian corridors, shelterbelts, and human settlements. Little new development is occurring within the project study area. Most of the economic development activity is close to the urban area of Wray.

Farmlands

The wind project is primarily located in agricultural land. The Farmland Protection Policy Act protects prime farmland from being converted to non-agricultural uses. The provisions of this act identify prime and unique farmlands for protection. Prime farmlands are those lands that have the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with the minimum of fertilizer, fuel, pesticides, and labor and without intolerable erosion. Unique farmlands are composed of land other than prime farmland that is used for producing specific high value food and fiber crops (NRCS 2011). According to the Natural Resources Conservation Service (NRCS) in Yuma County, no prime farmland (irrigated) exists within the project boundary. For the most part, the wind project would not interfere with the cultivation of this land.

No soil map units within the project area boundaries are considered to be “Prime Farmland.” “Farmland of Statewide Importance” include soils that nearly, but do not, meet the criteria of “Prime” or “Unique” farmland; economically they can produce high yields of crops when properly managed (see Section 3.7.1).

Land Ownership

Land ownership in the area within the project boundary is estimated to be 73,912 acres (93%) private land, 5,124 acres (6.5%) state land, and 80 acres (<1%) BLM land. Private land ownership in the area is mixed small and larger acreage landowners, operating primarily farms producing crops with some grazing. State lands represent state board lands. Lands under contract within the project area include approximately 40,000 acres.

Land Use Regulations

Land use plans and regulations for private lands in the project area are administered by the counties and cities.   The Land Use regulations which pertain to the wind project include the Yuma County Land Use Code, Standard Criteria- Article 5-101, 102, and 103 on page 43 and specifically Section I, 5-104, Additional Standards for Wind Energy Facility on page 57 (Yuma County 2010). Wind turbines are an approved use in unincorporated Yuma County. Invenergy will be applying for a Major Land Use Application. A recent change in the Yuma County code related to financial assurance (Section 4-105) will be implemented some time in 2011 to reduce the burden of project development on the county. The change in the code will facilitate wind energy development in Yuma County. Invenergy would be required to provide the form of financial assurance at the time of land use permit application.

Planned Land Uses and Developments

The proposed Republican River Compact Compliance Pipeline is the main cumulative project planned within the project area. Current focus toward compact compliance is through a $71 million locally funded 13-mile long pipeline project. The pipeline would deliver water from wells located 8 to 15 miles north of the North Fork Republican River to that same stream at the Colorado/Nebraska state line just above the measuring device. The water source for the pipeline comes from existing irrigation wells with pumping limited to historic use. The projected completion date for the Compact Compliance Pipeline is 2012.

The pipeline has been approved by the Yuma County Commissioners. The next step in approval of the pipeline is acquiring agreements with affected water districts within the project boundary in order to transport water out of the area. Sand Hills Water District has been contacted, but no agreement has been made or meetings scheduled. There may be three or four districts involved. Water districts would be concerned about how much of the transported water would actually be going out of district to meet the Nebraska/Kansas/Colorado compact agreement.

Tri-State is proposing a new 230-kV transmission line between Burlington and Wray (Burlington-Wray 230-kV Transmission Project). The project would replace a 115-kV line between the existing substations near Wray and Burlington. The line would be 50 to 70 miles long and have wood H-frame structures. Construction is scheduled from 2013 to 2015, with an in- service date of 2015.

No other known planned developments are under review for the project area (Briggs 2011).

3.11.2 Environmental Impacts and Mitigation Measures

3.11.2.1 Issues and Significance Criteria

Impacts to land use would be significant if the Proposed Project or alternatives:

- resulted in the termination or modification of land uses;
- was not compatible with land use plans or regulations adopted by local, state, or federal agencies; or
- threatened the economic viability of a farm by changes in land use.

3.11.2.2 Impacts of the Proposed Project

Existing Land Uses. Construction of the Wray Wind Energy Project would occur on property leased by Invenergy. The project would be primarily located in the southern portion of the approximate 80,000 plus acre project boundary on leased property. As described in Section 2, the project would include up to 56 wind turbines, a 9.5 mile transmission line, and support facilities. Existing land uses would not change; however, some land use restrictions may result due to land disturbance from placement of the turbines and facilities.

Predominant land uses near the proposed wind farm include agricultural uses (primarily cropland and some grazing), rural residential use associated with the farms in the area, and transportation access. There are an estimated 72 miles of rural roads within the project boundary comprised of 46 miles of local rural roads, 7 miles of major rural collector roads, and 19 miles of minor rural collector roads. The project would add another 24 miles of roads, all on private property. Other less prevalent uses within the project area include native sandhills steppe/grassland, wildlife habitat, and some industrial use (including a transmission line and pipeline). The land is privately owned and state owned. The project would not affect the economic viability of any of the agricultural uses within the study area in the long run or change the land uses.

Road and wind power facility construction would impact the existing land uses within the study area. Approximately 432 acres would be temporarily impacted by construction activity (Table 2.2-1). Short-term disruptions, particularly to existing residences and businesses, due to increased noise, dust, traffic, and visual effects of project construction and equipment operations would occur. Once construction has been completed (six months), permanent disturbance would be reduced to 65 acres. Long term visual effects would occur since the turbines would become a part of the project area landscape once the project is completed. Some existing land uses would change during operations, but the number of acres impacted would not be considered significant. Maintenance roads located on private property would be maintained by Invenergy.

Table 3.11-1 shows residences within 1 mile of the turbines, the number of turbines in proximity to the residence, and the distance from each residence. Nineteen residences are located within one mile of the turbines, six residences are within 0.5 miles, and one residence is between 1,000 and 1,500 feet of the turbines. Many of these residences have several turbines within proximity. Figure 2.1-1 shows the location of these residences. Wind turbines would not be sited less than 1,000 feet from any residence or other developed land use per the Yuma County Land Use Code and Invenergy standards.

Impacts to residences could include visual impacts, including shadow flicker, slightly increased noise levels depending how far the residence is from the turbine, and potential impacts to property values. These impacts are discussed in Section 3.12 (Noise), Section 3.13 (Visual), and Section 3.14 (Socioeconomics).

Table 3.11-1 Residences within one mile of Turbines

	Residence Number	**Turbine Number**	**Distance from Turbine (Feet)**	**Distance from Turbine (Miles)**	**Distance from Turbine (Meters)**
Residences <= 1,000'	none	none	-	-	-
Residences <= 1,500'	R-20	T-55	1149.5	0.2	350.361
		T-56	1189.7	0.2	362.618
Residences <= 0.5 miles (2,640')	R-6	T-13	1958.3	0.4	596.903
		T-14	2522.9	0.5	768.987
	R-8	T-26	1668.5	0.3	508.568
	R-10	T-31	1948.9	0.4	594.031
	R-17	T-48	1848.8	0.4	563.521
	R-27	T-49	2355.0	0.4	717.808
Residences <= 1 mile (5,280')	R-6	T-12	3100.0	0.6	944.890
		T-15	3594.9	0.7	1095.731
	R-7	T-12	5250.1	1.0	1600.227
		T-13	4520.9	0.9	1377.974

	Residence Number	Turbine Number	Distance from Turbine (Feet)	Distance from Turbine (Miles)	Distance from Turbine (Meters)
		T-14	3177.3	0.6	968.440
		T-15	3520.6	0.7	1073.093
	R-8	T-18	3550.7	0.7	1082.262
		T-19	4492.2	0.9	1369.235
		T-27	3323.8	0.6	1013.107
		T-30	5271.2	1.0	1606.650
	R-9	T-24	5168.0	1.0	1575.219
		T-26	2724.3	0.5	830.371
		T-27	3313.4	0.6	1009.928
		T-29	4126.4	0.8	1257.723
		T-30	2971.7	0.6	905.786
		T-32	3989.3	0.8	1215.935
	R-10	T-23	4723.0	0.9	1439.585
		T-35	4933.3	0.9	1503.657
		T-36	4450.4	0.8	1356.492
	R-15	T-48	4852.1	0.9	1478.935
	R-17	T-37	4877.7	0.9	1486.724
		T-50	4364.1	0.8	1330.178
		T-51	3942.5	0.7	1201.672
		T-52	3879.5	0.7	1182.476
	R-18	T-49	5075.8	1.0	1547.112
		T-50	4832.4	0.9	1472.914
	R-19	T-40	4035.5	0.8	1230.014
		T-54	4913.0	0.9	1497.467
		T-55	3649.1	0.7	1112.242
	R-20	T-53	3269.2	0.6	996.445
		T-54	2817.9	0.5	858.886
		T-59	4921.4	0.9	1500.057
		T-60	4704.4	0.9	1433.904
	R-23	T-43	5155.9	1.0	1571.522
		T-44	4423.2	0.8	1348.196
		T-45	5175.7	1.0	1577.568

	Residence Number	Turbine Number	Distance from Turbine (Feet)	Distance from Turbine (Miles)	Distance from Turbine (Meters)
	R-27	T-50	4080.9	0.8	1243.869
	R-34	T-63	4022.6	0.8	1226.091

Long-term operation and maintenance impacts would include the visual impacts of the wind turbines in proximity to the rural residences. Associated noise from the wind turbines for those residences is discussed in Section 3.12, Noise, but ongoing noise from the turbines may only be noticed by the residences less than 1,300 feet from any turbine and would be less than 40 decibels .

Farmlands. Short-term impacts to cultivated farmland from the construction of the wind turbines would include soil compaction. Long-term impacts would include soil erosion, either by wind or water, and any contamination by release of regulated materials. Very short-term impacts to some cropland may occur during construction activities. Western's Standard Construction Practices and Invenergy's Applicant-Committed Mitigation Measures would be incorporated to reduce the potential impacts of soil compaction, erosion, and crop displacement during construction activities (Tables 2.2-2 and 2.2-3, GEN-1, GEN-2, GEN-3, GEN-5, EROSION-4 and IGEN-1).

Direct, long-term impacts to agriculture would be negligible compared to the existing conditions. These changes would result in slightly adverse effects to agricultural land and operations. Adverse long-term, negligible effects would result since the turbines would remove some land from production or potentially interfere with agricultural operations.

Land Use Plans and Regulations. The transmission line rebuild would conform to land use regulations for Yuma County in Colorado. Citations for land use conformance include: Yuma County Land Use Code, 2003, Revised February, 2010. Sections 5-101 - General Standards; 5-102 - Resource and Environmental Protection Standards; and 5-103 – Site Development Standards; Section 5-104 - Additional Standards For Certain Uses: I. Additional Standards for Wind Energy Facility; Section 4-105 Financial Assurance Requirements For Major Land Use (Yuma County 2010).

These land use regulations state that wind facilities are allowable uses and specify general and environmental standards, setbacks, and safety standards for a major land use development in Yuma County.

Planned Land Uses and Developments. Cumulative projects are discussed in Section 3.17 Cumulative Impacts. The Republican River Water Conservation District (RRWCD) is in the process of planning for construction of a $71 million Compact Compliance Pipeline project to deliver water from wells located 8 to 15 miles north of the North Fork Republican River to that same stream at the Colorado/Nebraska state line just above the measuring device.

Tri-State is proposing to build a 230-kV transmission line from Burlington to Wray. The 230-kV line would connect to the existing substations near Wray and Burlington. The line would be 50-70 miles long, on wood H-frame structures. Construction start is projected from 2013 to 2015, with an in-service date of 2015. An existing line is currently within this corridor, so existing land use would not change.

Planned land uses identified in Section 3.17 would not be directly impacted with the construction or operation of the proposed Wray Wind Energy Project. However, short term construction impacts would be experienced at the adjacent developments. Short-term disruptions to existing residences and businesses due to increased noise, dust, and visual effects of project construction and equipment operations may occur. These are discussed in Section 3.17.1 Reasonably Foreseeable Projects. The proposed or developing projects are located near the Proposed Project. The long-term impacts are discussed in Section 3.17.

3.11.2.3 Impacts of the No Action Alternative

Since there would be no project development with the No Action Alternative, there would be no impacts to land use other than reasonably foreseeable projects discussed in Section3.17.

3.11.2.4 Mitigation Measures

Implementation of Western's Standard Construction Practices GEN-1 and GEN-2, (Table 2.2-2) and Invenergy's Applicant-Committed Mitigation Measure IGEN-1 (Table 2.2-3) would ensure that short-term impacts to land use would be minimized.

3.12 Noise

3.12.1 Affected Environment – Environmental Setting for the Proposed Project

The perception of noise is affected by several factors including the intensity of the noise and the frequencies involved. Intensity of sound is measured in decibel units (dB). Audible sounds are measured in a range from 0 dB ("threshold of hearing") to about 140 dB ("threshold of pain").

The normal audible frequency range is approximately 20 Hz to 20 kHz. The A-weighted scale, shown with a unit of dB(A), approximates the range of human hearing by filtering out lower frequency noises, which are not as damaging as the higher frequencies. The A-weighted scale is used in most noise ordinances and standards. The graphic below shows noise levels in dB(A) at various distances from a large wind turbine to provide a frame of reference.

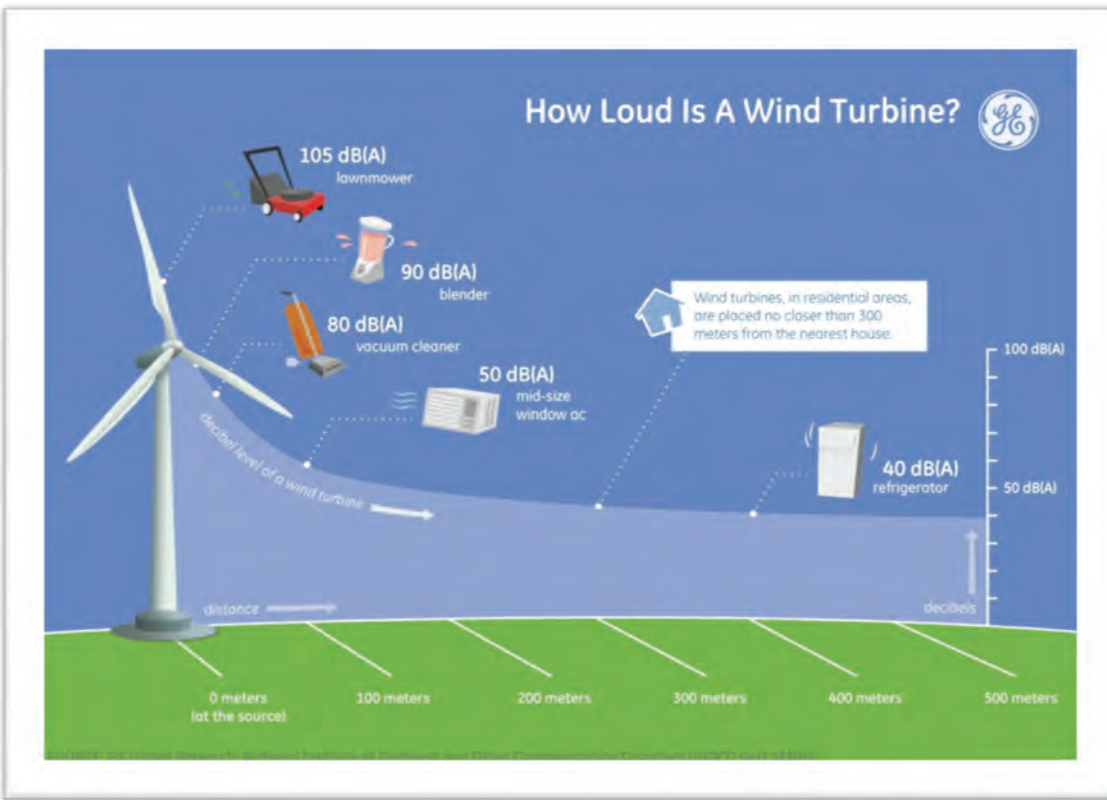


Figure 3.12-1 Relative Noise Levels *(GE 2010)*

The project area is rural farmland, grazing land, and prairies. The major noise contributors in the area are agricultural activities, state and county roads, homesteads, and the wind. For a typical rural, hilly terrain area with low human population densities, background noise is expected to be approximately 40 db(A) during the day and 30 db(A) at night (BLM 2005). Noise levels within the project area would be lowest during the morning and at night when wind speeds are lower and highest in the afternoon when wind speeds are higher.

Wind plants are located where the wind speed is higher than average and background noise of the wind tends to mask the sounds that might be produced by operating wind turbines because the turbines only run when the wind is blowing. An operating wind farm using current turbine technology is similar to background sound found in a typical home at 350 meters (1,150 feet) (AWEA 2010, GE 2010).

The Noise Control Act of 1972, along with its subsequent amendments (Quiet Communities Act of 1978 [42 USC Parts 4901-4918]), delegate to states the authority to regulate environmental noise and directs government agencies to comply with local community noise statues and regulations (BLM 2005). Yuma County, Colorado Land Use Code requires the setback of wind turbines from inhabited structures, including residences, schools, hospitals, churches or public libraries to be 1,000 feet (Yuma County 2010). Colorado Noise Statute (referenced in Yuma County 2010) established maximum permissible noise levels for residential areas during the day as 55 dB(A) and nighttime as 50 dB(A).

3.12.2 Environmental Impacts and Mitigation Measures

3.12.2.1 Issues and Significance Criteria

Impacts to environmental noise would be significant if:

- operation of the Proposed Project resulted in regular annoyance to residents within 1,000 feet of a wind turbine.

3.12.2.2 Impacts of the Proposed Project

The Proposed Project is located in a rural area with hilly terrain. The population density is low. Primary existing noise sources include noise caused by wind and vehicular traffic along US Highway 385D and 34B. Other noise sources are farm machinery (tractors) and animal noise (dog barking and bird chirping) (BLM 2005).

Construction of the Proposed Project would cause short-term increase in noise levels during the day from transportation of turbine components to the site and heavy equipment required to install the turbines. Cranes are used to assemble the turbine components, cement mixers are required to lay the foundation, and some earthmoving activities may be required for the turbine foundations. The construction phase would last approximately six months and would be conducted during regular business hours to prevent unnecessary disturbance. Noise from the construction of the Proposed Project would be moderate during daylight hours. Noise levels would be similar to noise from farm machinery, trucking, and the highway.

Table 3.11-1 shows the distance from each turbine location (including 11 alternative locations) from residences located within the project area. The Yuma County Land Use Code requires a setback from residences of 1,000 feet. No residences in the project area are within 1,000 feet of any turbine location studied. The closest turbine to a residence is turbine number T-55 and it is 1,150 feet (350 meters) from the nearest residence. The decibel level at 300 meters is similar to the background sound found in a typical home (45 dB(A)), and at 400 meters the decibel level is similar to the sound of a refrigerator (40 dB(A)). One residence (R-20) is located between 1,000 and 1,500 feet (310 and 460 meters) of turbines T-55 and T-56 (see Figure 2.2-1).

Six residences would be located within a half mile of one or more turbines, and 13 residences would be located between a half mile and a mile of one or more turbines.

