4.13 Impacts to Water Resources

Impacts to water resources were identified through federal and state agency consultation and public scoping. These include potential impacts to surface water quality and quantity such as increased erosion and sediment loads or turbidity, increased ion or salt concentrations, stream channel instability, and increased consumptive use of water. Also considered are potential impacts to groundwater quality and quantity such as not maintaining beneficial use classifications and decreases to the water table.

Impacts would occur during the construction phase of the project by ground disturbance for roadway, power line, and WTG construction and when water is used for concrete batching and dust abatement. Impacts would continue into the operational phase at more localized locations where long-term disturbance occurs or where roads are constructed or widened at stream crossings, ephemeral drainage ways, or in close proximity to streams. Impacts of the decommissioning phase would be similar to those anticipated during construction.

The study area used for assessing impacts to water resources is defined as all 6th order, 12-digit HUC-12 sub-watersheds (Berelson et al. 2001) that have a portion of the applicable alternative area included within their boundary (**Table 3.13-1** and **Figure 3.13-1**). A total of 21 sub-watersheds were assessed in this analysis. The total area encompassed by these sub-watersheds is approximately 640,000 acres, or 1,000 miles^2.

Management considerations in the 2008 Rawlins RMP (BLM 2008a) are derived in part from the CWA, the ESA, and Wyoming state statutes (**Table 4.13-1**). The CWA requires that surface water quality be protected. Project components that disturb greater than 1/10 acre of streams or other Waters of the U.S. will require a CWA Section 404 Permit be filed and approved by the USACE that includes detailed, site-specific BMPs and ACMs. The ESA is the basis for limited development of most consumptive water uses for the protection of endangered species downstream of the project. Wyoming statutes address point source and non-point source pollution (W.S. 35), water quality standards (W.S. 35), and water use (W.S. 41). The 2008 Rawlins RMP addresses surface-disturbing activities through consideration of each of the above references.

Table 4.13-1 Relevant Management Considerations for Water Resources

2008 Rawlins RMP and ROD – Water Resources
Management Objectives • Maintain or improve surface and groundwater quantity and quality consistent with applicable state and federal standards and regulations. • Control or remediate sources and causes of pollution on public lands in cooperation with other federal, local, and state agencies and private entities. • Maintain or reestablish proper watershed, wetland, aquifer, riparian, and stream functions to support natural or desired surface flow regimes that meet state water quality standards. • Minimize or control contributions of non-point source pollution from public lands to all receiving waters. • Minimize or control elevated levels of salt contribution from public lands to the Colorado River system consistent with WDEQ water quality regulations. • Provide for availability of water to support uses authorized on public lands where appropriate.

Table 4.13-1 Relevant Management Considerations for Water Resources

Management Goals • Maintain or improve water quality by managing surface land use and groundwater resources, where practical and within the scope of the BLM's authority, according to the State of Wyoming Water Quality Rules and Regulations. • Maintain the hydrologic and water quality conditions needed to support riparian/wetland areas; minimize flood and sediment damage to water resources from human and natural causes; analyze and, where possible, minimize levels of salt loading in watersheds; and protect water resources used by the public (including impoundments, reservoirs, pipelines, and irrigation ditches) and by federal, state, and local agencies for fisheries, wildlife, livestock, agricultural, recreational, municipal, and industrial uses. • All accidental spills of environmental pollutants on public lands will be addressed according to the 2008 Rawlins RMP, Appendix 32. • Implement intensive management of surface disturbing activities in watersheds contributing to waterbodies listed on the Wyoming 303(d) list of waterbodies with water quality impairments or threats, within the BLM's authority. • Maintain or improve wetland/riparian areas as required by the Wyoming Standards for Healthy Rangelands (BLM 1997b). • Activities that would cause water depletion within the Colorado River system or North Platte River system would comply with existing agreements, decrees, rules, and regulations.
Management Actions • Intensive management of surface disturbing activities would be implemented in watersheds contributing to waterbodies listed on the state's 303(d) list of impaired waterbodies in consultation and cooperation with affected interests. • Manage water and soil resources to meet the Wyoming Standards for Healthy Rangelands. • Surface disturbing activities would be avoided on unstable areas, such as landslides, slopes of greater than 25 percent, slumps, and areas exhibiting soil creep. Reclamation practices and BMPs would be applied as appropriate for surface disturbing activities. • Surface disturbing activities would be avoided in the following areas: 1) identified 100-year floodplains; 2) areas within 500 feet of perennial waters, springs, and wetland and riparian areas; and 3) areas within 100 feet of the inner gorge of ephemeral channels. Exceptions to this would be granted by the BLM based on an environmental analysis and site-specific engineering and mitigation plans. Only those actions within areas that cannot be avoided and that provide protection for the resource identified would be approved.

Source: Proposed 2008 Rawlins RMP, Final EIS for the RFO, Chapter 2, Table 2-1, pp 2-98 through 2-100 (BLM 2008b).