No residences within the project area would experience an increase in noise relative to current conditions. Although noise impacts from operation of the wind project are expected to be negligible, Invenergy would perform a noise analysis at all turbine locations prior to construction as described in Section 3.12.2.4, Mitigation Measures.

3.12.2.3 Impacts of the No Action Alternative

Since there would be no project development with the No Action Alternative, there would be no impacts to noise levels with this alternative.

3.12.2.4 Mitigation Measures

Implementation of Western's Standard Construction and Mitigation Practices GEN-8 (Table 2.2-2) and Invenergy's Applicant-Committed Mitigation Measures INOISE-1 and INOISE-2 (Table 2.2-3) address noise concerns during construction.

Invenergy's Mitigation Measure INOISE-3 would commit to completion of a noise analysis at each proposed turbine location. This analysis would be used to ensure compliance with Yuma County noise statutes.

3.13 Visual Resources

Visual resources consist of landforms, vegetation, rock and water features, and cultural modifications that create the visual character and sensitivity of landscapes. Important visual resources are areas that have landscape qualities of unusual or intrinsic scenic value and areas of human and cultural use that are valued for their visual settings.

The project impact area for visual resources includes: the immediate and surrounding project area, access roads, substation and switchyard sites, construction and O&M sites, and surrounding viewsheds where the appearance of project facilities may alter landscape quality and sensitive views.

3.13.1 Affected Environment – Environmental Setting for the Proposed Project

Factors considered in evaluating the importance of visual resources include the following:

Visual Quality is defined as the overall visual impression or attractiveness of an area, considering the variety, vividness, coherence, harmony, or pattern of landscape features. Visual quality is defined according to three levels in the EA: *Distinctive*, resources that are unique or exemplary in quality; *Representative*, resources that are typical of the physiographic region and commonly encountered; and *Indistinctive*, those landscape or cultural areas that either lack visual resource amenities or have been degraded.

Visual Sensitivity is defined as a measure of an area's potential sensitivity to visual change, considering types of viewers and viewer exposure. Visual sensitivity considers viewer types and volumes, as well as viewing distance zones. Areas and associated viewer types considered to be potentially sensitive to visual changes include: designated park and recreation areas, major travel routes, and residential areas.

Distance Zones – Foreground, Middleground, and Background Distances. The distance from which a project component may be viewed affects the visual dominance and clarity that a feature or component may have within the seen landscape. Distance zones are described in this section according to *foreground views*, *middleground views*, and *background views*. *Foreground* views pertain to viewing distances where the viewer has close range visibility to a given object (generally within 0.25 to 0.5 mile away). *Middleground* views typically pertain to distances of 0.5 to 5 miles from the viewer, where objects are still distinguishable from other adjacent visual features. *Background* views pertain to viewing distances up to 15 miles away, where visibility of objects is less distinctive, and where ridges and skylines provide the greatest potential viewing opportunities to an object.

Viewer Groups – Number and Types of Viewers. Potentially sensitive viewers are determined based on the type and amount of use various land uses receive. Land uses that derive value from the quality of their settings are considered potentially sensitive. Land uses within the project area that are considered sensitive to visual changes to their settings include residential areas and major transportation systems.

Visual Quality

The project area encompasses portions of northeastern Colorado and northwestern Nebraska, which are characterized by expansive open plains, flat and slightly rolling terrain, with agriculture and ranching scattered along highways, gravel roads throughout the landscape, and few large scale agricultural structures (grain elevators). Land uses include residential units, irrigated (pivot irrigation) and non-irrigated farms, grazing lands, and Western Great Plains Sandhill Steppe. Many farmsteads have shelterbelts around the perimeter. The only major water feature is the Republican River which runs south of the project area. Wetlands and riparian vegetation patterns are associated with this drainage. The project area is typical of northeastern Colorado with elevations ranging between 3,400 and 3,800 feet. Mixed grasses and shortgrass prairies characterize the visual quality of these landscapes. Large-scale industrial uses are principally located within the town of Wray and include the Western Wray Substation, railroad yards, and miscellaneous industrial operations. One transmission line (Tri-State Power and Generation) is present within the project area. Other land uses in the area are discussed in Section 3.11, Land Use. Overall, the scenic quality of the project area is representative of the region and highly influenced by the open quality of the plains environment and the rural agricultural landscapes.

Visual Sensitivity

Sensitive viewer groups within the project area consist of rural residences, agricultural based communities, and travelers along state highways and county roads. Residences are scattered evenly throughout the 80,000 acre project boundary with the majority of residences located within the towns of Wray and Laird which are just south of the project boundary. No developed recreational use areas are within the project boundary or vicinity of the project.

Wray, and to a lesser degree Laird, are the only developed areas outside of the project area. The landscape is characteristically flat to rolling, with the green and brown colors of the agricultural fields and linear features such as roads and transmission lines. The area is not within sight of any highly sensitive visual elements, and the visual elements of the Proposed Project area are quite common in eastern Colorado. The visual sensitivity of the area would be considered moderate to low due to the low number of resident population and travelers along the highways and roads. The following land uses may have potential views to the project area:

Residential Areas and Communities – Residential areas and communities within the foreground to middleground viewing distance zones of the project include Wray and Laird. Figure 2.2-1 shows project facilities as well as residences, communities, and travel routes throughout the study area.

Major Travel Routes – Major travel routes in the project area include U.S. Highways 34B and 385D in Yuma County. Numerous local county roads are also in the project area (See Figure 2.2-1). Average annual daily traffic (AADT) ranges from 2,200 to 4,200 vehicles per day along segments of Highway 385D near Wray. This level of traffic is about 12 percent of total capacity for the highway. AADT on Highway 34B ranges from 1,200 to 7,100 vehicles per day and represents about 11 percent of total capacity of the highway. The larger AADT numbers occur within close proximity of the Town of Wray.

Key Observation Points

Key observation points (KOPs) are representative viewpoints evaluated in detail for this EA section. KOPs are chosen based on the range of sensitive viewers, distance zones, viewing conditions, and visual changes that would result from the Proposed Project.

Two KOPs were chosen from a total of six key observation points to evaluate the potential impacts of project development on the surrounding area. The KOPs are referenced in this EA section to document the range of visual changes anticipated from the Proposed Project. For ease of reference, photographs and simulations are shown at the end of the Visual Section 3.13.

KOP 2 is located along Highway 385D near County Road (CR) 42.5 with a view looking east. KOP 4 is located on Highway 34B near the Colorado-Nebraska state line with a view looking north. Both KOPs were selected because they represent the visual setting and visual sensitivity of a rural highway traveler's perspective from a middleground view of the project area. These two locations represent the most sensitive viewers to the project area besides the residences located within the project boundary, who, for the most part, have leased property to Invenergy for the project. Table 3.13-1 shows the visual quality, visual sensitivity, and distance from the Proposed Project of the two KOPs.

Table 3.13-1 Key Observation Points for Wray Wind Energy Project

	Visual Quality	Visual Sensitivity	Distance zone	Distance from nearest turbine (miles)
KOP 2 (Hwy 385 and CR 42.5 E)	Representative	Moderate to Low	Middleground	3.7
KOP 4 (Hwy 34 and CO-NE state line N)	Representative	Moderate to Low	Middleground	3.9

3.13.2 Environmental Impacts and Mitigation Measures

Impacts Methodology - Visual Contrasts

The evaluation of visual effects is based upon adopted federal (U.S. Department of Interior, Bureau of Land Management, Visual Resource Management System - BLM Handbook 8431-1) methods and principles for evaluating visual resources and contrasts (BLM 1986a, BLM 1986b). Visual contrast is a measurement of changes in visual elements of line, form, color, and texture and is used to compare the existing setting and future setting with the project. Visual contrast ratings are defined according to three levels: *Weak*, element contrast can be seen but does not attract attention; *Moderate*, element contrast begins to attract attention and is not easily overlooked; or *Strong*, element contrast attracts attention and will not be overlooked. The visual contrast evaluations are supported by photographs of the existing KOP settings and computer-generated visual simulations of the Proposed Project. Visual simulation provides an objective and accurate tool for documenting the type of visual changes that are likely to occur from specific KOPs.

View Point West prepared two photographic simulations of the proposed Wray Project. The simulations show the proposed turbine configuration and structure heights. View Point West primarily used QuickSurf 6.0 for AutoCAD by PetroByte LLC for terrain modeling and structure placements and Accurender 4.0 by Robert McNeel and Associates for the photographic rendering. Other programs used in the process include AutoCAD Map 3-D 2010 by Autodesk, Inc., Adobe Photoshop CS3 Ver. 10.0.1 by Adobe Systems, Inc., and Google Earth Version 6.0.3.

3.13.2.1 Issues and Significance Criteria

Visual impacts would be significant if:

- views to the project area resulted in strong visual contrasts in highly sensitive or visually unique areas in proximity to high to medium numbers of high sensitivity viewers.

Figure 3.13-1 displays the viewshed of the project area for a ten-mile viewing limit. The project facilities, highways and county roads, and communities and residences are also included in the map. This area encompasses the project area and outlying areas in northeastern Colorado and northwestern Nebraska. The figure presents the potential visibility of the turbines from varying distances including foreground, middleground, and background. At any point on the map, the approximate number of turbines visible is identified based on the location of the turbines within the project area.

3.13.2.2 Impacts of the Proposed Project

The Proposed Project would result in long-term visual and aesthetic changes that would primarily affect representative landscapes of eastern Colorado and residential and highway viewer groups in the project area.

Visual impacts would also include short-term direct effects from ground disturbances, and the visibility of construction crews, equipment, and vehicles working at the turbine sites along the transmission line ROW and access roads. Short-term visual impacts during project construction would be adverse, but less than major, since these visual changes would be temporary. Western's Standard Construction Practices (Table 2.2-2) and Invenergy's Applicant-Committed Mitigation Measures would be implemented to reclaim disturbed landscapes to pre-existing conditions (Table 2.2-3).

Landscape character changes and visual contrasts created by the proposed wind farm would typically range from strong to weak throughout the project area. Project-related visual and aesthetic impacts would vary, however, depending on specific viewing conditions and distances from the project.

Figures 3.13-2a, 3.13-2b, 3.13-3a, and 3.13-3b should be referenced in reviewing this impact discussion. These figures can be found at the end of the Visual Analysis section.

Travel Routes. The Proposed Project would be visible to motorists along U.S. Highway 385D and U.S. Highway 34B. Visual contrasts along these routes would be weak to moderate, when compared to the existing setting.

KOP 2, Figure 3.13-2a shows a typical existing setting of the eastern plains and farmland from U.S Highway 385D looking east near CR 42.5. Figure 3.13-2b illustrates the Proposed Project and the visual changes in form, line, color, and texture created by the introduction of the wind turbines into the environment.

Approximately 41 to 50 turbines could be seen from KOP 2 as shown in Figure 3.13-1. The wind turbines would change the form and line aesthetic of the existing landscape with the addition of tall, vertical towers and rotating blades into a characteristic open, mostly horizontal landscape. The natural undulating horizontal lines of the landscape would contrast with the simple, vertical lines of the turbines. The viewing angle from this KOP creates a two-dimensional somewhat transparent form blending into the sky. The texture associated with the turbines would be characterized as asymmetrical, slightly random, and graduated. Whether these effects are deemed beneficial or adverse depends on viewer perspective and sensitivity.

The introduction of the white turbines into the blue sky horizon would also change the landscape and add a contrasting feature to the existing environment. Due to the slender nature of the turbines in the middleground and background view, the color and texture of the wind turbines would blend in somewhat with the landscape and be less obtrusive when viewed.

From this KOP the long-term visual impacts to motorists would be weak to moderate due to the short duration of views and the distance zone from the turbines (middleground to background) and would not adversely affect the visual character at this location, compared to the existing setting.

Figure 3.13-1 Viewshed Analysis

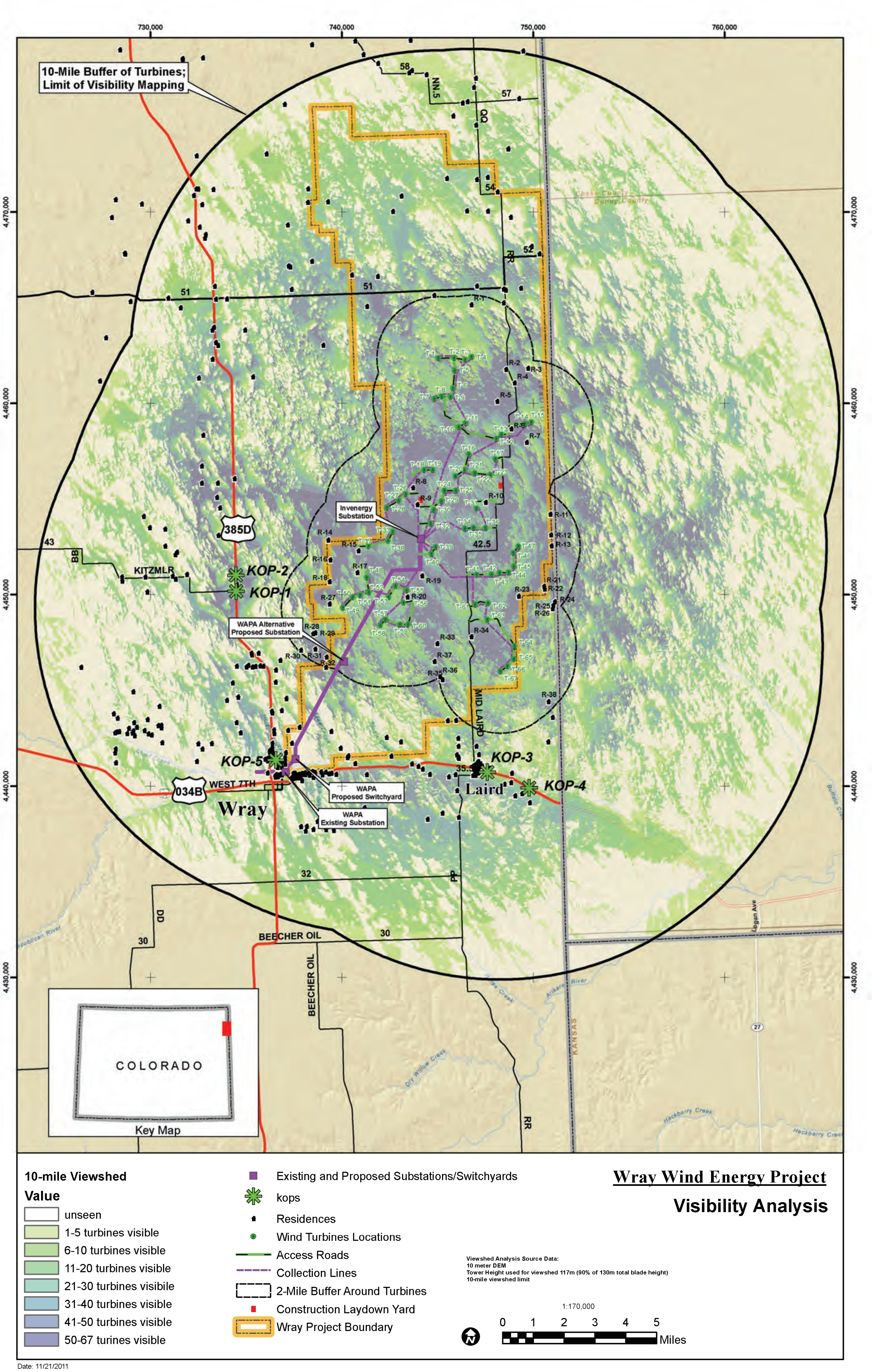


Figure 3.13-2b shows the low to moderate level of contrast to the landscape seen from KOP 2.

From KOP 4, the Proposed Project would also be seen within a middleground to background viewing distance of U.S. Highway 34B. Figure 3.13-3a shows the existing setting from Highway 34B near the Colorado-Nebraska state line looking north. Figure 3.13-3b illustrates the change in the landscape due to the Proposed Project at this location.

Approximately 21 to 30 turbines could be seen from this location (See Figure 3.13-1). Impacts would be similar to those described for KOP 2. Due to the open qualities of the high plains landscape, the increased height and contrast of the proposed turbines would be skylined for motorists viewing the landscape. The vertical forms of the turbines again would be contrasted with the horizontal lines of the landscape. However, the contrast would be relatively indistinct since the turbines are scattered randomly through the landscape. The introduction of white into the skyline somewhat blends in harmony with the blue sky when viewing from the middleground and background. Evident visual changes would be low to moderate from the roadway due to the short-duration of view and the intervening distances that would occur.

Weather conditions would affect the impact of the wind farm in relation to form, line, color, and textures associated with the wind turbines.

Figure 3.13-3b shows the low to moderate level of contrast to the landscape seen from KOP 4.

Residential Areas and Communities. Residential areas that may have views of the Proposed Project include the towns of Wray and Laird as well as scattered outlying rural residences. Wray and Laird are the closest communities to the Proposed Project. Laird is approximately 3.25 miles and Wray approximately 6.11 miles from the nearest turbines (T67 and T49, respectively). For both Wray and Laird, between one to five turbines could be viewed from the town center (See Figure 3.13-1). Wray is less than one mile from the proposed Western switchyard.

Throughout the project area, an estimated six residences are within the foreground view of 0 to 0.5 miles from the project turbines, an estimated 152 residences are within the middleground view of 0.5 to 5 miles from the turbines, and an estimated 251 residences are within the background view of 5 to 15 miles from the turbines. Invenergy provided data on residences within the study area.

The wind turbines would change the aesthetics of the landscape with the addition of tall, vertical towers and rotating blades into a characteristic open mostly horizontal landscape; whether this effect is deemed a beneficial or adverse effect depends on viewer perspective and sensitivity.

The project substation, access roads, overhead power lines, vehicles, and dust would also impact visual resources. The substation would be viewed most frequently by local landowners, and it would represent an industrial facility in a rural landscape. Construction of approximately 24 miles of roads would constitute a 63% increase in the number of roads in the project area. During construction, vehicles and dust would be present in the project area; during operation, vehicle traffic would be only slightly more than current traffic levels. These project facilities would not be new to the area, however, since substations, access roads, and power lines exist within the study area.

Current FAA requirements for wind turbine lighting typically includes red, simultaneously pulsating nighttime lighting and no daytime lighting (white towers are sufficiently conspicuous to pilots). Red nighttime lights are less intrusive to humans than white nighttime lights (AWEA 2004). Invenergy is preparing a lighting plan to meet FAA requirements while minimizing the number of lights for the project (IVISUAL-1 Table 2.2-3).

In summary, due to the location of the project in a typically representative setting and the low number of sensitive viewers from roadways and residences, visual impacts within the project area would be considered direct and long-term, with moderate visual contrasts to the sensitive viewer.

Shadow Flicker

Shadow flicker is the moving/flickering shadows produced when sunlight passes through the spinning rotor blades of a turbine. This phenomenon can become an annoyance to nearby residents when the shadows pass directly over their line of sight, i.e., windows or other transparent surfaces. While the adverse effects of shadows can be subjective, the shadows themselves can be precisely modeled for location and duration.

While evergreen trees would fairly consistently block shadows year-round, deciduous trees would have a lesser impact in the winter months when they have no leaves. Additionally, the farther an observer is from the wind turbine, the smaller the portion of the sun being blocked, and this distance allows the shadow to diffuse (weaken). There is no official U.S. standard for limiting the amount of shadow flicker for any time period on any receptor, but some literature suggests that flickering shadows in excess of 30 hours per year impacting a particular location are considered a potential nuisance (DOE 2011).

A shadow flicker analysis will be completed for the Proposed Project to evaluate the amount of shadow flicker that would be experienced by local residents (IVISUAL-4 Table 2.2-3). The analysis will consider several aspects affecting the casting of shadows and potential impacts on local receptors, including the distance to receptors, angle of incoming solar insolation, and the amount of sunlight experienced at the project site during each of the four seasons.

The industry standard for locating turbines is 1,000 feet from any residence. Within the project area one residence (R20) is located approximately 1,150 feet from a turbine and five additional residences (R6, R8, R10, R17, R27) are located within 2,600 feet of turbines. These are the closest receptors of potential shadow flicker. As mentioned above, a shadow flicker analysis will be completed for the Proposed Project and mitigating measures would be taken if acceptable conditions do not exist.

3.13.2.3 Impacts of the No Action Alternative

Since there would be no project development with the No Action Alternative, there would be no impacts to visual resources with this alternative.

3.13.2.4 Mitigation Measures

Implementation of Invenergy’s Applicant-Committed Mitigation Measures IVISUAL-1, IVISUAL-2, IVISUAL-3, and IVISUAL-4 (Table 2.2-3) would ensure that short-term impacts to visual resources would be minimized.

Figure 3.13-2 Existing & Simulation #1

Figure 3.13-3 Existing & Simulation #2

3.14 Socioeconomics and Community Resources (including Environmental Justice)

3.14.1 Affected Environment – Environmental Setting for the Proposed Project

This section addresses historical and present socioeconomic conditions in Yuma County. Topics reviewed include population, employment and income, and housing. Table 3.14-1 summarizes baseline conditions within the County. The only urban community directly affected by the Wind Energy Project is Wray, Colorado. This section of the EA also addresses issues related to Environmental Justice, as required under Executive Order 12898.

3.14.1.1 Demographics

Employment and Income

The study area has a diverse economic base; however, agriculture is the mainstay of the economy. The greatest percentages of total employment occur in the agriculture, government, and retail trade sectors (CDLE 2011).

Labor Force. Employment and unemployment for 2011 in Yuma County and the State of Colorado is shown in Table 3.14-1. Yuma County had an estimated unemployment rate of 4.3 percent in 2011; the fourth lowest unemployment rate in Colorado compared to the state average at 8.5 percent. The total labor force for the Yuma County area is estimated at over 6,500.

Table 3.14-1 Socioeconomic Profile

Labor Force Summary July 2011				
County	**Labor Force**	**Employed**	**Unemployed**	**%**
Yuma County	6,559	6,277	282	4.3
State of Colorado	2,701,596	2,471,449	230,147	8.5

Full Time and Part-time Employment by Industrial Sector (NAICS)				
	Yuma	**%**	**Colorado**	**%**
Private	2,810		1,802,158	
Ag, For, Fish	679	17.5	13,670	<1
Mining	227	6.0	24,232	1.1
Utilities	4	<1	8,266	<1
Construction	105	2.8	115,111	5.3
Manufacturing	77	2.0	125,501	5.8
Wholesale Trade	203	5.3	90,851	4.2
Retail Trade	438	11.5	236,726	10.9
Transportation and Warehousing	85	2.2	57,134	2.6

Full Time and Part-time Employment by Industrial Sector (NAICS)				
	Yuma	**%**	**Colorado**	**%**
Information	49	1.3	71,634	3.3
Finance and Insurance	160	4.2	98,229	4.5
Real Estate	34	<1	41,348	1.9
Prof and Technical	58	1.5	167,505	7.7
Management of Companies and Enterprises			28,818	1.3
Administrative and Waste Services	8	<1	133,522	6.1
Educational Services			28,979	1.3
Health and Social Assistance	287	7.5	232,262	10.7
Arts Entertainment and Recreation	28	<1	44,621	2.0
Accommodation and Food Services	296	7.8	217,976	10.0
Other Services	59	1.5	65,278	3.0
Government	1,000	26.2	374,911	17.2
Total All Industries	3,811		2,177,069	
Population Growth in the Study Area				
	1990	**2000**	**2008**	**% Increase 1990-2008**
Yuma County	8,954	9,841	9,669	8.0
State of Colorado	3,294,473	4,301,261	4,935,213	49.8

Source: Colorado Dept of Labor and Employment (CDLE) 2011, includes Labor Market Statistics, Colorado Quarterly Employment and Wages (QCEW) and U.S. Census Bureau 2011

Note: NAICS = North American Industry Classification System

Employment. Wage and salary employment by industrial sector is shown in Table 3.14-1. The construction sector represents 2.8 percent of total employment (3,811) in Yuma County, with an estimated 105 employed in the construction sector within the county (CDLE 2011).

Wages. The average weekly wage in Yuma County in 2010 was $652 compared to $1,001 for Colorado and $633 in the construction industry (CDLE 2011). Average annual earnings per job in the county were $33,904 assuming a wage and salary 40 hour per week job, compared to $52,052 in Colorado (CDLE 2011). Per capita income is estimated at $39,389 in Yuma County. Median household income was $43,560 (U.S. Dept. of Commerce 2011b).

Population. Population in Yuma County has increased by 8 percent between 1990 and 2008. Colorado as a whole has increased by 50 percent during the same time period.

The race composition of the study area is composed primarily of White or Hispanic ethnic background. The Yuma County population is 77.9 percent White and 20.8 percent Hispanic compared to the Colorado population with 70 percent White and 20.7 percent Hispanic (US Census Bureau 2010).

Housing

The Wray Wind Energy Project is located within close proximity to the towns of Wray, Yuma, and Laird in Yuma County and Holyoke in Phillips County. These towns have a number of short-term housing accommodations. The total number of rooms in Holyoke and Wray total 79. Yuma has a total of approximately 90 rooms (Kathol 2011). These towns are within easy commuting distance of the wind project. In addition, there are public and private campgrounds throughout the area that provide campground facilities for temporary workers including 65 RV hook-ups in Holyoke at the Phillips County Fairgrounds. Other temporary accommodations are available within commuting distance of the project in other outlying areas as well as the larger towns of Brush and Sterling which are within a one and a half hour drive time of Wray.

In addition to temporary housing, there is adequate permanent housing within commuting distance of the project throughout the study area. Most recent data shows 406 vacant units in Yuma County, and of the over 4,300 housing units, approximately 33% are rental units. It is anticipated that some construction workers would travel to and from their permanent residences on a daily basis. However, this number is likely to be low considering the level of skilled labor required to construct the wind farm. Some local non-skilled laborers would be hired from the local area.

3.14.1.2 Public Services

Public services throughout the study area are provided by various private and public entities, including counties, municipalities, special districts, and private interests. Because of the minimal level of population impacts anticipated during the construction phase of the project, only public facilities which might potentially be impacted by accidents of wind facility construction will be covered in this section.

Emergency Services- Law Enforcement and Hospital

Emergency services provided in Yuma County, Colorado include fire, sheriff and police, ambulance, and hospital services.

Law enforcement services are provided by the Yuma County Sheriff's Department and the Wray, Holyoke, and Yuma Police Departments. Fire protection and emergency services are provided by the Wray Volunteer Fire and Rescue Department, Yuma Volunteer Fire Department, Eckley Volunteer Fire Department, Wages Volunteer Fire Department, Joes Fire Department, and Hale Fire and Rescue Department.

There are four hospitals in the study area within close proximity of the wind farm: Wray Community District Hospital Critical Access Hospitals (CAH), Melissa Memorial Hospital CAH in Holyoke, Yuma District Hospital – CAH, and East Morgan County Hospital District CAH in Brush. All hospitals are either government authorized hospital districts or authorities providing emergency services as well.

3.14.1.3 Environmental Justice

Under Executive Order 12898 (published in the Federal Register February 11, 1994), federal agencies are required to identify and address disproportionately high or adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. A specific consideration of equity and fairness in resource decision-making is encompassed in the issue of environmental justice. As required by law and Title VI, all federal actions will consider potentially disproportionate negative impacts on minority or low-income communities. Within the area potentially affected by the Proposed Project, minimal minority populations are affected. During the EA process, particular efforts were made to ensure that property owners within the affected areas were informed of the Proposed Project, the EA procedures, and the opportunity to provide comments.

Income levels throughout the study area are diverse. The most recent estimate of per capita personal income in Yuma County was $39,389 in 2009 and $41,895 in the State of Colorado (U.S. Dept of Commerce 2011b). These numbers reflect somewhat the disparity of incomes in a more agricultural-oriented Yuma County as compared to the state as a whole. The most recent poverty status statistics are from the 2009 census data. These data showed poverty status for 12.6 percent (1,265) of the population in Yuma County, and 13.3 percent (668,883) for the State of Colorado (U.S. Census Bureau 2011). Since the economic base of the study area is largely rural agriculture, low income areas are dispersed within the study area. People within the poverty status may reside within the immediate project area, but not disproportionately.

Table 3.14-2 highlights demographic statistics for identifying potential areas of concern. The 2009 data was used for the analysis of race, and income data was used for analysis of poverty.

Table 3.14-2 2010 Census Community Statistics for Environmental-Justice Analysis

Population	Yuma	Colorado
Persons Below Poverty Level (2009)	1,265	668,883
Percent Below Poverty (2009)	12.6 %	13.3 %
White	7,824	3,520,437
Black	20	201,168
American Indian	50	55,321
Asian	20	140,818
Native Hawaiian or Pacific Islander	0	50,292
Other Race	40	20,116
Hispanic Origin (of any race)	2,089	1,041,044

US Census Bureau (Quick Facts) 2011

3.14.2 Environmental Impacts and Mitigation Measures

3.14.2.1 Issues and Significance Criteria

Impacts to socioeconomics would be significant if:

- minority or low-income populations are disproportionately affected by the wind project; or
- project related population increases result in housing or public service demands that could not be met by existing or currently planned communities.

3.14.2.2 Impacts of the Proposed Project

Construction and Operations. The construction phase of the project is anticipated to last approximately six months. The construction workforce would average 150 to 200 workers during the six month construction period. Due to the specialized nature of wind project construction, the construction crew would not likely be composed of a large percentage of local workers. It is anticipated that the workforce would be mostly non-local, but a portion could come from Colorado. Construction workers would likely stay in short-term rental units (motels or single or multifamily rental units) and RV campers where available. If local, some workers would commute to and from their permanent residence on a daily basis if within commuting distance of the show-up area.

Project development entails a number of occupations including project management, engineers, construction workers, truck drivers, crane operators, and wind technicians (Hamilton and Liming 2011). Salary ranges for these specialties are construction labor ($29,110), construction equipment operator ($39,530), crane and tower operator ($47,170), electrician ($49,800), and project management ($80,000-$100,000). A portion of this income would be spent in the local area for goods and services. This would have a positive impact on local businesses such as restaurants, service stations, and miscellaneous retail stores. In addition to local expenditures near the project area, workers would also be contributing to their local economy in the form of local expenditures for goods, services, housing, insurance, entertainment, and food.

Other economic benefits beyond wages and salaries include taxes paid to local governments. The project is anticipated to pay an estimated $280,000 in property taxes to Yuma County starting the first year. Over the 20 year project period an estimated $6.9 million would be paid in property taxes (Williams 2011). In addition to property taxes, Invenergy would also pay miscellaneous sales and use taxes for certain expenditures in and outside the county for construction materials and miscellaneous purchases of up to $220,000 for the life of the project. However, most other expenditures related to renewable energy project materials are exempt from sales taxes in Colorado. Invenergy estimates infrastructure improvement expenditures for Yuma County roads ($1 million) and expenditures for interconnected Western transmission facilities ($4 million) would total $5 million. In addition, Invenergy would pay over $450,000 per year in lease payments to property owners leasing their property for the wind project. Income generation within the town of Wray and Yuma County would be moderate and considered a beneficial impact to the local economy.

Table 3.14-3 shows the estimated economic benefits of the Wray Wind Energy Project.

Table 3.14-3 Estimated Economic Impacts from Wray Wind Energy Project

Economic Impacts	**Annual**	**Life of Project (20 years)**
Property Tax	$ 280,000	$6.9 million
Landowner Payments	$ 450,000	$9 million
State Sales Tax		$220,000
Employment	150-200 (short-term)	8-10 (long-term)
Road Improvements Yuma County		$1 million

Source: Williams 2011

Based on information provided in Section 3.14.1.1, housing and temporary accommodations provided in the study area are adequate for the estimated 150 to 200 construction workforce; although, some workers may have to commute some distance for temporary lodging during peak construction.

Emergency services including fire, police, ambulance, and hospital services would not be impacted by increases in permanent population or employment during the construction phase of the Proposed Project. The only impacts that would affect the provision of emergency services within the study area would be a construction accident or possibly traffic impedance for short periods of time. Basic medical and emergency services, which may be required in the event of an accident, are available throughout the study area as described in Section 3.14.1.1.

Because additional workers would be in the area and because there would be an increase in traffic, the project would result in a small increase in the need for additional law enforcement; however, no public safety issues are anticipated based on experiences from construction of other wind projects.

The operations phase of the project would have a minor beneficial impact on population, employment, housing, or local infrastructure. An estimated 8 to 10 permanent operation wind technicians would maintain operations at the wind farm for the life of the project. Wind technicians who are involved in ongoing operations of the wind farm have starting salaries ranging from $35,000 to $40,000. An estimated $320,000 per year would be paid to operations workers who would live within the project area for the long-term. These technicians may come from the local labor pool and be trained for the job, or could come from outside the area.

Property Values

The following discussion of wind development impacts on property values was excerpted from the U.S. Bureau of Land Management’s Final Programmatic Environmental Impact Statement on Wind Energy Development of BLM-Administered Lands in the Western United States (BLM 2005).

> “The potential impact of wind development projects on residential property values has often been a concern in the vicinity of locations selected for wind power. Although this PEIS does not directly assess the potential impacts of wind power on property values, a review of two studies that examined potential property value impacts of wind power facilities suggests that there would not be measureable negative impacts.
>
> ECONorthwest (2002) interviewed county tax assessors in 13 locations that had recently experienced multiple-turbine wind energy developments. While not all the locations chosen had wind turbines that were visible from residential areas, and some development projects had been constructed too recently for their full impact to be properly assessed, the study found no evidence that wind turbines decreased property values. In one area examined, it was found that designation of land parcels for wind development actually increased property values.
>
> Sterzinger et al. (2003) analyzed the effects of 10 wind energy development projects built during the period 1998 to 2001 on housing sale prices. The study used a hedonic statistical framework that attempted to account for all influences on changes in property value; its data came from sales of 25,000 properties, both within view of recent wind energy developments and in a comparable region with no wind energy projects, before and after project construction. The results of the study indicate that there were no negative impacts on property values. For the majority of the wind energy projects considered, property values actually increased within the viewshed of each project, with property values also tending to increase faster in areas with a view of the wind turbines than in areas with no wind projects.”

The overall social and economic impacts of the wind project during construction would be considered moderate, beneficial, short-term, direct, and indirect on the local area population, employment, housing, or infrastructure. During operations, impacts of the project would be considered minor, beneficial, long-term direct, and indirect.

Environmental Justice

Neither low income (poverty status) nor minority populations would be disproportionately impacted by the Proposed Project. As described in Section 3.14.1.3 Environmental Justice, the economic base of the area is predominately agriculture. Segments of the population are lower income, due to a typically lower income generated in the wage and salary agricultural sector. However, families within the defined poverty status represent less than 13 percent (in 2009) and are dispersed throughout the study area. No new properties would be impacted by the wind farm.

The Proposed Project would not have a disproportionately high or adverse effect on minority or low income populations or corresponding property values of minority or low income populations.

3.14.2.3 Impacts of the No Action Alternative

The No Action Alternative would preclude employment for an estimated construction workforce of 150 to 200 for the short-term and an operations workforce of 8 to 10 for the long-term. Income generated in the form of direct wages to employees, lease payments to land owners, property taxes to Yuma County and municipalities, and direct expenditures by the contractor and Invenergy would not be filtered into the local economies adjacent to the project.

3.14.2.4 Mitigation Measures

No additional mitigation is required to ensure that short- and long-term impacts to socioeconomics would be minimized.

3.15 Transportation

This section describes the existing transportation system within the study area, and the potential impacts of the Proposed Project on traffic and the transportation system.

3.15.1 Affected Environment – Environmental Setting for the Proposed Project

The transportation system in the study area is predominantly automobile oriented, relying almost exclusively on public roads and highways. Surface transportation in the area is provided by a network of primary, secondary, and local roads. The study area is served by two US Highways, 34B and 385D, and many local Yuma County Roads (CR) within the project boundary (Yuma CR 36 through 55 and JJ through SS). Most county roads run linearly north-south or east-west.

Average annual daily traffic (AADT) ranges from 2,200 to 4,200 vehicles per day along segments of Highway 385D near Wray. This level of traffic is about 12 percent of total capacity for the highway. AADT on Highway 34B ranges from 1,200 to 7,100 vehicles per day and represents about 11 percent of total capacity of the highway. The larger AADT numbers occur within close proximity of the town of Wray.

The primary roads are hard surface and well maintained. Yuma County Roads are mostly gravel and in excellent condition providing easy access overall to the project area. These access roads are not heavily used and are regularly maintained. Farmers and cattle operations utilize these roads.

3.15.2 Environmental Impacts and Mitigation Measures

3.15.2.1 Issues and Significance Criteria

Impacts to transportation would be significant if:

- construction or operation and maintenance caused access impedance to cultivated farmland;
- emergency access to any portion of the project area would be precluded by construction activity; or
- any permanent impact (damage) to roads systems occurred.

3.15.2.2 Impacts of the Proposed Project

Impacts to transportation would be associated with construction related traffic on the major and local transportation systems within the project area. Large truck traffic and traffic associated with employees traveling to and from the job site on a daily basis would potentially impact the transportation systems within the area.

In addition, as shown in Section 2.2.2.1, Invenergy would upgrade eight miles of existing roads within the project site and build an additional 24 miles of new access roads in accordance with landowner easement agreements and county and industry standards for wind farm roads. These roads would be built to minimize disturbance and maximize transportation efficiency. During construction of the wind project, traffic on the project site would be restricted to the roads developed for the project. Signs would be placed along the roads, as necessary, to identify speed limits, travel restrictions, and other traffic control information.

Approximately 80 percent of the areas disturbed for turbine assembly and site access would be reclaimed upon completion of construction.