The analysis of surface water quality impacts is based on the assumption that surface disturbance within a given watershed serves as an indicator of the potential for increased sediment and salt runoff. Marston and Dolan (1988) conducted research to investigate the major criteria that control upland erosion in an environment similar to the project alternative areas. This research showed that slope and vegetative cover exert the most influence on upland erosion rates. Erosion was found to be inversely correlated with vegetation density (i.e., as vegetation density decreases, upland erosion increases). The surface disturbance associated with the proposed project would initially remove vegetative cover, which would increase erosion. Once reclamation is undertaken, the vegetative cover would be reestablished, decreasing erosion. As the vegetative cover approaches desired density levels, the erosion rate also

would approach pre-construction levels. This is expected to occur within 5 to 10 years of initiating reclamation (see Section 4.11.6 and POD, Appendix E).

However, drainages in this area have naturally high sediment yields (SERCD 2005), and during large runoff events, these streams are not sediment-limited, but rather limited by the stream power needed to transport the sediment downstream. A previous study of the Sage Creek watershed indicates that monitoring near the mouth of the watershed may not reflect changes to sediment loads and that monitoring over relatively short periods (less than 10 years) will not be sufficient to factor out non-project impacts such as climate variation, geology, and historical sediment storage (SERCD 2005). Although the Sage Creek stream channel is in a stable form, highly erosive uplands in the watershed contribute the majority of sediment to the stream through hill slope erosion processes during runoff events (SERCD 2005). The higher-altitude upland areas are where project development would generally be concentrated.

GIS analyses were performed to quantify the amount of potential disturbance based on the footprint of each alternative. Further qualitative impact discussion is provided for areas where project components or disturbance are in close proximity to stream channels. Impacts to water quantity are analyzed by comparing the water use for each alternative with the average streamflow rates and volume of the North Platte River.

Impacts from each alternative would be considered significant under any one of the conditions listed below:

- Water quality in surface water is degraded beyond the standards set for the designated use of the receiving waterbody, or other violations of federal or state water quality standards, or negative impacts are experienced to a waterbody listed on the Wyoming 303(d) list of Impaired or Threatened Waterbodies.
- Unmitigated loss of wetlands or wetland function (E.O. 11990 and E.O. 11988) or activities that would degrade wetland/riparian areas such that, as a minimum physical state, PFC Standards for Healthy Rangelands (BLM 2009b) are not maintained.
- Streamflow and stream channel geometry or gradient of perennial, intermittent, and ephemeral streams is altered through accelerated runoff and erosion (e.g., undesirable aggradation, degradation, or side cutting) beyond the expected range of natural processes.
- Streamflow quantity of perennial streams are altered such that established uses by the public and by federal, state, and local agencies for fisheries and wildlife and for livestock, recreational, municipal, and industrial uses cannot be maintained.
- Groundwater quality in any aquifer is degraded such that it can no longer be classified for its current and potential use(s).
- The natural flow or level of groundwater to existing local springs, seeps, flowing artesian wells, or permitted water supply wells is interrupted or reduced to the point beneficial uses cannot be maintained.

For the purposes of analyzing the number of stream crossings, it is assumed that the NHD accurately defines the location of waterways, and that construction and operation of the electrical collection and transmission lines would not increase disturbance because they fall within the road disturbance at streams and riparian areas. It also is assumed that the policies and procedures in place for the ESA (USFWS) and W.S. 41 (WSEO) will adequately address and mitigate any impacts associated with the consumptive use of water during construction and operation of all alternatives.

Because of the programmatic nature of this NEPA analysis, conceptual project layouts were assumed to reasonably reflect the actual layouts for project construction. Although conceptual layouts were used for

overall project impact assessment, no site specific analyses have been performed. Site specific design, impact analysis, and impact mitigation would occur through subsequent NEPA review by the BLM.

4.13.1 Impacts to Water Resources from the No Action Alternative

Current management in the area would be maintained under the No Action alternative. Under this alternative, there would be no project construction or operation and maintenance disturbance to impact water quality or water use. There would be no project construction or operation and maintenance equipment or infrastructure in the area to cause potential hazardous material spills.

Water quality in the area is trending towards improvement due to watershed improvement projects with funding through Section 319 of the CWA (see Section 3.13.2.1). Livestock grazing is the major activity that impacts water quality through decreased vegetative cover and increased channel instability from animal activity. The cooperators of the watershed improvement projects have implemented BMPs that have shown and documented long-term (greater than 10 years) improvements from past conditions.

New water use in the North Platte Basin, both surface and tributary groundwater, is largely limited due to stipulations of the Nebraska v. Wyoming Modified North Platte Decree and the Platte River Cooperative Agreement (U.S. Supreme Court 2001) (see Section 3.13.3). The only new uses potentially allowed are stock, domestic, and municipal uses. These uses must undergo the approval process of the WSEO, which includes consideration of the above decree and agreement as well as consultation with the USFWS under Section 7 of the ESA. Through these processes, all existing water users and interstate agreements are protected.

4.13.2 Impacts to Water Resources from Alternative 1R, Applicant Proposed Alternative

Impacts would occur during the construction, operation, and decommissioning phases of Alternative 1R. During construction, potential impacts include increased runoff and erosion from disturbed lands due to construction of this alternative, increased stream channel instability from construction of road crossings, and potential degradation of surface and groundwater quality due to spills of hazardous materials from construction equipment. During operation and maintenance, potential impacts would include increased runoff and erosion from disturbed lands, increased stream channel instability related to new stream crossings, and potential spills of hazardous materials. Impacts during decommissioning would be similar to those caused during construction.

Surface disturbance within each sub-watershed during construction and operation of Alternative 1R is detailed in **Table 4.13-2** and depicted in **Figure 4.13-1**. Sub-watershed disturbance ranges from less than 0.1 percent to 4.8 percent during construction and from less than 0.1 percent to 1.0 percent disturbance during operation. All disturbance associated with streams or wetlands greater than 1/10 acre will require a CWA § 404 Permit be filed and approved by the USACE.

Disturbance associated with this alternative is generally concentrated towards the higher elevations within each sub-watershed. The sub-watershed with the highest percentage of construction disturbance is 101800021304 (Sugar Creek) with 4.8 percent disturbance. This high value is due to the relatively small size of this sub-watershed coupled with the presence of a laydown area and a substation site along with multiple WTG sites and access roads. In order by percentage of basin area disturbed, sub-watersheds with construction disturbance equal to or greater than 1 percent include 101800021304 (Sugar Creek), Hugus Draw, Iron Springs Draw, Rasmussen Creek, Grenville Dome, Miller Creek, Lower Sage Creek-Upper North Platte River, McKinney Creek, Upper Sage Creek-North Platte River, and Lower Little Sage Creek. Miller Creek and Lower Little Sage Creek sub-watersheds include 67 acres and 37 acres, respectively, that account for the haul road in the off-site area totaling 104 acres.

Table 4.13-2 Surface Disturbance of Sub-watersheds Associated with Alternative 1R

Sub-watershed Name	Sub-watershed Total Area (acres)	Alternative 1R Construction Disturbance		Alternative 1R Operation Disturbance		Stream Crossings in sub-watershed (number)
		(acres)	(percent sub-watershed)	(acres)	(percent sub-watershed)	
North Platte Basin						
North Platte River-First Cottonwood Draw	46,942	326	0.7	61	0.1	15
Little Jack Creek	35,771	-	0.0	-	0.0	0
Upper Sage Creek-North Platte River[1]	40,935	494	1.2	87	0.2	21
Rasmussen Creek[1]	23,488	820	3.5	157	0.7	58
Lower Sage Creek-Upper North Platte River[1]	20,079	507	2.5	82	0.4	27
Miller Creek[1]	28,571	794	2.8	147	0.5	47
Upper Little Sage Creek[1]	30,732	4	0.0	<1	<0.1	0
Lower Little Sage Creek[1]	16,898	165	1.0	39	0.2	10
North Platte River-Coal Mine Draw	34,326	153	0.4	25	0.1	5
North Platte River-Lost Springs Draw	47,020	1	<0.1	-	0.0	0
Iron Springs Draw	18,853	703	3.7	107	0.6	23
Hugus Draw	35,341	1,508	4.3	264	0.7	76
Grenville Dome	22,059	739	3.3	126	0.6	41
Pass Creek-Stage Station Springs	34,785	-	0.0	-	0.0	0
Middle Sugar Creek	24,897	189	0.8	29	0.1	3
Lower Sugar Creek	42,909	235	0.5	225	0.5	
101800021304 (Sugar Creek)[2]	11,042	528	4.8	108	1.0	12
North Platte Basin Subtotals	**514,648**	**7,164**	**1.4**	**1,456**	**0.3**	**339**
White-Yampa Basin						
North Fork Savery Creek	30,812	-	0.0	-	0.0	0
Little Savery Creek	30,995	-	0.0	-	0.0	0

Table 4.13-2 Surface Disturbance of Sub-watersheds Associated with Alternative 1R

Sub-watershed Name	Sub-watershed Total Area (acres)	Alternative 1R Construction Disturbance		Alternative 1R Operation Disturbance		Stream Crossings in sub-watershed (number)
		(acres)	(percent sub-watershed)	(acres)	(percent sub-watershed)	
Muddy Creek-Littlefield Creek[3]	32,259	-	0.0	-	0.0	0
McKinney Creek[3]	30,433	530	1.7	86	0.3	10
White-Yampa Basin Subtotals	**124,499**	**530**	**0.4**	**86**	**0.1**	**10**
Grand Totals [4]	**639,147**	**7,694**	**1.2**	**1,542**	**0.2**	**348**

[1] Sub-watersheds included in Sage Creek watershed improvement project.

[2] Some 12-digit sub-watersheds (HUs) were assigned the HUC-12 number when no GNIS name was identified on the DRGs. The name in parentheses indicates the HUC-10 name.

[3] Sub-watersheds included in Upper Muddy Creek watershed improvement project.

[4] Discrepancies in total acreage due to rounding.

Note: GIS estimates use assumed component locations to generate disturbance associated with soil limitations. While these estimates may vary somewhat from disturbance estimates that were generated by assuming an average amount of disturbance associated with each project component proposed by alternative (as presented in Chapter 2.0), the difference is estimated to be less than 5 percent. For example, the differences here are less than 0.5 percent.