A variety of vehicles and traffic volumes would be necessary to construct and operate the wind farm. Heavy equipment and materials needed for site access, clearing and grading, and foundation construction are typical of road construction projects and would include bulldozers, graders, excavators, front-end loaders, compactors, concrete trucks, and dump trucks. Delivery of erection cranes and wind turbine generators would occur during construction for the eight weeks after the access roads have been completed.

The expected daily volume of traffic during construction would be estimated at sixty vehicle trips per day. There are certain periods of construction (turbine delivery) when the traffic volume would be higher as well as periods (commissioning) where it would be lower.

During the six months of construction activity, construction of access roads and preparation and construction of foundations would require approximately 4,000 vehicle trips. Delivery of components and concrete to the individual turbine locations would entail approximately 2,000 truck loads over the course of eight weeks following road completion. Throughout the construction process, workers would arrive on-site each day and would attempt to carpool to and from the site whenever possible to reduce vehicle trips.

Transportation of materials such as gravel, concrete, and water would not be expected to significantly affect local primary and secondary road networks. The delivery of the erection cranes and wind turbine generators could affect traffic temporarily due to the size of the crane and turbine tower components and blades. However, the delivery of the oversized equipment and wind turbine components would be intermittent and cause only temporary traffic delays. Turbine component delivery would occur during construction for the eight weeks after the access roads have been completed. Western's Standard Construction Practices and Invenergy's Applicant-Committed Mitigation Measures would be implemented to ensure traffic safety and minimize traffic obstruction whenever possible. Passage of emergency response vehicles would be assured.

Impacts to the transportation system due to the Proposed Project would be short-term and minor. The highways providing access to the project area have adequate capacity to handle both construction worker traffic and truck traffic associated with construction of the wind farm. No emergency access would be impeded or permanent changes to the transportation or utility systems would occur.

During normal O&M, traffic around the site would be limited and infrequent and include three to five four-wheel-drive pickup trucks. Snow removal equipment (pickup trucks equipped with wing-style blades) would be utilized as needed during winter.

3.15.2.3 Impacts of the No Action Alternative

Since there would be no project development with the No Action Alternative, there would be no impacts to transportation with this alternative.

3.15.2.4 Mitigation Measures

Implementation of Western's Standard Construction Practices TRANSPORTATION-1 AND TRANSPORTATION-2, (Table 2.2-2) would ensure that short-term impacts to transportation would be minimized.

3.16 Public Health and Safety

3.16.1 Affected Environment – Environmental Setting

The project area includes potential public health and safety hazards at construction sites, at turbine sites, along roads, in open spaces, and along existing transmission lines. These hazards relate to traffic accidents along county roads; unanticipated fires and electrocution from high voltage equipment; interference with school buses or emergency vehicles; electromagnetic interference (EMI) with local aircraft radar or microwaves; potential effects of electromagnetic fields (EMF) from transmission lines; lightning strikes; and interference with airplane flight paths. These hazards would be considered random risks associated with weather, travel, electrical equipment, and electrical facilities.

3.16.2 Environmental Impacts and Mitigation Measures

3.16.2.1 Significance Criteria

Impacts to public health and safety would be considered significant if:

- the Proposed Project resulted in loss of life, limb, or property.

3.16.2.2 Impacts of the Proposed Project

Workers have the potential to be injured or killed during construction, operation, and decommissioning of wind turbines through industrial accidents such as falls, fires, and dropping or collapsing equipment. Such accidents are uncommon in the wind industry and are avoidable through implementation of proper safety practices and equipment maintenance.

Other potential sources of accidents are ice shedding and lightning. Ice shedding refers to the phenomenon that can occur when ice accumulates on rotor blades and subsequently breaks free or melts and falls to the ground. Although a potential safety concern, it is important to note that, while more than 90,000 wind turbines have been installed worldwide, there has been no reported injuries caused by ice shedding from a turbine (Tetra Tech EC, Inc. 2007). Turbines are engineered to include sensors on the turbine blades which detect imbalances on the blade. When ice forms, the sensors recognize an imbalance and the turbine automatically shuts down. This technology is intended to prevent damage to the turbine from the imbalance created by ice accumulation. Ice that has accumulated on the blades would fall to the foot of the turbine as it melts. Property setbacks also protect against possible accidents or injury related to ice shedding; the turbine manufacturer requires the area directly underneath to be a clear zone (DOE 2011).

A study conducted for the National Renewable Energy Laboratory was successful in identifying damaged mechanisms due to direct and indirect effects of lightning strikes on wind turbines. Lightning strikes can cause extensive damage to the turbine blades, controllers, and power electronics (NREL 2002). However, this damage can be reduced by the protection from tall nearby communication towers, integral blade protection in the form of conductors, bonding to minimize arcing, good turbine grounding, controller cable and controller shielding, and transient voltage surge suppression. The turbines used by Invenergy include copper sensors on the blades which run through the turbine to ground. Therefore all components of the turbines would be grounded to avoid damage from lightning strikes. The amount of lightning damage is a factor of the lightning activity in the area, the height and prominence of the turbine, the terrain, and the lightning protection system in place.

According to the FAA, the Wray Municipal Airport is within a possible impacts range of less than 10 miles from the project site. All structures taller than 200 feet, as is the case with the Proposed Project, are required to have aircraft warning lights in accordance with requirements specified by the FAA. Invenergy is required to submit a permit application to the FAA. This application would be submitted prior to construction. At that time, the FAA would conduct a thorough study to determine that no hazards related to height or glide slope would be present due to the wind farm. Without FAA approval the project could not be built.

The term electromagnetic field (EMF) refers to electric and magnetic fields that are present around any electrical device. Electric fields arise from the voltage or electrical charges, and magnetic fields arise from the flow of electricity or current that travels along transmission lines, collector lines, substation transformers, house wiring, and electrical appliances. The intensity of the electric field is related to the voltage of the line, and the intensity of the magnetic field is related to the current flow through the conductors (wire). EMFs can occur indoors and outdoors. While the general consensus is that electric fields pose no risk to humans, the question of whether exposure to magnetic fields potentially can cause biological responses or even health effects continue to be the subject of research and debate. However, wind turbines are not considered a significant source of EMF exposure since emissions levels around wind farms are low (CMOH 2010).

Public access to private lands is already restricted by landowners and would continue to be restricted in accordance with easement agreements. This would prohibit members of the public from accessing the wind farm facilities located on private property.

US Highway 34 and US Highway 385 are located south and west of the project respectively. These highways would be the primary access to the county roads within the project area. As discussed within Section 3.15 Transportation, county roads are primarily used for agricultural activities and are in generally good condition and provide adequate capacity for large agricultural equipment. Traffic in the area of the project site is generally limited to local residents and agricultural activities. Adequate capacity exists along all roads within the study area.

The potential for fire or explosion from the wind energy facility is minimal. At electrical substations, there may be a variety of types and applications of power transformers. In order to reduce the likelihood of property damage and the extent of transformer fires, protection is provided in the form of electrical, fixed fire, and passive protection systems, such as fire barrier walls or separation.

3.16.2.3 Impacts of the No Action Alternative

Since there would be no project development with the No Action Alternative, there would be no impacts to public health and safety with this alternative.

3.16.2.4 Mitigation Measures

Implementation of Invenergy's Applicant-Committed Mitigation Measures ISAFE-1, ISAFE-2, ISAFE-3, IFIRE-1, IFIRE-2, and IFIRE-3 (Table 2.2-3) would ensure that short-term impacts to public health and safety would be minimized.

Safety signage would be posted around the tower (where necessary); transformers and other high voltage facilities would be in conformance with applicable federal, state, and local regulations.

All contractors, subcontractors, and their personnel would be required to comply with all federal and state worker safety requirements, specifically all of the applicable requirements of OSHA. FAA requirements would be met.

The following measures are part of the project description:

- The towers would be placed in accordance with all Yuma County setback requirements, including a minimum of 1,000 feet from all residences and two times the total height from public ROWs;
- At the turbines, the nacelle would sit on solid steel enclosed tubular towers in which all electrical equipment would be located, except for the padmount transformer. Access to the tower is through a solid steel door that would be locked when not in use by Invenergy personnel; and
- Safety warning signs would be posted around all towers, padmount transformers, and substation facilities in conformance with applicable state and federal regulations.

3.17 Cumulative Impacts

3.17.1 Reasonably Foreseeable Development

The Republican River Water Conservation District (RRWCD) is in the process of constructing a $71 million Compact Compliance Pipeline project to deliver water from wells located 8 to 15 miles north of the North Fork Republican River to that same river at the Colorado/Nebraska state line just above the measuring device. Colorado will get credit for this water delivery in the accounting for the Republican River Compact between Colorado, Kansas, and Nebraska.

The water pipeline alignment runs approximately 12.7 miles from a starting point on the land owned by Cure Land LLC and will run roughly parallel to the state line to an outfall point located approximately ½ mile above the Colorado/Nebraska state line. The pipe diameter will be 42 inches on the north end of the pipe, reducing to 36 inches in the middle portion of the pipe, and reducing even further to 30 inches in the lower section of the pipeline near the river. Water can be pumped from a network of up to 15 wells, into a storage tank at the top end of the pipe, and then free-flow down the pipe to the outfall at the river.

Requests were submitted to the Colorado Ground Water Commission to allow moving the water rights of the 62 well permits to locations so that pumping of the entire 14,798 acre-feet may be withdrawn from up to 15 specific wells. This change will significantly reduce the miles of connecting pipeline required for this project. Lands previously irrigated will be taken out of production and returned to native vegetation.

RRWCD has applied to the Colorado Ground Water Commission to change the use of the wells from irrigation to allow them to be used for augmentation of stream flows in the North Fork Republican River. In making that change, the future pumping of the wells will be limited to 14,798 acre-feet, the amount of legal historic depletion to the aquifer over the last ten years from those wells.

RRWCD has a contract on 53 irrigation wells to purchase only the water rights, not the 10,000 acres of land that the wells have been irrigating. There are 62 well permits but only 53 wells because some well structures have two well permits; the second being an increase in appropriation or increase in irrigated acres for the same well.

GEI Consultants, Inc. of Centennial, Colorado was hired in 2007 to do a feasibility study on building a Compact Compliance Pipeline to deliver water to the North Fork Republican River from underground wells. Upon completion of that study, that same firm was hired to design and assist in the construction of that pipeline. The planned completion of the pipeline is in 2012.

Tri-State is proposing to build a 230-kV transmission line from Burlington to Wray. The 230-kV line would connect to the existing substations near Wray and Burlington. The line would be 50 to70 miles long with wood H-frame structures. Construction is projected from 2013 to 2015, with an in-service date of 2015. An existing line is currently within this corridor.

3.17.2 Cumulative Environmental Impacts for Resource Topic

Air Quality

The Proposed Project would have minor, short-term potential impacts to air quality during construction and negligible impacts during operation. Agricultural activity, possible construction of a Tri-State transmission line, and the Republican River Pipeline Project would likely also have minor, short-term impacts to air quality. Should these projects be constructed simultaneously, the Proposed Project would not cause or contribute to a violation of applicable standards.

Geology

The Proposed Project is not expected to impact geological resources if construction methods described in Section 2.2.9 are implemented. Therefore, the project would not contribute to cumulative impacts to geological resources.

Paleontology

The Proposed Project is not expected to impact paleontological resources. Therefore, the project would not contribute to cumulative impacts to paleontological resources.

Water Resources

There would be no direct impact to surface water because no surface water bodies would be impacted by construction of any structures or facilities in the Proposed Project. Negligible, short-term, indirect impacts to water quality from sedimentation during the construction period would occur. Similar impacts could occur from the possible construction of the Tri-State transmission line and the Republican River Pipeline Project. Implementation of mitigation measures would minimize indirect cumulative impacts to surface water and would not contribute to increased cumulative impacts.

The Proposed Project would not impact floodplains. There would not be a cumulative impact from this project to floodplains during construction or operation.

The Proposed Project is not expected to impact ground water and would not contribute to cumulative impacts to ground water resources.

The Proposed Project would consume less than 25 AF of water during construction from existing permitted sources from Holyoke or Wray, Colorado. Cumulative groundwater quantity and quality impacts are anticipated to be minimal. During operation, an exempt commercial well would provide an estimated 375 gallons/day (less than 0.5 AF/year) to the O&M building and would not cause undue depletion of ground water in the Republican River Basin.

Wetlands

Considering the limited acreage of wetlands within the project area and their location, coupled with Invenergy's commitment to avoid wetlands wherever possible, the cumulative impact of this project on regional wetlands is negligible.

Vegetation

The cumulative impacts area analyzed for vegetation resources is the same as the project study area. Other foreseeable projects within the study area include possible conversion of native vegetation areas to irrigated or dryland cropland and construction of the Republican River pipeline. The extent of possible future conversion of native vegetation types to cultivated cropland is unknown. Regarding the Republican River pipeline, the actual construction of the pipeline would result in a relatively minor and short-term disturbance of native and agricultural vegetation resources that would be reclaimed once pipeline construction is completed. However, because of the Nebraska/Kansas/Colorado compact agreement, some irrigated cropland areas within the project study area would be removed from cultivation and returned to native sandhill steppe or grasslands since less irrigation water would be available for cultivated areas.

Most of the disturbance area for the proposed Wray Wind Energy Project would be reclaimed and revegetated after completion of construction. There would be a long-term loss of 65 acres associated with new access roads, turbine foundations, and other project facilities for the life of the project (52 acres of sandhill steppe, 12 acres of irrigated cropland/adjacent agricultural disturbance, and 1 acre of native grassland). Overall, the long-term footprint of facilities would be relatively small in relation to the extent of existing vegetation types within the study area, and long-term loss of native vegetation types (less than 1% of existing sandhill steppe and native grassland within the study area) would be relatively minor.

Soils

Impacts to soils from the Republican River Pipeline Project and Tri-State's Transmission Line Project would be similar to those associated with the collection system and transmission line construction associated with this project, though at a larger scale. The potential disturbance acreages associated with these projects are unknown at this time. It can be assumed that all disturbances associated with these two projects not needed for operations and maintenance will be revegetated in the same manner as this Proposed Project.

Therefore, assuming the successful initial revegetation of Invenergy project components, the cumulative impact to the soil resource is the removal of 65 acres of soils from productivity through initial project life in addition to the acreage of soils removed from production by the Republican River Pipeline and Tri-State Transmission Line projects. The soil impacts resulting from this project would be correspondingly reduced at project termination with the revegetation of the remaining facility components.

Wildlife

The cumulative impacts area analyzed for wildlife resources is the same as the project study area. Other foreseeable projects within the study area include possible conversion of native vegetation areas to dryland cropland and construction of the Republican River pipeline. The extent of possible future conversion of native vegetation types to cultivated cropland is unknown. Future conversion of native vegetation types to cropland would not be beneficial to local wildlife populations, and in particular, the greater prairie-chicken. Regarding the Republican River pipeline, the actual construction of the pipeline would result in a relatively minor and short-term disturbance of native and agricultural vegetation resources that would be reclaimed once the pipeline construction is completed. However, because of the Nebraska/Kansas/Colorado compact agreement, some irrigated cropland areas within the project study area would be removed from cultivation and returned to native sandhill steppe or grasslands since less irrigation water would be available for cultivated areas. Some existing cultivated cropland would be converted back to native vegetation types which would be beneficial to local wildlife populations, and in particular, the greater prairie-chicken.

Special Status and Sensitive Species

As indicated in Section 3.9.2.2, there would be no impacts from the Proposed Project on threatened, endangered, proposed, candidate, or state species of special concern so there would be no cumulative impacts to these species from implementation of the Proposed Project.

Cultural Resources

There would be no cumulative impacts for Cultural Resources.

Land Use

The Proposed Project would make a minor contribution to cumulative land use effects resulting from the reasonably foreseeable future projects described above. Future actions that could impact the land use character of the region to the greatest degree would be the removal of irrigation water in an area highly dependent on irrigation for crop production. Impacts from these reasonably foreseeable projects could be major in terms of reduced productivity of the lands taken out of agricultural use.

For the short-term, the proposed reasonably foreseeable projects would not have a dramatic impact on the region. However, the Proposed Project would not change the overall land use character of the area since it would impact only 65 acres within the agricultural area, far less of an impact than the Republican River Pipeline Project.

Because of the vast amount of private agricultural land in Yuma and Phillips counties, land use activities and characteristics are likely to remain in spite of the proposed cumulative development. The Proposed Project would not directly cause or contribute to the long-term cumulative impacts to land uses.

Noise

Noise impacts from the Proposed Project are anticipated to be negligible because at distances of approximately 305 m (1,000 feet) or more from the turbines, the area would not experience an increase in noise relative to current conditions. Cumulative impacts due to noise would be negligible.

Visual Resources

The cumulative visual impacts of the Proposed Project with other past, present, and reasonably foreseeable developments and actions consist of moderate impact contributions to the conversion of regional agricultural landscapes for wind energy and transmission development. Cumulative visual impacts within the vicinity of the project would be long-term and visible from some developments within a 15-mile radius of the project. The wind turbines and project facilities would be within the middleground and background of U.S. Highway 385D and U.S. Highway 34B, and would be visible within the region at various locations. The Proposed Project's contribution towards cumulative effects would be considered moderate due to the surrounding land uses and relatively few sensitive viewers. None of the cumulative projects discussed would include sensitive viewers.

Socioeconomics and Community Resources (including Environmental Justice)

The Proposed Project would make a minor and short-term contribution to the cumulative socioeconomic impacts that would result from construction and operation of other reasonably foreseeable projects. Build-out of these projects would contribute to changes in short-term local population, employment, housing, public services and facilities, the economy, and the transportation network. If construction of the Republican River Compact pipeline and wind farm occurred simultaneously, a short-term shortage of temporary housing may occur, possibly displacing other tourists or visitors to the area.

These projects would affect the overall socioeconomic environment of the project area, primarily in the areas of increased population and employment, increased income in the project area, and increased revenues generated particularly in Yuma County, but also in the towns affected by the developments. It is difficult to identify the secondary and induced growth effects from commercial, industrial, and residential activity within the study area.

The Wray Wind Energy Project would have a very minor contribution to these cumulative socio-economic changes since project-related effects would be short-term and occur primarily during project construction. The additional employment of 8 to 10 permanent wind technicians would contribute beneficially to the economic base of the area for the life of the project.

Transportation

During construction, the Proposed Project would result in short-term and minor impacts to local transportation systems. Impacts to transportation systems would result from the intermittent presence of large construction equipment (cranes, turbine transport trucks, cement trucks, etc.), construction crews, other vehicles, and associated increased traffic. These effects could occur simultaneously with other proposed developments which would have a larger impact on traffic and noise, dust, and potential traffic delays related to additional construction traffic. The Proposed Project's contribution to cumulative impacts is considered short-term, and could be partially mitigated through the coordination with other local agencies regarding construction plans and schedules. Over the long term, the Proposed Project would not change traffic-related activity throughout the project area.