Under this alternative, 348 road-stream crossings would be constructed. There are a total of 343 locations where roads cross ephemeral streams and five where a perennial stream (Sage Creek two times, Miller Creek, and Smith Draw two times) is crossed under the conceptual development of this alternative. Two of the above ephemeral streams are crossed within the Upper Muddy Creek Watershed/Grizzly WHMA. No streams are crossed within the Red Rim-Grizzly WHMA. Five of the above ephemeral streams are crossed by the haul road in the off-site area. All power collector lines would be buried within the road ROW and disturbed area; therefore, no additional disturbance is considered for the collector lines. The number of stream crossings may change during the detailed design phase. These crossings would alter the channel geometry and riparian vegetation, potentially increasing water velocities and decreasing bank stability through all phases of the project. The project area experiences high levels of variability in channel processes under natural and existing conditions that may be exacerbated by development. This is due to the combination of the arid climate, high runoff during storm events, and erodible soil types. The majority of these channels (ephemeral/intermittent) only flow during periods of precipitation.

Localized channel impacts would occur during high flows and in response to changes in channel geometry from crossing construction and increased erosion due to upland/riparian vegetation clearing. Impacts might include head-cutting, bank failure, channel sedimentation, and channel scour. Construction disturbance near or across drainage channels and streams would likely exacerbate these processes, especially in areas with highly erodible soil types (see Sections 3.9 and 4.9) by decreasing the vegetative cover and damaging soil structure that limit erosion under undisturbed conditions.

Road-stream crossings would include low-water crossings, culverts, or bridges (temporary and/or permanent). Low-water crossings would require the least amount of initial disturbance, but are only applicable to drainages with no flow for the majority of the year (e.g., ephemeral streams). Low-water

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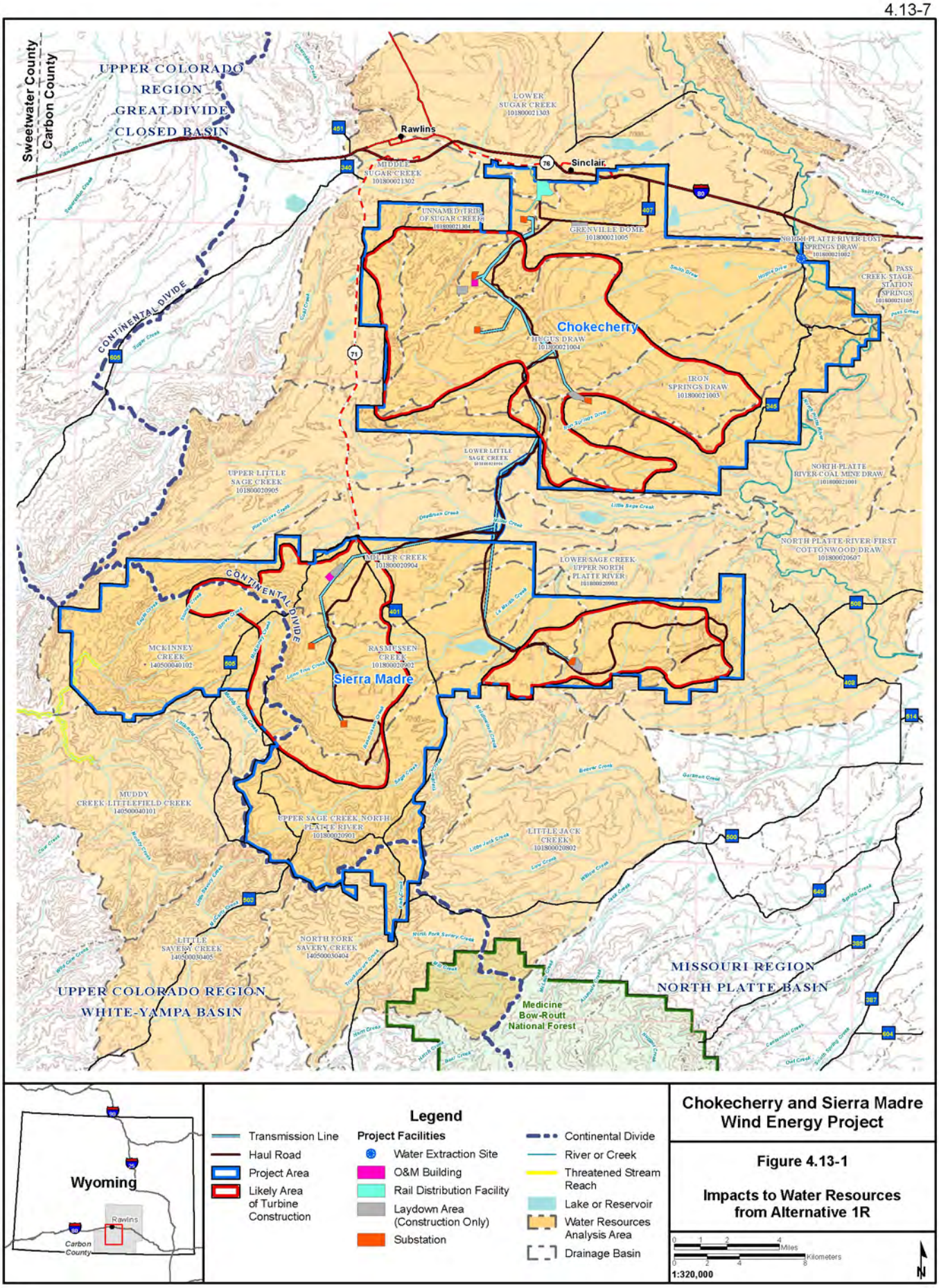