3.18 Intentional Destructive Acts

Wind farms and other installed infrastructure such as the Wray Wind Energy Project may be the subject of intentional destructive acts ranging from vandalism and theft to sabotage and acts of terrorism intended to disable a project. The former, more minor type of act is far more likely for such projects in general and particularly for those like the Proposed Project, which are in relatively remote areas and come in contact with relatively small populations. Intentional sabotage or terrorist acts would not be expected to target these facilities, where a loss of service would not have substantial regional impacts.

Theft is most likely to involve substation and switchyard equipment that contains salvageable metal (e.g., copper and aluminum) when metal prices are high. Vandalism, on the other hand, is more likely to take place in relatively remote areas, and perhaps more likely to involve acts of opportunity (e.g., shooting out transmission line insulators, shooting at the blades on a wind generator) than premeditated acts.

With respect to the Proposed Project, certain project facilities, such as the substations, would be protected from theft and vandalism by fencing and alarm systems. The presence of high voltage would also discourage theft and vandalism. The relatively remote location of the Proposed Project would tend to reduce vandalism on the whole, because of the small number of people who would be expected to encounter the turbines or transmission line. However, this same remoteness might encourage a rare act of opportunistic vandalism. Such occurrences would be infrequent and would be vigorously investigated and prosecuted to discourage further acts. Vigorous prosecution of thieves and monitoring of metal recycling operations might deter the theft of equipment. Similarly, the prosecution of vandals who have damaged or destroyed project equipment might discourage vandalism.

The effects of intentional destructive acts could be wide ranging or more localized, depending on the nature and location of the acts and the size of the project, and would be similar to outages caused by natural phenomena such as storms and ice buildup. Since the wind project taps the Western system, destructive acts to the wind project would not have a local or regional effect since auxiliary power would come from other sources than the wind turbines.

Destructive acts could cause environmental effects from damage to the facilities. Two such possible effects would be fire ignition, should conductors be brought down, and oil spills from equipment (e.g., mineral oil in transformers) in the substations, should that equipment be damaged or breached. Fires would be fought in the same manner as those caused by an electrical storm. Any spills would be treated by removing and properly disposing of contaminated soil and replacing it with clean soil. Implementation of the Western Standard Construction Practices and Invenergy Applicant-Committed Mitigation Measures would be applied to any intentional destructive act.

3.19 Unavoidable Adverse Impacts

A commitment of resources is irreversible when its primary or secondary impacts limit the future options for a resource or limit those factors that are renewable only over long periods. Examples of nonrenewable resources are minerals, including petroleum. An irretrievable commitment of resources refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future generations. Examples of irretrievable resources are the loss of a recreational use of an area. While an action may result in the loss of a resource that is irretrievable, the action may be reversible. Irreversible and irretrievable commitments of resources are primarily related to construction activities.

For the Proposed Project, resources consumed during construction of the project, including labor, fossil fuels, and construction materials, would be committed for the life of the project. Nonrenewable fossil fuels would be irretrievably lost by using gasoline and diesel powered construction equipment during construction. Approximately 65 acres of land would be irreversibly committed during the functional life of the project but retrievable upon decommissioning.

3.20 Irreversible and Irretrievable Commitment of Resources

Unavoidable adverse impacts associated with the Proposed Project include:

- long-term loss of approximately 65 acres of agricultural land resulting from the construction of the tower foundations; and
- introduction of an additional vertical element into the existing viewshed.

These impacts are long-term, in regard to the loss of possible agriculturally productive land and visual impacts. Overall, impacts of the Proposed Project on the environment and human health would be negligible.

4.0 List of Preparers

Geology and Paleontology

Erathem-Vanir Geological, PLLC

Gustav F. Winterfeld, Ph.D.
Principal Scientist paleontological

Education:	B.S., Biology, Cornell University M.S., Geology, University of Wyoming Ph.D., Geology, University of Wyoming
Project Responsibility:	Geology and Paleontology
Experience:	30 years of experience in geology and paleontology of the western U.S. Areas of expertise include geology, paleontology, sedimentation, stratigraphy-biostratigraphy, and paleontological resource assessment and mitigation planning and implementation. Dr. Winterfeld has directed and performed literature and record review and conducted field surveys and analyzed environmental impacts to fossil and geological resources of mines, pipelines, dam sites, flood control projects, gravel pits, housing developments, transmission lines, and well pads. He has recommended and implemented mitigation and resource recovery programs for paleontological resources for clients including private companies and federal (BLM, BOR, FERC, DOE, USDA-USFS), state (CA, NV, UT, WY), and local governmental agencies. Dr. Winterfeld has prepared geology and paleontology sections for numerous EIS and EA reports. He is a Registered Geologist with the states of WY and UT and currently holds statewide collecting permits for BLM lands in CO, NV, MT, UT, and WY.

Thomas M. Bown, Ph.D.
Associate Scientist

Education:	B.S., Geology, Iowa State University Ph.D., Geology, University of Wyoming
Project Responsibility:	Geology and Paleontology
Experience:	40 years of geologic and paleontologic field experience in the western U.S. Regional Paleontologist for the USGS in Denver for 18 years. Dr. Bown has led or participated in more than 80 major geologic and paleontologic expeditions and has published over 200 peer-reviewed scientific papers in the field of mammalian vertebrate paleontology and geology. He has prepared geology and paleontology sections for numerous EA and EIS reports for projects in MT, WY, NE, KS, CO, UT, and CA. Clients have included private industry and federal (BLM, NPS, USFS, BIA) and state (WY, CO, UT, NE) governmental agencies.

Water Resources and Floodplains, Climate and Air, Noise

JNS, Inc., **Janet N. Shangraw, PH**

Education:	B.S., Watershed Science/Hydrology, Colorado State University
Project Responsibility:	Water Resources and Floodplains/Assistant Project Manager
Experience:	Professional Hydrologist – American Institute of Hydrology; 28 years experience in surface water hydrology; NEPA experience as an interdisciplinary team member and project manager on EIS and EA documents for utility projects, timber sales, timber restoration projects, and mining. projects

Wildlife, Vegetation, and Threatened, Endangered, and Other Special Status Species

Cedar Creek Associates, Inc., **T. Michael Phelan, CWB**

Education:	B.A., Zoology, University of California at Los Angeles Post Graduate Studies, Ecology, San Diego State University
Project Responsibility:	Wetlands, Wildlife, and Special Status Species
Experience:	President of Cedar Creek Associates, Inc.; Certified Wildlife Biologist - The Wildlife Society; 34 years of experience in environmental consulting, field analysis, impact assessment, and mitigation planning in the biological sciences including project management and technical contribution to numerous NEPA compliance EIS and EA documents for a variety of energy development, mining, and other industrial development projects.

Wetlands and Soils

Cedar Creek Associates, Inc., **Stephen G. Long**

Education:	M.S., Forestry, Colorado State University B.S., Wildlife Biology, Colorado State University
Project Responsibility:	Upland Vegetation, Soils, and Threatened, Endangered, and Other Special Status Plant
Experience:	33 years of experience in single and multi-discipline studies, permitting, and EA and EIS projects.

Cultural Resources

Alpine Archaeological Consultants, Inc, **Mathew Landt**

Education:	M.A., Archaeology, Washington State University
Project Responsibility:	Cultural Resources
Experience:	15 years of experience as an archaeologist in Wyoming, Montana, Washington, New Mexico, Utah, and Colorado as well as overseas.

Land Use, Visual, Socioeconomics, Transportation, Public Health and Safety

Kathol & Company, **Jennifer Kathol**

Education:	B.S., Natural Resource Economics, Colorado State University
Project Responsibility:	Land Use, Socioeconomics, Transportation, and Public Health and all miscellaneous sections of EA. EA Project Manager responsible for coordination of consultant resource specialists and EA document preparation.
Experience:	President of Kathol & Company; 30 years NEPA experience completing and managing projects and Human Resources sections of EIS, EA, EIR, and international environmental documents.

Visual Resources Simulations

View Point West, **Tony Kovacic**

Education:	A.A., Computer Science, Coleman College, San Diego, California
Project Responsibility:	Visual Resources including Computer-Generated Visual Simulations
Experience:	25 years of experience in NEPA compliance, computer simulations, and modeling.

Technical Editing and Desktop Publishing

Georgia A. Doyle

Education:	M.S. Hydrology/Hydrogeology, University of Nevada, Reno B.S. Hydrology and Water Resources, University of Arizona
Project Responsibility:	Technical Editing and Desktop Publishing
Experience:	20 years experience researching, writing and editing scientific publications; preparation of EIS and EA documents.

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Appendix A – Agency Correspondence

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STATE OF COLORADO

Bill Ritter, Jr., Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
AN EQUAL OPPORTUNITY EMPLOYER
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For Wildlife-
For People

September 13, 2010

Kathy Moser
Invenergy LLC
2580 W. Main St., Suite 200
Littleton, CO, 80120

Dear Ms. Moser,

The Colorado Division of Wildlife (CDOW) would like to thank Invenergy LLC for the opportunity to provide recommendations on the proposed wind energy development located in Yuma County. Division staff has reviewed the information provided and respectfully provides the following comments.

The CDOW's primary concern is the potential impacts to wildlife species in the sandsage habitats of the project area. Most of the proposed project area is comprised of native sandsage prairie with areas of developed agricultural lands interspersed. Within the native prairie habitats specific areas of concern will include any groups of deciduous trees, wetland areas, playa lakes, and large continuous tracts of unbroken prairie. Development in the agricultural areas will have less of an impact on wildlife species than within the native prairie. The CDOW recommends that these areas be identified in the planning process and encourages coordination with the local District Wildlife Manager (DWM) in order to minimize wildlife impacts.

Ecologically, native sandsage prairie habitats are very rich in wildlife diversity. In Yuma County, large unbroken tracts of sandsage habitats are found on only a small portion of the landscape, yet they are critical habitat for a high proportion of the county's wildlife species. The primary wildlife species of concern within the proposed project area is the greater prairie chicken (GPC). GPC's depend upon the areas of sandsage prairie for successful breeding, nesting and brood rearing. Other species of concern found within the project area include black-tailed prairie dogs, raptors, swift foxes, and song birds. These species are likely to be found throughout the proposed project area. Potential impact to both raptors and song birds will likely be higher around areas of deciduous trees and wetland areas such as playa lakes. The best management practices for the wildlife species within the project area are included in Appendix A. We recommend that sensitive wildlife species and critical habitat features should be identified and buffered when considering infrastructure placement and operation.

In addition to these specific recommendations, the Division of Wildlife is providing a list of general best management practices and raptor buffer guidelines as attachments to this letter (Appendix A and B)

The CDOW encourages, through thoughtful design and careful facility siting, any actions that avoid or minimize impacts to wildlife. CDOW requests the opportunity to comment on future issues derived from baseline or impact surveys, as well as amendments made to infrastructure/facility placement. If you have any questions regarding this letter, please contact District Wildlife Manager, Josh Melby at (970) 848-0683.

Sincerely,

Tom Kroening
Area Wildlife Manager

Cc: S. Yamashita, K. Green, J. Melby, C. Greenman

APPENDIX A

The recommendations listed below are best management practices for wind farm development.

1. **Avoiding/Minimizing Impacts.** *In selecting sites for construction, focus on options that avoid critical wildlife habitats, over the use of mitigation strategies.* Areas that exhibit high levels of wildlife use within this project area would benefit greatly by not placing facility infrastructure, including transmission lines, adjacent to or over such areas. Locally, micro-siting of turbines and infrastructure might be effective in minimizing losses to habitat and wildlife. If all options for avoiding impacts are taken and prove insufficient, then mitigation strategies should be identified and implemented.

2. **Study Protocols.** *Consult with CDOW for review and comment on wildlife and habitat survey protocol, including monitoring locations, before the protocol is finalized.* It is recommended that pre-construction and construction/ post-construction monitoring be conducted using similar methods, so that valid comparisons can be made. The recommended length of study for both pre and post-construction surveys is 1 year. CDOW requests the opportunity to comment on baseline or impact surveys, as well as amendments made to infrastructure/facility placement, county permit requirements or recommendations. CDOW encourages developers to be proactive in bringing plans for additional phases or developments to our attention prior to establishing infrastructure placement and routing, in the hope that proactive, cooperative efforts will identify concerns early in the project so that they may be appropriately addressed.

3. **Access / Monitoring.** *Provide CDOW with pre-construction and post-construction reports with all forms of raw data collected at onset, during, and post construction surveys.* It is recommended that all research data (observed, written, recorded, GPS files, etc.) collected be accessible and provided to CDOW's district wildlife managers and biologists in a timely manner.

4. **Operational Considerations.** *Limit on-site visit frequency and duration by service personnel, especially during critical nesting time, to minimize impacts to wildlife.* Educate personnel on wildlife issues, such as where species might be found, and at what time of day. During the operational phase, train staff in documenting wildlife mortalities and notifying local wildlife officials in a timely manner.

5. **Reclamation and Decommissioning.** *Reclaim areas disturbed by construction.* The width of access roads can be reduced after construction of the turbines. Areas should be reclaimed with seed for native vegetation. *Develop long-term decommissioning and reclamation plans in the event that it is decided to decommission any infrastructure of the facility.* Decommissioning plans should include (but not limited to) timing of decommissioning individual or project wide infrastructure and plans to reclaim areas back to pre-construction conditions.

6. **Hunting.** *At the landowner's discretion, hunting should be allowed to continue within and adjacent to the project area.* It is recommended that traditional uses of the land, including hunting, not be prohibited as a condition of the lease by the project proponent after construction at the site is completed. Colorado wildlife statutes prohibit landowners from claiming game damage reimbursements due to hunting restrictions on their property. Hunting restrictions further burden the state's ability to manage wildlife populations; exacerbating state/landowner relationships and increasing forage conflicts.

7. **Weed Management.** Noxious weeds reduce or destroy wildlife habitat. *Actively eradicate noxious weeds, and develop and implement a noxious weed and re-vegetation management plan where there will be disturbance due to construction or maintenance activities.* Clean equipment when it is moved from site to site to remove weed seeds even if no weeds are recognized. The applicant may wish to contact the Yuma County Pest Control District to facilitate development of reclamation and weed management plans for the facility.

8. **Livestock Fencing.** *Use wildlife-friendly fencing to prevent harm or fatalities to wildlife.* Fencing should allow free passage of wildlife, incorporating three or four strand fencing with a bottom strand height of 16 inches and a maximum top strand height of 42 inches, along with installation of double stays between posts. Chain link and mesh fencing should be kept to a minimum and used only to protect facilities where security is

required. Substation fencing should be built according to and meet applicable standards. Additional specifications can be provided upon further request.

9. **Wildlife Protection.** The proposed wind energy project will be in an area that is rich in wildlife diversity and will span a variety of regionally unique habitat types. We recommend that sensitive wildlife species and critical habitat features be identified and buffered when considering infrastructure placement and operation, especially during critical nesting periods. We suggest that as more detailed planning occurs, you continue to contact DOW representatives to determine specific sensitive areas for each of these species.

   - **Greater Prairie Chickens.** *Conduct spring surveys to identify occupied leks within the proposed project area by coordinating with the local District Wildlife Manager. In planning infrastructure placement we recommend that development occurs 1k (.6 miles) from active leks. We also recommend the restriction of maintenance and operational activities between 3:00 a.m. and 9:00 a.m. during the breeding season (March 1 to May 15) to prevent disturbance of birds on leks.* Greater prairie chickens are most sensitive to disturbance during the breeding season with studies showing that increased activity and noise can displace birds from the breeding area. The CDOW has known lek locations for part of the project area but surveys will need to be done starting in March. Lek densities will be higher in larger tracts of undeveloped sandsage prairie. So by placing infrastructure near agricultural lands or existing developed areas the impact to greater prairie chickens can be greatly reduced. If possible transmission lines should be buried underground and if not feasible perch guards should be installed on poles to prevent the creation of perch sites for raptors

   - **Raptors.** *Identify raptor nests within the project area and implement an appropriate buffer from wind turbine and transmission lines. During nesting periods, observe timing stipulations for construction activities located near nests. Site turbines no less than ¼ mile from all deciduous trees.* Raptors are likely to use any trees or larger rock escarpments for nesting or perching. Prairie dog towns located in the project area also provide excellent shelter, feeding and nesting habitat for numerous resident and migratory raptors. By affording these areas a buffer when considering turbine placement, impacts to raptor species will be greatly reduced. CDOW raptor guidelines for buffers are found in Appendix B. Only a subset of these raptors is expected to be found in the project area.

   - **Bats**. *Acoustic monitoring of bats is recommended with the monitoring device placed 30 to 50 meters above ground level of the MET tower.* Acoustic monitoring is recommended for spring and fall seasons. Mist netting is recommended near water bodies where bats roost. It is recommended that all survey data collected be accessible and provided to CDOW.

   - **Swift Fox.** *Identify and avoid all maternal swift fox den sites.* Swift fox live here year-round, breed, during December, and raise their young into the next fall. Any disturbance or destruction of dens from December 15th through August 15th would be detrimental to this species. It is recommended that swift fox surveys include daylight searches for den areas and nighttime spotlight searches during August and September. *Swift fox is a species of state and federal concern that lives in and around the proposed area.*

   - **Black-tailed prairie dogs.** *All prairie dog towns within and adjacent to the proposed project should be located prior to construction.* If a prairie dog town falls within an unavoidable construction site, the town should be surveyed for other species, such as burrowing owls and mountain plover. *(Burrowing Owls are a State Threatened Species)*

   - **Reptiles and amphibians.** *Identify critical reptile and amphibian habitat, including escarpments, ephemeral ponds, and wetlands, and avoid during construction and when siting infrastructure.* With an increase in roads and traffic, reptiles and amphibians could be negatively impacted within the project area. The "operational considerations" portion of this document should be considered.

   - **Deer and pronghorn.** The effects that wind turbine placement will have on mule deer and pronghorn are not well known, but studies suggest there is noticeable displacement from areas where there has been construction of roadways and increased service vehicle traffic. Personnel should be informed that poaching is illegal and will not be tolerated.

APPENDIX B

RECOMMENDED BUFFER ZONES AND SEASONAL RESTRICTIONS FOR COLORADO RAPTORS

Tolerance limits to disturbance vary among as well as within raptor species. As a general rule, Ferruginous Hawks and Golden Eagles respond to human activities at greater distances than do Ospreys and America Kestrels. Some individuals within a species also habituate and tolerate human activity at a proximity that would cause the majority of the group to abandon their nests. Other individuals become sensitized to repeated encroachment and react at greater distances. The tolerance of a particular pair may change when a mate is replaced with a less tolerant individual and this may cause the pair to react to activities that were previously ignored. Responses will also vary depending upon the reproductive stage. Although the level of stress is the same, the pair may be more secretive during egg laying and incubation and more demonstrative when the chicks hatch.

The term "disturbance" is ambiguous and experts disagree on what actually constitutes a disturbance. Reactions may be as subtle as elevated pulse rate or as obvious as vigorous defense or abandonment. Impacts of disturbance may not be immediately evident. A pair of raptors may respond to human intrusion by defending the nest, but well after the disturbance has passed, the male may remain in the vicinity for protection rather than forage to feed the nestlings. Golden eagles rarely defend their nests, but merely fly a half mile or more away and perch and watch. Chilling and over heating of eggs or chicks and starvation of nestlings can result from human activities that appeared not to have caused an immediate response.