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.13-1

Impacts to Water Resources from Alternative 1R

crossings cannot be used during runoff events that cause excess flows at a crossing. Culverts are generally the preferred crossing method. Impacts to channel geometry and stability would occur at the installation location, and can occur up- or downstream due to improper installations. Temporary bridges could be utilized during the construction phase for temporary roads. Permanent bridges are economically limited in their applicability for access roads. Bridge installation also would require the largest initial disturbance for foundation construction and potential pier placements.

Construction disturbance in the Upper Muddy Creek watershed improvement project area (within White-Yampa Basin) totals 530 acres and represents approximately 0.8 percent of the improvement area. Of this, 305 acres fall on public lands managed as the Upper Muddy Creek Watershed/Grizzly WHMA. Construction disturbance in the Sage Creek watershed improvement project area (within North Platte Basin) totals 2,783 acres, which represents a disturbance range from less than 0.1 percent in Upper Little Sage Creek sub-watershed to approximately 3.5 percent in Rasmussen Creek sub-watershed. The Red Rim – Grizzly WHMA has a total of 68 acres of initial disturbance, of which 43 acres would be within the McKinney Creek sub-watershed, and 25 acres would be within the Upper Sage Creek-North Platte River sub-watershed.

Operational disturbance decreases as construction disturbance not needed for operation is reclaimed. Reclamation success would not be an immediate response, but would take time to be achieved. A portion of the disturbance decrease is due to the completion of reclamation of laydown areas and concrete batch plants and of decreased access road ROW width, some of which are located in the lower elevation areas. The sub-watershed with the highest percentage of operation disturbance is 101800021304 (Sugar Creek), with 1.0 percent disturbance.

Operational disturbance in the Upper Muddy Creek watershed improvement project area totals 86 acres, which represents approximately 0.3 percent of the McKinney Creek sub-watershed. Of this, 50 acres fall on public lands managed as the Upper Muddy Creek Watershed/Grizzly WHMA. Operational disturbance in the Sage Creek watershed improvement project area totals 513 acres, which represents a disturbance range from less than 0.1 percent of the Upper Little Sage Creek sub-watershed to approximately 0.7 percent of the Rassmussen Creek sub-watershed. The Red Rim – Grizzly WHMA has a total of 11 acres of operational disturbance, of which 7 is within the McKinney Creek sub-watershed, and 4 is within the Upper Sage Creek-North Platte River sub-watershed.

There are multiple BMPs and ACMs that can, if properly implemented, minimize the impacts of surface disturbance to water resources. Disturbance activities within 500 feet of perennial waters, 100 feet of ephemeral waters, and within drainage bottoms and riparian areas would be avoided as required by the RFO RMP and ROD. Where these features cannot be completely avoided such as in the case of access road-stream crossings, impacts would be minimized through design modifications and the use of erosion control and channel stabilizing measures (e.g., culverts, culvert outlet protection, energy dissipating structures, rock/rip rap embankments). All structures crossing streams would be located and constructed according to the BLM Gold Book (2007) and BLM Manual 9113 so that changes to channel geometry and water velocity are minimized.

Disturbance that occurs in upland locations would be minimized through the use of erosion control devices (e.g., silt fences, jute netting, hay bales, water bars, check dams, berms, shallow swales, mulches). Road designs would only exceed 10 percent grade in limited locations and would avoid changing existing surface water runoff patterns by following natural contours and utilizing roadside ditches and subsurface culverts. Additional erosion control measures would be implemented on locations where road surface grades exceed 10 percent. Excessive grades would be avoided on roads, road embankments, ditches, and drainages whenever possible. See **Appendix A** for further information.

Storm water management would be implemented under the administration of the WDEQ and as defined in the Stormwater Pollution Prevention Plan (SWPPP) (POD, Appendix F), which includes monitoring and maintenance of all control devices and structures during active construction on one of two schedules: at least once every 14 days and within 24 hours of a precipitation event greater than 0.5 inch,

or at least once every 7 days. After active construction is finished but complete reclamation has not yet occurred, these structures and devices would be inspected at least once every month. SWPPP review would be completed by WDEQ-WQD in collaboration with the BLM, WGFD, Conservation Districts, and other cooperators to simultaneously meet the requirements of the storm water permit and allow the BLM and cooperators review and comment on the BMP monitoring plan.

No impacts to groundwater quality are anticipated from construction due to the relatively high elevation locations and shallow excavation depth of turbines. A draft Watershed Monitoring Plan has been developed by the proponent that describes water quality monitoring that has commenced to collect baseline information, and would continue during construction of the project and for a period of three years following construction. Included in this monitoring are components of stream channel cross-section and longitudinal (up-and-downstream) profile monitoring, greenline (vegetation cover) monitoring, water quality sampling, streamflow measurements, and photographic documentation. Results of the monitoring would be reviewed by the proponent and BLM, and necessary adjustments or additions to the ACMs and BMPs would be implemented to reduce impacts. Upon completion of construction, reclamation of disturbed areas not required for operation would be undertaken as early as possible using weed-free native grasses, forbs, and shrubs. Control of weeds could entail the use of herbicides, which would be performed in accordance with a BLM-approved Weed Management Plan. During operation, roads would be inspected on a regular basis and following snowmelt or heavy or prolonged rainfall to identify maintenance needs to road crowns and outslopes, and for clearing sediment or debris blocking ditches and culverts. Maintenance would be performed as necessary.

Properly implemented BMPs and ACMs used during construction and operation would minimize impacts of surface disturbance on water quality and quantity. For instance, measures such as low-flow crossings and culverts would be installed at stream crossings during construction to control erosion and stabilize stream channels.

Water use for construction of this alternative would primarily include concrete batching for the WTG foundations, dust abatement, and compaction of access roads. Water use is addressed in the POD, and a potential water consumption schedule was provided by PCW (PCW 2012). Based on this information the BLM estimates that water consumptively used during construction of the project would be approximately 0.06 acre-feet per turbine foundation, 0.18 acre-feet per mile of road for compaction, and 0.9 acre-feet per mile of road (total over 5 years) for dust abatement.

Alternative 1R would consume approximately 553 acre-feet of water, with the maximum water use in Year 4, totaling 168 acre-feet in that year (30 percent of total construction water). The maximum annual volume of water consumed equates to approximately 0.02 percent of the North Platte River's average annual flow near Sinclair of nearly 810,000 acre-feet per year (USGS 2010). PCW estimates that 10 percent of the total construction water needs (55 acre-feet) may come from the White-Yampa Basin within the Upper Colorado River drainage (PCW 2010c). Water from this basin would be used during Years 2 and 3, and would equate to 0.20 percent of Muddy Creek's average annual flow near Baggs of nearly 14,000 acre-feet per year, or 0.04 percent of Savery Creek's average annual flow near Savery of approximately 72,000 acre-feet per year (USGS 2010). **Table 4.13-3** tabulates the water use by year and basin following the rationale described above.

Similar to the No Action alternative, water use would not be allowed to impact current water users or interstate agreements through the water rights processes required by the WSEO. PCW has committed to obtaining water supplies for construction and operations so that no additional depletions would occur in the North Platte Basin or White-Yampa Basin as a result of this project. Water that is currently being consumed by permitted beneficial use may be temporarily changed for construction use under these processes, and tentative specific water rights have been identified (PCW 2012) and are being evaluated. No net increases in water consumption are anticipated, nor are changes anticipated to existing return flow timing or volumes. Part of this temporary change process is consultation under Section 7 of the ESA. See Sections 3.15 and 4.15 for more information on endangered species consultation. The

proponent has indicated that available municipal water supplies might be utilized if available to meet long term needs (PCW 2011).

Table 4.13-3 Water Use Analysis for Construction of Alternative 1R

	Total	Year 1	Year 2	Year 3	Year 4	Year 5
Total Estimated Project Water Consumption (acre-feet)	553	38	109	151	168	87
Percent Estimated Water Consumption by Year		7%	20%	27%	30%	16%
North Platte Basin Estimated Project Water Consumption (acre-feet)	498	38	82	123	168	87
Percent Average Annual North Platte River Runoff Consumed by Project		0.00%	0.01%	0.02%	0.02%	0.01%
White-Yampa Basin Estimated Project Water Consumption (acre-feet)	55	0	27	28	0	0
Percent Average Annual Muddy Creek Runoff Consumed by Project		0.00%	0.20%	0.20%	0.00%	0.00%
Percent Average Annual Savery Creek Runoff Consumed by Project		0.00%	0.04%	0.04%	0.00%	0.00%

Note: North Platte River average annual runoff is 807,352 acre-feet. Muddy Creek average annual runoff is 13,979 acre-feet. Savery Creek average annual runoff is 72,354 acre-feet.

Magnesium-chloride ($MgCl_2$) has been proposed by PCW for use in road dust abatement, and it is suggested that its use would decrease water needs by up to 30 percent (PCW 2012). Several studies performed along roadways in Colorado where $MgCl_2$ has been used as a dust inhibitor or a deicer indicate that its use might increase the levels of the constituents in waterways depending on application rates, road proximity to waterway, and weather patterns, among others. These studies show that the increases did not approach concentration limits implemented by WDEQ or USEPA in water quality classifications or drinking water secondary standards, respectively (Goodrich et al. 2009; Lewis 1999; Stevens 2010).

During the operation of the project, a minimal amount of water would be needed for potable and sanitary services at the O&M buildings. PCW has assumed that the Operations Building water and sewer connection could be made to the Town of Sinclair water system (PCW 2010). The proponent must consult the "Town of Sinclair-City of Rawlins Municipal Water Supply Joint Powers Agreement" (File Number 394, Date Filed 4-11-03 with the Wyoming Secretary of State's Office) and contact the City of Rawlins to negotiate municipal water and sewer service.