A 'holistic' approach is recommended when protecting raptor habitats. While it is important for land managers to focus on protecting nest sites, equal attention should focus on defining important foraging areas that support the pair's nesting effort. Hunting habitats of many raptor species are extensive and may necessitate interagency cooperation to assure the continued nest occupancy. Unfortunately, basic knowledge of habitat use is lacking and may require documentation through telemetry investigations or intensive observation. Telemetry is expensive and may be disruptive so a more practical approach is to assume that current open space is important and should be protected.

Although there are exceptions, the buffer areas and seasonal restrictions suggested here reflect an informed opinion that if implemented, should assure that the majority of individuals within a species will continue to occupy the area. Additional factors, such as intervening terrain, vegetation screens, and the cumulative impacts of activities should be considered.

These guidelines were originally developed by CDOW raptor biologist Gerald R. Craig (retired) in December 2002. To provide additional clarity in guidance, incorporate new information, and update the conservation status of some species, the guidelines were revised in January 2008. Further revisions of this document may become necessary as additional information becomes available.

RECOMMENDED BUFFER ZONES AND SEASONAL RESTRICTIONS

1. BALD EAGLE

Nest Site:

No surface occupancy (beyond that which historically occurred in the area; see 'Definitions' below) within ¼ mile radius of active nests (see 'Definitions' below). Seasonal restriction to human encroachment (see 'Definitions' below) within ½ mile radius of active nests from October 15 through July 31. This closure is more extensive than the National Bald Eagle Management Guidelines (USFWS 2007) due to the generally open habitat used by Colorado's nesting bald eagles.

Winter Night Roost:

No human encroachment from November 15 through March 15 within ¼ mile radius of an active winter night roost (see 'Definitions' below) if there is no direct line of sight between the roost and the encroachment activities. No human encroachment from November 15 through March 15 within ½ mile radius of an active winter night roost if there is a direct line of sight between the roost and the encroachment activities. If periodic visits (such as oil well maintenance work) are required within the buffer zone after development, activity should be restricted to the period between 1000 and 1400 hours from November 15 to March 15.

Hunting Perch:

Diurnal hunting perches (see 'Definitions' below) associated with important foraging areas should also be protected from human encroachment. Preferred perches may be at varying distances from human encroachment and buffer areas will vary. Consult the Colorado Division of Wildlife for recommendations for specific hunting perches.

2. GOLDEN EAGLE

Nest Site:

No surface occupancy (beyond that which historically occurred in the area) within ¼ mile radius of active nests. Seasonal restriction to human encroachment within ½ mile radius of active nests from December 15 through July 15.

3. OSPREY

Nest Site:

No surface occupancy (beyond that which historically occurred in the area) within ¼ mile radius of active nests. Seasonal restriction to human encroachment within ¼ mile radius of active nests from April 1 through August 31. Some osprey populations have habituated and are tolerant to human activity in the immediate vicinity of their nests.

4. FERRUGINOUS HAWK

Nest Site:

No surface occupancy (beyond that which historically occurred in the area) within ½ mile radius of active nests. Seasonal restriction to human encroachment within ½ mile radius of active nests from February 1 through July 15. This species is especially prone to nest abandonment during incubation if disturbed.

5. RED-TAILED HAWK

Nest Site:

No surface occupancy (beyond that which historically occurred in the area) within 1/3 mile radius of active nests. Seasonal restriction to human encroachment within 1/3 mile radius of active nests from February 15 through July 15. Some members of this species have adapted to urbanization and may tolerate human habitation to within 200 yards of their nest. Development that encroaches on rural sites is likely to cause abandonment.

6. SWAINSON'S HAWK

Nest Site:
No surface occupancy (beyond that which historically occurred in the area) within ¼ mile radius of active nests. Seasonal restriction to human encroachment within ¼ mile radius of active nests from April 1 through July 15. Some members of this species have adapted to urbanization and may tolerate human habitation to within 100 yards of their nest.

7. PEREGRINE FALCON

Nest Site:
No surface occupancy (beyond that which historically occurred in the area) within ½ mile radius of active nests. Seasonal restriction to human encroachment within ½ mile of the nest cliff(s) from March 15 to July 31. Due to propensity to relocate nest sites, sometimes up to ½ mile along cliff faces, it is more appropriate to designate 'Nesting Areas' that encompass the cliff system and a ½ mile buffer around the cliff complex.

8. PRAIRIE FALCON

Nest Site:
No surface occupancy (beyond that which historically occurred in the area) within ½ mile radius of active nests. Seasonal restriction to human encroachment within ½ mile radius of active nests from March 15 through July 15.

9. NORTHERN GOSHAWK

No surface occupancy (beyond that which historically occurred in the area) within ½ mile radius of active nests. Seasonal restriction to human encroachment within ½ mile radius of active nests from March 1 through September 15.

10. BURROWING OWL

Nest Site:
No human encroachment within 150 feet of the nest site from March 15 through October 31. Although Burrowing Owls may not be actively nesting during this entire period, they may be present at burrows up to a month before egg laying and several months after young have fledged. Therefore it is recommended that efforts to eradicate prairie dogs or destroy abandoned towns not occur between March 15 and October 31 when owls may be present. Because nesting Burrowing Owls may not be easily visible, it is recommended that targeted surveys be implemented to determine if burrows are occupied. More detailed recommendations are available in a document entitled "Recommended Survey Protocol and Actions to Protect Nesting Burrowing Owls" which is available from the Colorado Division of Wildlife

DEFINITIONS

Active nest – Any nest that is frequented or occupied by a raptor during the breeding season, or which has been active in any of the five previous breeding seasons. Many raptors use alternate nests in various years. Thus, a nest may be active even if it is not occupied in a given year.

Active winter night roost – Areas where Bald Eagles gather and perch overnight, and sometimes during the day in the event of inclement weather. Communal roost sites are usually in large trees (live or dead) that are relatively sheltered from wind and are generally in close proximity to foraging areas. These roosts may also serve a social purpose for pair bond formation and communication among eagles. Many roost sites are used year after year.

Human encroachment – Any activity that brings humans in the area. Examples include driving, facilities maintenance, boating, trail access (e.g., hiking, biking), etc.

Hunting perch – Any structure on which a raptor perches for the purpose of hunting for prey. Hunting perches provide a view of suitable foraging habitat. Trees are often used as hunting perches, but other structures may also be used (utility poles, buildings, etc.).

Surface occupancy – Any physical object that is intended to remain on the landscape permanently or for a significant amount of time. Examples include houses, oil and gas wells, tanks, wind turbines, roads, tracks, etc.

CONTACT

For further information contact:

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Recommended Buffer Zones and Seasonal Restrictions Around Raptor Use Sites

Species and Use	Buffer	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Bald Eagle													
ACTIVE NEST - No Surface Occupancy	¼ Mile												
ACTIVE NEST - No Human Encroachment	½ Mile												
ACTIVE WINTER NIGHT ROOST without a direct line of sight- No Human Encroachment	¼ Mile												
ACTIVE WINTER NIGHT ROOST with a direct line of sight - No Human Encroachment	½ Mile												
HUNTING PERCH - No Human Encroachment	Contact CDOW												
Golden Eagle													
ACTIVE NEST - No Surface Occupancy	¼ Mile												
ACTIVE NEST - No Human Encroachment	½ Mile												
Osprey													
ACTIVE NEST - No Surface Occupancy	¼ Mile												
ACTIVE NEST - No Human Encroachment	¼ Mile												
Ferruginous Hawk													
ACTIVE NEST - No Surface Occupancy	½ Mile												
ACTIVE NEST - No Human Encroachment	½ Mile												
Red-tailed Hawk													
ACTIVE NEST - No Surface Occupancy	1/3 Mile												
ACTIVE NEST - No Human Encroachment	1/3 Mile												
Swainson's Hawk													
ACTIVE NEST - No Surface Occupancy	¼ Mile												
ACTIVE NEST - No Human Encroachment	¼ Mile												
Peregrine Falcon													
ACTIVE NEST - No Surface Occupancy	½ Mile												
ACTIVE NEST - No Human Encroachment	½ Mile												
Prairie Falcon													
ACTIVE NEST - No Surface Occupancy	½ Mile												
ACTIVE NEST - No Human Encroachment	½ Mile												
Northern Goshawk													
ACTIVE NEST - No Surface Occupancy	½ Mile												
ACTIVE NEST - No Human Encroachment	½ Mile												
Burrowing Owl													
ACTIVE NEST - No Human Encroachment	150 feet												
		= time period for which seasonal restrictions are in place.											

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Colorado Field Office
P.O. Box 25486, DFC (65412)
Denver, Colorado 80225-0486

RECEIVED
BY JGA | DATE 29 Sept 2010

IN REPLY REFER TO:
ES/CO: T&E/Species list
TAILS: 65412-2010-SL-0641

SEP 27 2010

Mr. Jim Hartman
Department of Energy
Western Area Power Administration
Rocky Mountain Region
P.O. Box 3700
Loveland, Colorado 80539-3003

Dear Mr. Hartman:

The U.S. Fish and Wildlife Service (Service) received your September 1, 2010, letter and site map regarding **Invenergy LLC's proposed Wray Wind Energy Project in Yuma County, Colorado**. These comments have been prepared under the provisions of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et. seq.), the Bald and Golden Eagle Protection Act of 1940 (BGEPA), as amended (16 U.S.C. 668 et. seq.), the Migratory Bird Treaty Act of 1918 (MBTA), as amended (16 U.S.C. 703 et. seq.), and the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321-4327).

For your convenience, we have enclosed a list of Colorado's threatened and endangered species, as well as the counties in which they are known to occur. We do not have site specific information available to us. If questions regarding the presence of an endangered species, the extent of its habitat, or the effects of a particular action need to be resolved, the Service recommends that a knowledgeable consultant conduct habitat assessments, trapping studies, or provide recommendations regarding options under the ESA. Due to staffing constraints, the Colorado Field Office cannot provide you with these services.

The Service supports the development of wind power as an alternative energy source. However, if not appropriately designed and sited, turbines and wind farms can have negative impacts on wildlife and their habitats. On July 10, 2003, we released Interim Guidance on Avoiding and Minimizing Impacts to Wildlife from Wind Turbines (Guidance) (http://www.fws.gov/habitatconservation/wind.html). These voluntary siting guidelines are intended to assist developers in avoiding and minimizing impacts from wind turbines to wildlife and their habitats. They are based on the best information available and were developed by a team of Federal, State, university, and wind energy industry biologists.

Two years of pre-construction surveys to identify and avoid/minimize any potential wildlife impacts followed by 1-3 years of post-construction surveys/monitoring are highly recommended at all developed sites. Pre- and post-development studies and monitoring may be conducted by any qualified wildlife biologist without regard to his/her affiliation or interest in the site.

Please also be aware of the potential application of the MBTA and the BGEPA. The MBTA prohibits taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior. Unlike the ESA, neither the MBTA nor its implementing regulations (50 CFR Part 21) provide for permitting "incidental take" of migratory birds.

While the MBTA has no provision for allowing unauthorized take, the Service realizes that some birds may be killed at structures such as wind turbines even if all reasonable measures to protect them are used. The Service's Office of Law Enforcement carries out its mission to protect migratory birds through investigations and enforcement, as well as by fostering relationships with individuals, companies, and industries that have taken effective steps to minimize their impacts on migratory birds, and by encouraging others to enact such programs. It is not possible to absolve individuals, companies, or agencies from liability even if they implement avian mortality avoidance or similar conservation measures. However, the Office of Law Enforcement focuses its resources on investigating and prosecuting individuals and companies that take migratory birds without regard for their actions or without implementing all reasonable measures to avoid take.

The BGEPA prohibits knowingly taking or taking with wanton disregard for the consequences of an activity, any bald or golden eagles or their body parts, nests, or eggs, which includes collection, molestation, disturbance, or killing activities, unless allowed by permit. The term "disturb" under the BGEPA means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

Protective measures to help reduce possible impacts to migratory birds and other raptors should be installed whenever possible. For example, 7 CFR § 1724.52 allows for deviations from construction standards for raptor protection, provided that structures are designed and constructed in accordance with the Avian Power Line Interaction Committee's (APLIC) Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006, by the Edison Electric Institute, APLIC, and the California Energy Commission. The regulation requires that such structures be in accordance with the National Electrical Safety Code and applicable State and local regulations.

Any future mitigation recommended by the Service for the proposed wind project would be voluntary on the part of the developer unless made a condition of a Federal license, permit or other authorization. However, mitigation does not apply to "take" of species under the MBTA, BGEPA, or ESA. The goal of the Service under these laws is the elimination of loss of migratory birds and endangered and threatened species due to wind energy development. The Service will actively expand partnerships with regional, national, and international organizations, States, tribes, industry, and environmental groups to meet this goal.

If the Service can be of further assistance, please contact Sandy Vana-Miller in this office at (303) 236-4748.

Sincerely,

Susan C. Linner
Colorado Field Supervisor

Enclosure: Species List

cc: FWSR6/ES/LK, Sandy Vana-Miller
CDOW, Celia Greenman

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
COLORADO FIELD OFFICES

P.O. Box 25486 – DFC	764 Horizon Drive, Bld. B
Denver, Colorado 80225	Grand Junction, Colorado 81502
Phone 303-236-4773	Phone 970-243-2778

THREATENED, ENDANGERED, CANDIDATE, AND PROPOSED SPECIES BY COUNTY
July 2010

Symbols:
* Water depletions in the Upper Colorado River and San Juan River Basins, may affect the species and/or critical habitat in downstream reaches in other states.
▲ Water depletions in the North Platte, South Platte and Laramie River Basins may affect the species and/or critical habitat associated with the Platte River in Nebraska.
© There is designated critical habitat for the species within the county.
Recent genetic tests identified cutthroat population as GB linage, therefore, consultation is an interim measure until genetic and taxonomic issues are resolved.
§ This applies only to white-tailed or Gunnison’s prairie dog habitats. All black-tailed prairie dog habitats within Colorado have been block-cleared from the requirements of ferret surveys.
T Threatened
E Endangered
P Proposed
X Experimental
C Candidate

For additional information contact: U.S. Fish and Wildlife Service, Colorado Field Office, PO Box 25486 DFC (MS 65412), Denver, Colorado 80225-0486, telephone 303-236-4773
U.S. Fish and Wildlife Service, Western Colorado Field Office, 764 Horizon Drive, Building B, Grand Junction, Colorado 81506, telephone 970-243-2778

Species	Scientific Name	Status
ADAMS		
Least tern (interior population)▲	Sternula antillarum	E
Mexican spotted owl	Strix occidentalis lucida	T
Mountain Plover	Charadrius montanus	P
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover▲	Charadrius melodus	T
Preble’s meadow jumping mouse	Zapus hudsonius preblei	T
Ute ladies’-tresses orchid	Spiranthes diluvialis	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

ALAMOSA

Black-footed ferret	Mustela nigripes	E
Canada lynx	Lynx canadensis	T
Gunnison’s prairie dog	Cynomys gunnisoni	C
Mexican spotted owl	Strix occidentalis lucida	T
Mountain Plover	Charadrius montanus	P
Rio Grande cutthroat trout	Oncorhynchus clarki virginalis	C
Southwestern willow flycatcher	Empidonax traillii extimus	E
Yellow-billed cuckoo	Coccyzus americanus	C

ARAPAHOE

Least tern (interior population)▲	Sternula antillarum	E
Mexican spotted owl	Strix occidentalis lucida	T
Mountain Plover	Charadrius montanus	P
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover▲	Charadrius melodus	T
Preble’s meadow jumping mouse	Zapus hudsonius preblei	T
Ute ladies’-tresses orchid	Spiranthes diluvialis	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

ARCHULETA

Black-footed ferret	Mustela nigripes	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Mexican spotted owl	Strix occidentalis lucida	T
New Mexico meadow jumping mouse	Zapus hudsonius luteus	C
Pagosa skyrocket	Ipomopsis polyantha	P
Razorback sucker*	Xyrauchen texanus	E
Rio Grande cutthroat trout	Oncorhynchus clarki virginalis	C
Southwestern willow flycatcher	Empidonax traillii extimus	E
Yellow-billed cuckoo	Coccyzus americanus	C

BACA

Arkansas darter	Etheostoma cragini	C
Lesser prairie chicken	Tympanuchus pallidicinctus	C
Mountain Plover	Charadrius montanus	P

BENT

Arkansas darter	Etheostoma cragini	C
Least tern (interior population)	Sternula antillarum	E
Lesser prairie chicken	Tympanuchus pallidicinctus	C
Mountain Plover	Charadrius montanus	P
Piping plover	Charadrius melodus	T

BOULDER

Canada lynx	Lynx canadensis	T
Colorado butterfly plant	Gaura neomexicana spp. coloradensis	T
Greenback cutthroat trout	Oncorhynchus clarki stomias	T
Least tern (interior population)▲	Sternula antillarum	E
Mexican spotted owl	Strix occidentalis lucida	T
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover▲	Charadrius melodus	T
Preble's meadow jumping mouse	Zapus hudsonius preblei	T
Ute ladies'-tresses	Spiranthes diluvialis	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

BROOMFIELD

Colorado butterfly plant	Gaura neomexicana spp. coloradensis	T
Least tern (interior population) ▲	Sternula antillarum	E
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover▲	Charadrius melodus	T
Preble's meadow jumping mouse	Zapus hudsonius preblei	T
Ute ladies'-tresses orchid	Spiranthes diluvialis	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

CHAFFEE

Canada lynx	Lynx canadensis	T
Gunnison's prairie dog	Cynomys gunnisoni	C
Mexican spotted owl	Strix occidentalis lucida	T
Uncompahgre fritillary butterfly	Boloria acrocnema	E

CHEYENNE

Arkansas darter	Etheostoma cragini	C
Lesser prairie chicken	Tympanuchus pallidicinctus	C
Mountain Plover	Charadrius montanus	P

CLEAR CREEK

Canada lynx	Lynx canadensis	T
Greenback cutthroat trout	Oncorhynchus clarki stomias	T
Least tern (interior population)▲	Sternula antillarum	E
Mexican spotted owl	Strix occidentalis lucida	T
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover▲	Charadrius melodus	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

CONEJOS

Black-footed ferret	Mustela nigripes	E

Canada lynx	Lynx canadensis	T
Gunnison’s prairie dog	Cynomys gunnisoni	C
Mexican spotted owl	Strix occidentalis lucida	T
Mountain Plover	Charadrius montanus	P
New Mexico meadow jumping mouse	Zapus hudsonius luteus	C
Rio Grande cutthroat trout	Oncorhynchus clarki virginalis	C
Southwestern willow flycatcher	Empidonax traillii extimus	E
Yellow-billed cuckoo	Coccyzus americanus	C