Spills of hazardous materials from construction equipment would be addressed in the project's SPCC Plan (POD, Appendix T). This plan includes measures such as secondary containment at all on-site hazardous materials and waste storage facilities, including fuel. The SPCC Plan also defines procedures to be followed in the case of an accidental spill from a vehicle or equipment. No degradation to surface water or groundwater quality would be anticipated providing the SPCC is complete and available on-site and includes appropriate containment and clean up measures.

No permanent project components would be located within FEMA-designated 100-year floodplains (FEMA 1987); however, the water extraction site consisting of a temporary pump location would be immediately adjacent to the North Platte River floodplain. Therefore, impacts to floodplains would not be anticipated under this alterative.

4.13.3 Impacts to Water Resources from Alternative 2, Checkerboard Only

Impacts from this alternative would be similar to those discussed under Alternative 1R. A distinction of this alternative is the location of the internal haul road, which would be largely collocated with State Highway 71. The haul road would be constructed to the east, or downstream, of the existing highway. Surface disturbance within each sub-watershed during construction and operation of Alternative 2 is detailed in **Table 4.13-4** and depicted in **Figure 4.13-2**. The percentage of sub-watershed disturbance ranges from less than 0.1 percent to 7.8 percent during construction and from less than 0.1 percent to 1.1 percent during operation. There are a total of 520 locations where roads cross ephemeral streams and 11 where perennial streams (Sage Creek five times, Miller Creek, Little Sage Creek, Iron Springs Draw, Smith Draw three times) are crossed under the development of this alternative. Two of the above ephemeral streams are crossed within the Upper Muddy Creek Watershed/Grizzly WHMA. No streams are crossed within the Red Rim-Grizzly WHMA. Of the total crossings, 27 ephemeral and two perennial streams are crossed by the haul road in the off-site area. Construction disturbance under this alternative would be greater than that for Alternative 1R and would include a shift in disturbance from the southern portion of the project area to the central and northern portions, especially in the lower elevations. Sub-watersheds with construction disturbance equal to or greater than 1 percent include 101800021304 (Sugar Creek), Hugus Draw, Iron Springs Draw, Grenville Dome, Rasmussen Creek, Miller Creek, Lower Sage Creek-Upper North Platte River, Middle Sugar Creek, and McKinney Creek.

Table 4.13-4 Surface Disturbance of Sub-watersheds Associated with Alternative 2

Sub-watershed Name	Sub-watershed Total Area (acres)	Alternative 2 Construction Disturbance		Alternative 2 Operation Disturbance		Stream Crossings in Sub-watershed (number)
		(acres)	(percent sub-watershed)	(acres)	(percent sub-watershed)	
North Platte Basin						
North Platte River-First Cottonwood Draw	46,942	310	0.7	62	0.1	24
Little Jack Creek	35,771	-	0.0	-	0.0	-
Upper Sage Creek-North Platte River[1]	40,935	339	0.8	55	0.1	34
Rasmussen Creek[1]	23,488	794	3.4	145	0.6	74
Lower Sage Creek-Upper North Platte River[1]	20,079	506	2.5	94	0.5	44
Miller Creek[1]	28,571	726	2.5	114	0.4	38
Upper Little Sage Creek[1]	30,732	73	0.2	21	0.1	7
Lower Little Sage Creek[1]	16,898	99	0.6	17	0.1	1
North Platte River-Coal Mine Draw	34,326	315	0.9	53	0.2	11
North Platte River-Lost Springs Draw	47,020	5	<0.1	<1	<0.1	-

Table 4.13-4 Surface Disturbance of Sub-watersheds Associated with Alternative 2

Sub-watershed Name	Sub-watershed Total Area (acres)	Alternative 2 Construction Disturbance		Alternative 2 Operation Disturbance		Stream Crossings in Sub-watershed (number)
		(acres)	(percent sub-watershed)	(acres)	(percent sub-watershed)	
Iron Springs Draw	18,853	833	4.4	135	0.7	44
Hugus Draw	35,341	1,669	4.7	277	0.8	100
Grenville Dome	22,059	885	4.0	150	0.7	72
Pass Creek-Stage Station Springs	34,785	-	0.0	-	0.0	-
Middle Sugar Creek	24,897	494	2.0	90	0.4	41
Lower Sugar Creek	42,909	228	0.5	223	0.5	-
101800021304 (Sugar Creek)[2]	11,042	858	7.8	122	1.1	31
North Platte Basin Subtotals	**514,648**	**8,135**	**1.6**	**1,561**	**0.3**	**521**
White-Yampa Basin						
North Fork Savery Creek	30,812	-	0.0	-	0.0	-
Little Savery Creek	30,995	-	0.0	-	0.0	-
Muddy Creek-Littlefield Creek[3]	32,259	-	0.0	-	0.0	-
McKinney Creek[3]	30,433	371	1.2	61	0.2	10
White-Yampa Basin Subtotals	**124,499**	**371**	**0.3**	**61**	**0.0**	**10**
Grand Totals [4]	**639,147**	**8,506**	**1.3**	**1,622**	**0.3**	**531**

[1] Sub-watersheds within the Sage Creek watershed improvement project.