COSTILLA

Black-footed ferret	Mustela nigripes	E
Canada lynx	Lynx canadensis	T
Gunnison’s prairie dog	Cynomys gunnisoni	C
Mexican spotted owl	Strix occidentalis lucida	T
Mountain Plover	Charadrius montanus	P
New Mexico meadow jumping mouse	Zapus hudsonius luteus	C
Rio Grande cutthroat trout	Oncorhynchus clarki virginalis	C
Southwestern willow flycatcher	Empidonax traillii extimus	E
Yellow-billed cuckoo	Coccyzus americanus	C

CROWLEY

Arkansas darter	Etheostoma cragini	C
Least tern (interior population)	Sternula antillarum	E
Lesser prairie chicken	Tympanuchus pallidicinctus	C
Mountain Plover	Charadrius montanus	P
Piping plover	Charadrius melodus	T

CUSTER

Canada lynx	Lynx canadensis	T
Greenback cutthroat trout	Oncorhynchus clarki stomias	T
Gunnison’s prairie dog	Cynomys gunnisoni	C
Mexican spotted owl	Strix occidentalis lucida	T

DELTA

Black-footed ferret	Mustela nigripes	E
Bonytail	Gila elegans	E
Canada lynx	Lynx canadensis	T
Clay-loving wild buckwheat©	Eriogonum pelinophilum	E
Colorado hookless cactus	Sclerocactus glaucus	T
Colorado pikeminnow©	Ptychocheilus lucius	E
Greenback cutthroat trout#	Oncorhynchus clarki stomias	T
Humpback chub	Gila cypha	E
Razorback sucker©	Xyrauchen texanus	E
Yellow-billed cuckoo	Coccyzus americanus	C

DENVER

Least tern (interior population) ▲	Sternula antillarum	E
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover▲	Charadrius melodus	T
Preble's meadow jumping mouse	Zapus hudsonius preblei	T
Ute ladies'-tresses orchid	Spiranthes diluvialis	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E
DOLORES		
Bonytail*	Gila elegans	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Humpback chub*	Gila cypha	E
Mexican spotted owl	Strix occidentalis lucida	T
Razorback sucker*	Xyrauchen texanus	E
Southwestern willow flycatcher	Empidonax traillii extimus	E
Uncompahgre fritillary butterfly	Boloria acrocnema	E
Yellow-billed cuckoo	Coccyzus americanus	C
DOUGLAS		
Colorado butterfly plant	Gaura neomexicana spp. coloradensis	T
Greenback cutthroat trout	Oncorhynchus clarki stomias	T
Gunnison's prairie dog	Cynomys gunnisoni	C
Least tern (interior population)▲	Sternula antillarum	E
Mexican spotted owl	Strix occidentalis lucida	T
Pallid sturgeon▲	Scaphirhynchus albus	E
Pawnee montane skipper	Hesperia leonardus montana	T
Piping plover▲	Charadrius melodus	T
Preble's meadow jumping mouse©	Zapus hudsonius preblei	T
Ute ladies'-tresses orchid	Spiranthes diluvialis	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E
EAGLE		
Black-footed ferret	Mustela nigripes	E
Bonytail*	Gila elegans	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Greater Sage-grouse	Centrocercus urophasianus	C
Greenback cutthroat trout#	Oncorhynchus clarki stomias	T
Humpback chub*	Gila cypha	E
Mexican spotted owl	Strix occidentalis lucida	T
Razorback sucker*	Xyrauchen texanus	E
Uncompahgre fritillary butterfly	Boloria acrocnema	E
Ute ladies'-tresses orchid	Spiranthes diluvialis	T
Yellow-billed cuckoo	Coccyzus americanus	C

ELBERT

Arkansas darter	Etheostoma cragini	C
Least tern (interior population) ▲	Sternula antillarum	E
Mountain Plover	Charadrius montanus	P
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover▲	Charadrius melodus	T
Preble's meadow jumping mouse	Zapus hudsonius preblei	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

EL PASO

Arkansas darter	Etheostoma cragini	C
Greenback cutthroat trout	Oncorhynchus clarki stomias	T
Gunnison's prairie dog	Cynomys gunnisoni	C
Least tern (interior population) ▲	Sternula antillarum	E
Mexican spotted owl	Strix occidentalis lucida	T
Mountain Plover	Charadrius montanus	P
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover▲	Charadrius melodus	T
Preble's meadow jumping mouse	Zapus hudsonius preblei	T
Ute ladies'-tresses orchid	Spiranthes diluvialis	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

FREMONT

Arkansas darter	Etheostoma cragini	C
Black-footed ferret §	Mustela nigripes	E
Canada lynx	Lynx canadensis	T
Gunnison's prairie dog	Cynomys gunnisoni	C
Mexican spotted owl	Strix occidentalis lucida	T

GARFIELD

Bonytail	Gila elegans	E
Canada lynx	Lynx canadensis	T
Colorado hookless cactus	Sclerocactus glaucus	T
Colorado pikeminnow©	Ptychocheilus lucius	E
De Beque phacelia	Phacelia submutica	P
Greater Sage-grouse	Centrocercus urophasianus	C
Greenback cutthroat trout#	Oncorhynchus clarki stomias	T
Humpback chub	Gila cypha	E
Mexican spotted owl	Strix occidentalis lucida	T
Parachute beardtongue	Penstemon debilis	P
Razorback sucker©	Xyrauchen texanus	E
Ute ladies'-tresses orchid	Spiranthes diluvialis	T
Yellow-billed cuckoo	Coccyzus americanus	C

GILPIN

Canada lynx	Lynx canadensis	T
Least tern (interior population) ▲	Sternula antillarum	E
Mexican spotted owl	Strix occidentalis lucida	T
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover▲	Charadrius melodus	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

GRAND

Bonytail*	Gila elegans	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Greater Sage-grouse	Centrocercus urophasianus	C
Greenback cutthroat trout#	Oncorhynchus clarki stomias	T
Humpback chub*	Gila cypha	E
Osterhout milkvetch	Astragalus osterhoutii	E
Penland beardtongue	Penstemon penlandii	E
Razorback sucker*	Xyrauchen texanus	E
Yellow-billed cuckoo	Coccyzus americanus	C

GUNNISON

Bonytail*	Gila elegans	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Greenback cutthroat trout#	Oncorhynchus clarki stomias	T
Gunnison's prairie dog	Cynomys gunnisoni	C
Humpback chub*	Gila cypha	E
Razorback sucker*	Xyrauchen texanus	E
Uncompahgre fritillary butterfly	Boloria acrocnema	E
Yellow-billed cuckoo	Coccyzus americanus	C

HINSDALE

Bonytail*	Gila elegans	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Gunnison's prairie dog	Cynomys gunnisoni	C
Humpback chub*	Gila cypha	E
Razorback sucker*	Xyrauchen texanus	E
Rio Grande cutthroat trout	Oncorhynchus clarki virginalis	C
Southwestern willow flycatcher	Empidonax traillii extimus	E
Uncompahgre fritillary butterfly	Boloria acrocnema	E
Yellow-billed cuckoo	Coccyzus americanus	C

HUERFANO

Arkansas darter	Etheostoma cragini	C
Canada lynx	Lynx canadensis	T
Greenback cutthroat trout	Oncorhynchus clarki stomias	T
Gunnison's prairie dog	Cynomys gunnisoni	C
Mexican spotted owl	Strix occidentalis lucida	T
Mountain Plover	Charadrius montanus	P

JACKSON

Canada lynx	Lynx canadensis	T
Greater Sage-grouse	Centrocercus urophasianus	C
Least tern (interior population)▲	Sternula antillarum	E
North Park phacelia	Phacelia formosula	E
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover▲	Charadrius melodus	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

JEFFERSON

Canada lynx	Lynx canadensis	T
Colorado butterfly plant	Gaura neomexicana spp. coloradensis	T
Gunnison's prairie dog	Cynomys gunnisoni	C
Least tern (interior population)▲	Sternula antillarum	E
Mexican spotted owl	Strix occidentalis lucida	T
Pallid sturgeon▲	Scaphirhynchus albus	E
Pawnee montane skipper	Hesperia leonardus montana	T
Piping plover▲	Charadrius melodus	T
Preble's meadow jumping mouse©	Zapus hudsonius preblei	T
Ute ladies'-tresses orchid	Spiranthes diluvialis	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

KIOWA

Arkansas darter	Etheostoma cragini	C
Least tern (interior population)	Sternula antillarum	E
Lesser prairie chicken	Tympanuchus pallidicinctus	C
Mountain Plover	Charadrius montanus	P
Piping plover	Charadrius melodus	T

KIT CARSON

Mountain Plover	Charadrius montanus	P

LAKE

Canada lynx	Lynx canadensis	T
Greenback cutthroat trout	Oncorhynchus clarki stomias	T
Gunnison's prairie dog	Cynomys gunnisoni	C
Penland alpine fen mustard	Eutrema penlandii	T

Uncompahgre fritillary butterfly	Boloria acrocnema	E

LA PLATA

Black-footed ferret	Mustela nigripes	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Knowlton cactus	Pediocactus knowltonii	E
Mexican spotted owl	Strix occidentalis lucida	T
New Mexico meadow jumping mouse	Zapus hudsonius luteus	C
Razorback sucker*	Xyrauchen texanus	E
Southwestern willow flycatcher	Empidonax traillii extimus	E
Uncompahgre fritillary butterfly	Boloria acrocnema	E
Yellow-billed cuckoo	Coccyzus americanus	C

LARIMER

Black-footed ferret §	Mustela nigripes	E
Canada lynx	Lynx canadensis	T
Colorado butterfly plant	Gaura neomexicana spp. coloradensis	T
Greater Sage-grouse	Centrocercus urophasianus	C
Greenback cutthroat trout	Oncorhynchus clarki stomias	T
Least tern (interior population)▲	Sternula antillarum	E
Mexican spotted owl	Strix occidentalis lucida	T
Mountain Plover	Charadrius montanus	P
North Park phacelia	Phacelia formosula	E
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover▲	Charadrius melodus	T
Preble's meadow jumping mouse©	Zapus hudsonius preblei	T
Ute ladies'-tresses orchid	Spiranthes diluvialis	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

LAS ANIMAS

Arkansas darter	Etheostoma cragini	C
Black-footed ferret §	Mustela nigripes	E
Canada lynx	Lynx canadensis	T
Gunnison's prairie dog	Cynomys gunnisoni	C
Mexican spotted owl	Strix occidentalis lucida	T
Mountain Plover	Charadrius montanus	P
New Mexico meadow jumping mouse	Zapus hudsonius luteus	C

LINCOLN

Arkansas darter	Etheostoma cragini	C
Least tern (interior population)▲	Sternula antillarum	E
Lesser prairie chicken	Tympanuchus pallidicinctus	C
Mountain Plover	Charadrius montanus	P
Pallid sturgeon▲	Scaphirhynchus albus	E

Piping plover▲	Charadrius melodus	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E
LOGAN		
Least tern (interior population)▲	Sternula antillarum	E
Mountain Plover	Charadrius montanus	P
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover	Charadrius melodus	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E
MESA		
Bonytail©	Gila elegans	E
Canada lynx	Lynx canadensis	T
Colorado hookless cactus	Sclerocactus glaucus	T
Colorado pikeminnow©	Ptychocheilus lucius	E
De Beque phacelia	Phacelia submutica	P
Greenback cutthroat trout#	Oncorhynchus clarki stomias	T
Humpback chub©	Gila cypha	E
Razorback sucker©	Xyrauchen texanus	E
Yellow-billed cuckoo	Coccyzus americanus	C
MINERAL		
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Gunnison's prairie dog	Cynomys gunnisoni	C
Razorback sucker*	Xyrauchen texanus	E
Rio Grande cutthroat trout	Oncorhynchus clarki virginalis	C
Southwestern willow flycatcher	Empidonax traillii extimus	E
Uncompahgre fritillary butterfly	Boloria acrocnema	E
Yellow-billed cuckoo	Coccyzus americanus	C
MOFFAT		
Black-footed ferret	Mustela nigripes	E
Bonytail©	Gila elegans	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow©	Ptychocheilus lucius	E
Greater Sage-grouse	Centrocercus urophasianus	C
Humpback chub©	Gila cypha	E
Mexican spotted owl	Strix occidentalis lucida	T
Razorback sucker©	Xyrauchen texanus	E
Ute ladies'-tresses orchid (Yampa River floodplain)	Spiranthes diluvialis	T
Yellow-billed cuckoo	Coccyzus americanus	C

MONTEZUMA

Black-footed ferret	Mustela nigripes	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Greenback cutthroat trout#	Oncorhynchus clarki stomias	T
Mancos milkvetch	Astragalus humillimus	E
Mesa Verde cactus	Sclerocactus mesae-verdae	T
Mexican spotted owl	Strix occidentalis lucida	T
New Mexico meadow jumping mouse	Zapus hudsonius luteus	C
Razorback sucker*	Xyrauchen texanus	E
Sleeping Ute milkvetch	Astragalus tortipes	C
Southwestern willow flycatcher	Empidonax traillii extimus	E
Yellow-billed cuckoo	Coccyzus americanus	C

MONTROSE

Black-footed ferret	Mustela nigripes	E
Bonytail*	Gila elegans	E
Canada lynx	Lynx canadensis	T
Clay-loving wild buckwheat	Eriogonum pelinophilum	E
Colorado hookless cactus	Sclerocactus glaucus	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Gunnison's prairie dog	Cynomys gunnisoni	C
Humpback chub*	Gila cypha	E
Mexican spotted owl	Strix occidentalis lucida	T
Razorback sucker*	Xyrauchen texanus	E
Yellow-billed cuckoo	Coccyzus americanus	C

MORGAN

Least tern (interior population)	Sternula antillarum	E
Mountain Plover	Charadrius montanus	P
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover	Charadrius melodus	T
Preble's meadow jumping mouse	Zapus hudsonius preblei	T
Ute ladies'-tresses orchid	Spiranthes diluvialis	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

OTERO

Arkansas darter	Etheostoma cragini	C
Least tern (interior population)	Sternula antillarum	E
Mountain Plover	Charadrius montanus	P
Piping plover	Charadrius melodus	T

OURAY

Bonytail*	Gila elegans	E
Canada lynx	Lynx canadensis	T

Colorado pikeminnow*	Ptychocheilus lucius	E
Greenback cutthroat trout#	Oncorhynchus clarki stomias	T
Humpback chub*	Gila cypha	E
Razorback sucker*	Xyrauchen texanus	E
Uncompahgre fritillary butterfly	Boloria acrocnema	E
Yellow-billed cuckoo	Coccyzus americanus	C

PARK

Canada lynx	Lynx canadensis	T
Greenback cutthroat trout	Oncorhynchus clarki stomias	T
Gunnison’s prairie dog	Cynomys gunnisoni	C
Least tern (interior population)▲	Sternula antillarum	E
Mexican spotted owl	Strix occidentalis lucida	T
Mountain Plover	Charadrius montanus	P
Pallid sturgeon▲	Scaphirhynchus albus	E
Pawnee montane skipper	Hesperia leonardus montana	T
Penland alpine fen mustard	Eutrema penlandii	T
Piping plover▲	Charadrius melodus	T
Uncompahgre fritillary butterfly	Boloria acrocnema	E
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

PHILLIPS

Mountain Plover	Charadrius montanus	P

PITKIN

Bonytail*	Gila elegans	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Greenback cutthroat trout#	Oncorhynchus clarki stomias	T
Humpback chub*	Gila cypha	E
Mexican spotted owl	Strix occidentalis lucida	T
Razorback sucker*	Xyrauchen texanus	E
Uncompahgre fritillary butterfly	Boloria acrocnema	E
Ute ladies’-tresses orchid	Spiranthes diluvialis	T
Yellow-billed cuckoo	Coccyzus americanus	C

PROWERS

Arkansas darter	Etheostoma cragini	C
Least tern (interior population)	Sternula antillarum	E
Lesser prairie chicken	Tympanuchus pallidicinctus	C
Mountain Plover	Charadrius montanus	P
Piping plover	Charadrius melodus	T

PUEBLO

Arkansas darter	Etheostoma cragini	C

Black-footed ferret §	Mustela nigripes	E
Canada lynx	Lynx canadensis	T
Greenback cutthroat trout	Oncorhynchus clarki stomias	T
Mexican spotted owl	Strix occidentalis lucida	T
Mountain Plover	Charadrius montanus	P

RIO BLANCO

Black-footed ferret	Mustela nigripes	E
Bonytail*	Gila elegans	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow©	Ptychocheilus lucius	E
Dudley Bluffs bladderpod	Physaria congesta	T
Dudley Bluffs twinpod	Physaria obcordata	T
Greater Sage-grouse	Centrocercus urophasianus	C
Humpback chub*	Gila cypha	E
Razorback sucker*	Xyrauchen texanus	E
White River beardtongue	Penstemon scariosus var. albifluvis	C
Yellow-billed cuckoo	Coccyzus americanus	C

RIO GRANDE

Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Gunnison's prairie dog	Cynomys gunnisoni	C
Mexican spotted owl	Strix occidentalis lucida	T
Razorback sucker*	Xyrauchen texanus	E
Rio Grande cutthroat trout	Oncorhynchus clarki virginalis	C
Southwestern willow flycatcher	Empidonax traillii extimus	E
Uncompahgre fritillary butterfly	Boloria acrocnema	E
Yellow-billed cuckoo	Coccyzus americanus	C

ROUTT

Bonytail*	Gila elegans	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Greater Sage-grouse	Centrocercus urophasianus	C
Greenback cutthroat trout#	Oncorhynchus clarki stomias	T
Humpback chub*	Gila cypha	E
Razorback sucker*	Xyrauchen texanus	E
Yellow-billed cuckoo	Coccyzus americanus	C

SAGUACHE

Black-footed ferret	Mustela nigripes	E
Bonytail*	Gila elegans	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Greenback cutthroat trout#	Oncorhynchus clarki stomias	T

Gunnison's prairie dog	Cynomys gunnisoni	C
Humpback chub*	Gila cypha	E
Mexican spotted owl	Strix occidentalis lucida	T
Mountain Plover	Charadrius montanus	P
Razorback sucker*	Xyrauchen texanus	E
Rio Grande cutthroat trout	Oncorhynchus clarki virginalis	C
Southwestern willow flycatcher	Empidonax traillii extimus	E
Uncompahgre fritillary butterfly	Boloria acrocnema	E
Yellow-billed cuckoo	Coccyzus americanus	C
SAN JUAN		
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Razorback sucker*	Xyrauchen texanus	E
Rio Grande cutthroat trout	Oncorhynchus clarki virginalis	C
Southwestern willow flycatcher	Empidonax traillii extimus	E
Uncompahgre fritillary butterfly	Boloria acrocnema	E
Yellow-billed cuckoo	Coccyzus americanus	C
SAN MIGUEL		
Black-footed ferret	Mustela nigripes	E
Bonytail*	Gila elegans	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Humpback chub*	Gila cypha	E
Mexican spotted owl	Strix occidentalis lucida	T
Razorback sucker*	Xyrauchen texanus	E
Southwestern willow flycatcher	Empidonax traillii extimus	E
Uncompahgre fritillary butterfly	Boloria acrocnema	E
Yellow-billed cuckoo	Coccyzus americanus	C
SEDGWICK		
Least tern (interior population)	Sternula antillarum	E
Mountain Plover	Charadrius montanus	P
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover	Charadrius melodus	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E
SUMMIT		
Bonytail*	Gila elegans	E
Canada lynx	Lynx canadensis	T
Colorado pikeminnow*	Ptychocheilus lucius	E
Greater Sage-grouse	Centrocercus urophasianus	C
Greenback cutthroat trout#	Oncorhynchus clarki stomias	T
Humpback chub*	Gila cypha	E

Mexican spotted owl	Strix occidentalis lucida	T
Penland alpine fen mustard	Eutrema penlandii	T
Razorback sucker*	Xyrauchen texanus	E
Uncompahgre fritillary butterfly	Boloria acrocnema	E
Yellow-billed cuckoo	Coccyzus americanus	C

TELLER

Gunnison's prairie dog	Cynomys gunnisoni	C
Least tern (interior population)▲	Sternula antillarum	E
Mexican spotted owl	Strix occidentalis lucida	T
Pallid sturgeon▲	Scaphirhynchus albus	E
Pawnee montane skipper	Hesperia leonardus montana	T
Piping plover▲	Charadrius melodus	T
Preble's meadow jumping mouse©	Zapus hudsonius preblei	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

WASHINGTON

Least tern (interior population)▲	Sternula antillarum	E
Mountain Plover	Charadrius montanus	P
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover▲	Charadrius melodus	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

WELD

Colorado butterfly plant	Gaura neomexicana spp. coloradensis	T
Least tern (interior population)▲	Sternula antillarum	E
Mexican spotted owl	Strix occidentalis lucida	T
Mountain Plover	Charadrius montanus	P
Pallid sturgeon▲	Scaphirhynchus albus	E
Piping plover▲	Charadrius melodus	T
Preble's meadow jumping mouse	Zapus hudsonius preblei	T
Ute ladies'-tresses orchid	Spiranthes diluvialis	T
Western prairie fringed orchid▲	Platanthera praeclara	T
Whooping crane▲	Grus americana	E

YUMA

Mountain Plover	Charadrius montanus	P

APR 19 2011

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Chairman Mike LaJeunesse
Shoshone Business Council
P.O. Box 538
Fort Washakie, WY 82514

Dear Chairman LaJeunesse:

The Western Area Power Administration (Western) is a federal power marketing administration in the U.S. Department of Energy. Western proposes to approve a request from Invenergy LLC (Invenergy) to interconnect their proposed Wray Wind Energy Project (Project) located in Yuma County, Colorado, with Western's electrical transmission system (map enclosed). Western is the lead agency for complying with the National Environmental Policy Act and National Historic Preservation Act. Western will prepare an environmental assessment (EA) for their proposal to approve the interconnection request. We request comments from you on the Project. Comments may include identification of Traditional Cultural Properties of concern and other issues of interest to you.

In accordance with 36 CFR 800.4(a) (4), Western is initiating consultation with Tribes. Western will also consult with the State Historic Preservation Officer. The Area of Potential Effect (APE) for the Project has not yet been determined. It will be determined after Invenergy completes further studies. Project design information from Invenergy will be used to determine the APE. The turbine locations and locations of other project facilities would be determined by Invenergy based on siting criteria such as optimal wind speed and direction, favorable geotechnical conditions, and minimizing impacts on sensitive environmental resources.

The Project area is approximately 5 ½ miles northeast of Wray. It is mostly on private property, but includes some state land. Invenergy proposes a 90-megawatt (MW) project that would include fifty-six (56) – 1.6 MW wind power generation turbines. Project facilities and activities include rights-of-way to construct, operate, and decommission the project, including rights for access roads, wind turbines, operations and maintenance facilities, temporary concrete batch plant, and equipment laydown areas. Underground power collection lines from the turbines would go to a collection substation with a step up transformer. From the collection substation a Project owned transmission line, approximately 9 miles long, will be built to interconnect with Western's electrical system in the vicinity of Western's existing Wray Substation. Western will own and operate the facilities at the point of interconnection.

CONCURRENCE
RTG.SYMBOL A7400 JH
INITIALS/SIG. JH
DATE 4/19/11
RTG.SYMBOL
INITIALS/SIG.
DATE
RTG.SYMBOL
INITIALS/SIG.
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RTG.SYMBOL
INITIALS/SIG.
DATE

At your request cultural resource survey reports will be sent to you if you wish to review them. The reports will also be sent to the SHPO for review and comment. We request information that you have on known cultural resources in the Project area. Information you provide will not be released to the public. You may also request to review the draft EA when it is available. We respectfully request that you respond within 30 days of receipt of this letter.

If you have any questions or concerns, or would like additional information please do not hesitate to contact Western's Native American Liaison, Mr. Stephen Tromly, at (720) 962-7256.

Sincerely,

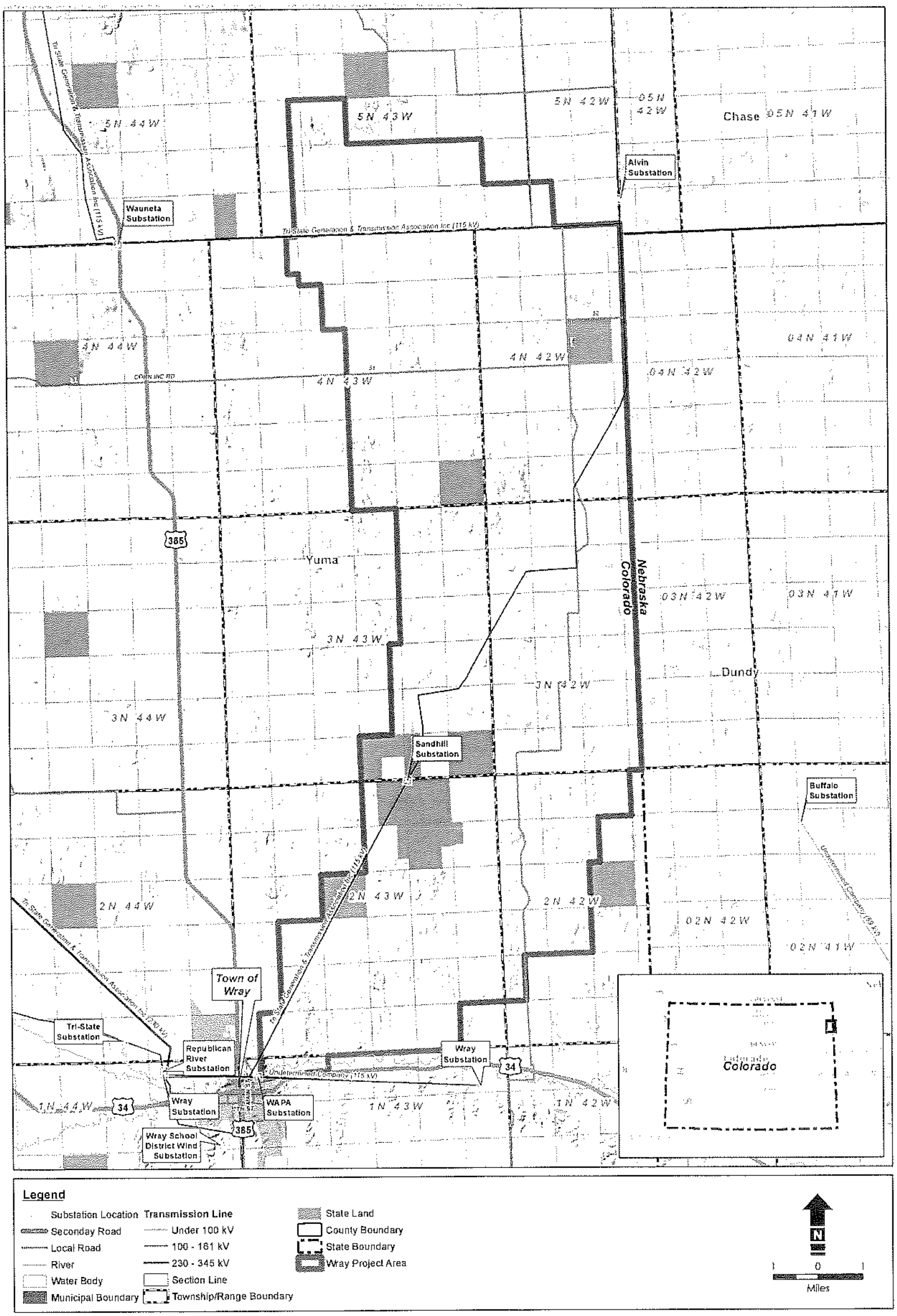
/S/

James Hartman
NEPA Project Manager

Enclosures

bcc:
A7400 (RF, Rodgers, Tromly)
G. Iley, J0400, Loveland, CO

7400:JHartman:X7255:lou:4/15/11:LaJeunesse



Wray Overview Summary

Rev. 02

South Platte Energy Center Wray Resource Area Yuma County, Colorado

April 06, 2011

Invenergy

One South Wacker Drive Suite 1900
Chicago, Illinois 60606
(312) 224-1400

Tribal Consultation for Wray Energy Project , Yuma County, CO

EASTERN SHOSHONE TRIBE:

Chairman Mike LaJeunesse
Shoshone Business Council
P.O. Box 538
Fort Washakie, WY 82514
(307) 332-3532

NORTHERN ARAPAHO TRIBE:

Chairwoman Kim Harjo
Northern Arapaho Business Council
P.O. Box 396
Fort Washakie, WY 82514
(307) 332-6120

UTE INDIAN TRIBE:

Chairman Richard Jenks, Jr.
Uintah and Ouray Tribal Business Committee
P.O. Box 190
Fort Duchesne, UT 84026
(435) 722-5141

NORTHERN CHEYENNE TRIBE:

Mr. Leroy Spang, President
Northern Cheyenne Tribal Council
P.O. Box 128
Lame Deer, MT 59043
(406) 477-6284

OGLALA LAKOTA NATION:

President John Yellow Bird/Steele
Oglala Sioux Tribal Council
P.O. Box 2070
Pine Ridge, SD 57770
(605) 867-5821
Fax (605) 867-5821 x 4021

ROSEBUD SIOUX TRIBE:

President Rodney Bordeaux
Rosebud Sioux Tribal Council
P.O. Box 430
Rosebud, SD 57570
(605) 747-2381

CROW NATION:

Chairman Cedris Black Eagle
Crow Nation
P.O. Box 159
Crow Agency, MT 59022
(406) 638-3715

From: Misti Kae Schriner
To: O'Sullivan, Rod
Date: 1/27/2012 8:44 AM
Subject: Re: Wray Wind Project...
Attachments: WRAY_ESA_ResultsReport.pdf

Hey Rod,
Since the Wray Wind Project is entirely in Yuma County Colorado we have no need for a Section 7 Consultation. There are no ESA species listed for the county. I have attached the output PDF from the Service's website as of January 27, 2012. Since there are no species there would be a no effect determination and no need to consult. This email should serve to inform the Administrative Record.
Thanks.
Misti

Misti K. Schriner
Biologist
Western Area Power Administration
Corporate Services Office
P.O. Box 281213
Lakewood, CO 80228
720.962.7239
mschriner@wapa.gov

>>> Rod O'Sullivan 1/27/2012 8:36 AM >>>
is entirely in Yuma County.

Group	Name	Population	Status	Lead Office	Recovery Plan Name	Recovery Plan Stage
Birds	Bald eagle (Haliaeetus	lower 48 States	Recovery	Rock Island Ecological Services	Recovery Plan for the Pacific	Final
Birds	Bald eagle (Haliaeetus	lower 48 States	Recovery	Rock Island Ecological Services	Southeastern States Bald Eagle	Final Revision 1
Birds	Bald eagle (Haliaeetus	lower 48 States	Recovery	Rock Island Ecological Services	Northern States Bald Eagle	Final
Birds	Bald eagle (Haliaeetus	lower 48 States	Recovery	Rock Island Ecological Services	Chesapeake Bay Bald Eagle	Final Revision 1
Birds	Bald eagle (Haliaeetus	lower 48 States	Recovery	Rock Island Ecological Services	Southwestern Bald Eagle	Final
Birds	American peregrine falcon		Recovery	Ventura Fish And Wildlife Office		

Appendix B – Paleontology Plan

In the unlikely event that fossils are discovered during the construction of the Wray Wind Energy Project, the following Paleontology Plan would be implemented.

Worker Instruction:

Construction personnel should be instructed about the types of fossils they could encounter, and the steps to take if they uncover fossils anywhere during construction of the project. Instruction should also stress the non-renewable nature of paleontological resources, and that collection or excavation of fossil materials from state land without a state permit is illegal.

Discovery Contingency:

Contingency plans should be made in the unlikely event that significant fossils are discovered during project implementation. Construction activities should be redirected until a qualified paleontologist has determined the importance of the uncovered fossils, the extent of the fossiliferous deposits, and implemented recommendations regarding mitigation measures, if any are warranted.

If fossils of scientific significance are discovered and collected, the following action will occur.

Specimen Curation:

Fossil specimens considered to have scientific significance should be curated into the collections of a museum repository acceptable to the State of Colorado. Specimens should be identified as completely as possible and catalogued.

Final Technical Report Submission:

If any fossils are collected and curated, a final technical report must be prepared. This report should contain the mitigation work conducted, an accession list of fossil specimens collected according to locality, and the final disposition of the fossils. The report should include a discussion of the scientific significance of the specimens and the geologic and paleontological setting of the fossils with their localities. A confidential appendix containing copies of locality maps and standard locality data sheets for each locality should be added to the report. Copies of the report should be filed with the State of Colorado and the repository where the fossils are curated.

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Appendix C – Soils Baseline Characteristics

Table 1: Pertinent Soil Baseline Characteristics and Interpretations of Common Soil Map Units Within the Project Area

Map Unit #/Unit component (% of unit)	Slope (%)	Soil Depth (in.)	Soil Texture Range	Drainage class	pH Range	Available Water Capacity (AWC)	Runoff	Water/Wind Erosion Hazard	Salinity / Sodicity	Source of Topsoil / Limitation(s) / Comments
Sandhills										
43 - Valent sand (80)	1 to 9	≥ 60	s	excessively drained	6.6-7.8	low	slow	slight / severe	nsa/nso	Poor/sandy/ dominant soil, soil blowing
44 - Valent sand (80)	9 to 15	≥ 60	s	excessively drained	6.6-7.8	low	slow	moderate / severe	nsa/nso	Poor/sandy/ dominant soil, blowouts common
45 - Valent sand (85)	15 to 45	≥ 60	s	excessively drained	6.6-7.8	low	slow	moderate / severe	nsa/nso	Poor/sandy, slope/ blowouts common
46 - Valent (40)	1 to 25	≥ 60	s	excessively drained	6.6-7.8	low	NI	moderate / severe	nsa/nso	Poor/sandy, slope
Blowout land (40)	1 to 25	≥ 60	s	NI	NI	very low	NI	NI /severe	nsa/NI	Not rated
Sandhills and Sandhill Valleys										
13 - Dailey loamy sand (95)	0 to 6	≥ 60	ls	somewhat excessively drained	6.6-8.4	low	slow	slight / severe	nsa/nso	Poor/sandy/soil blowing
18 - Haxton loamy sand (85)	0 to3	≥ 60	ls-sl-scl	well drained	6.6-8.4	moderate	slow	slight / severe	nsa/n-sso	Good/soil blowing
Valley Swales and Sandhills										
21 - Inavale loamy sand (80)	0 to 3	≥ 60	ls-fsl-scl	somewhat excessively drained	7.9-8.4	moderate	slow	slight / severe	nsa/nso	Poor/sandy/ hydric soil
26 - Laird fine sandy loam (85)	0 to 3	≥ 60	fsl-vfsl-lfs	well drained	7.4-9.0	moderate	slow	slight / severe	ssa-sa/n-sso	Good-Fair

Table 1:Pertinent Soil Baseline Characteristics and Interpretations of Common Soil Map Units Within the Project Area (continued)

Map Unit #/Unit component (% of unit)	**Slope (%)**	**Soil Depth (in.)**	**Soil Texture Range**	**Drainage class**	**pH Range**	**Available Water Capacity**	**Runoff**	**Water/Wind Erosion Hazard**	**Salinity / Sodicity**	**Source of Topsoil / Limitation(s) / Comments**
Flood Plains										
28 - Las Animas Loam (85)	0 to 2	≥ 60	l-s-vfsl	somewhat poorly drained	7.4-8.4	moderate	slow	slight / slight	ssa-msa/n-sso	Fair/salinity/ N. Fork Republican River/hydric soil
36 - Platte fine sandy loam (90)	0 to 2	≥ 60	fsl-fs-grcos	poorly drained	6.6-8.4	low	slow	slight / severe	ssa/nso	Poor/sandy/ hydric soil
Flood Plains, Swales and Creek Terraces										
16 – Glenberg (70)	0 to 2	≥ 60	fsl	well drained	7.4-9.0	moderate	slow	slight / severe	nsa/nso	Good
Bankard (30)	0 to 2	≥ 60	sl-s	somewhat excessively drained	7.4-8.4	low	slow	slight / severe	nsa/nso	Poor/sandy
17 - Haverson loam (85)	0 to 2	≥ 60	l-sl-sicl	well drained	7.4-9.0	high	slow	slight / moderate	nsa-sa/nso	Fair/coarse fragments/prone to flooding
Smooth Plains										
22 - Julesburg loamy sand (75+)	0 to 3	≥ 60	ls-sl-s	well drained	6.6-7.8	moderate	slow	slight / severe	nsa/nso	Fair-Poor/coarse fragments/soil blowing
23 -Julesburg loamy sand (60)	3 to 7	≥ 60	ls-sl-s	well drained	6.6-7.8	low	slow	slight / severe	nsa/nso	Poor/sandy/soil blowing
29 - Manter loamy sand (80)	0 to 3	≥ 60	ls-sl	well drained	6.6-8.4	moderate	slow	slight / severe	nsa/nso	Fair/dominant soil
30 - Manter sandy loam (90)	2 to 5	≥ 60	sl	well drained	6.6-8.4	moderate	medium	slight / severe	nsa/nso	Fair-Good/soil blowing

NI = No Information
Soil Texture Range Note: s = sand, fs = fine sand, grcos = gravelly coarse sand; ls = loamy sand, lfs = loamy fine sand, sl = sandy loam, fsl = fine sandy loam, vfsl = very fine sandy loam; scl = sandy clay loam; sicl = silty clay loam.
Salinity/Sodicity Note: nsa = non-saline; nso = non-sodic; n-sso = non- to slightly sodic; ssa-sa = slightly saline to saline; ssa-msa = slightly saline to moderately saline; ssa = slightly saline; sa = saline
Table developed from: Larsen 1981, NRCS 2011 (Soil Data Mart at http://soildatamart.nrcs.gov/)

Appendix D – National Historic Preservation Act Consultation

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Will be inserted when received