[2] Some 12-digit sub-watersheds (HUs) were assigned the HUC-12 number when no GNIS name was identified on the DRGs. The name in parentheses indicates the HUC-10 name.

[3] Sub-watersheds within the Upper Muddy Creek watershed improvement project.

[4] Discrepancies in total acreage due to rounding.

Note GIS estimates use assumed component locations to generate disturbance associated with soil limitations. While these estimates may vary somewhat from disturbance estimates that were generated by assuming an average amount of disturbance associated with each project component proposed by alternative (as presented in Chapter 2.0), the difference is estimated to be less than 5 percent.

Construction disturbance in the Upper Muddy Creek watershed improvement project area totals 371 acres, which represents approximately 1.2 percent of the McKinney Creek sub-watershed. Of this, 167 acres fall on public lands managed as the Upper Muddy Creek Watershed/Grizzly WHMA. Construction disturbance in the Sage Creek watershed improvement project area totals 2,537 acres, which represents a disturbance range from approximately 0.2 percent in Upper Little Sage Creek sub-watershed to 3.4 percent in Rasmussen Creek sub-watershed. The Red Rim – Grizzly WHMA has no disturbance under this alternative. The construction disturbance within each of these areas decreases

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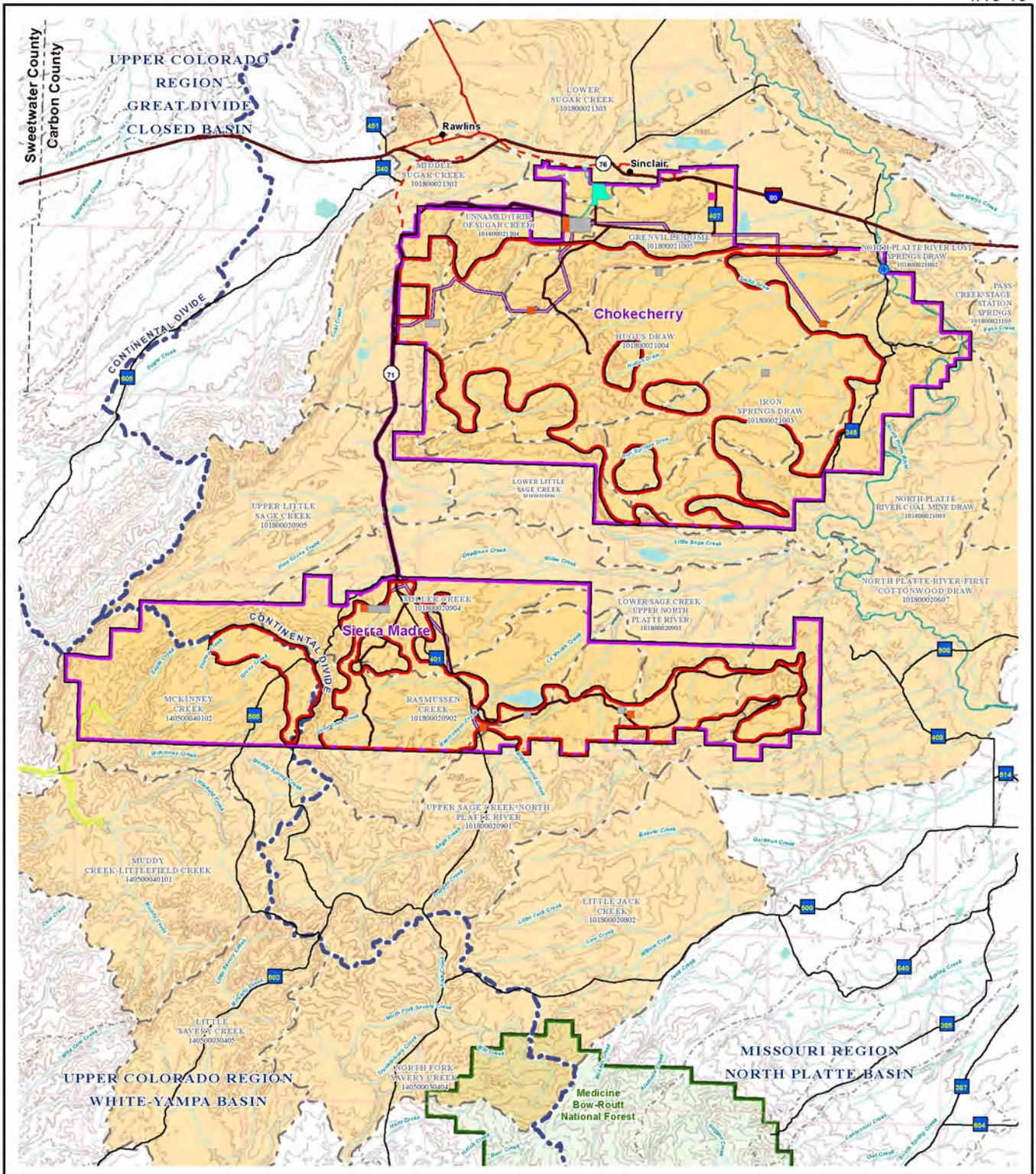

Legend

- Transmission Line
- Haul Road
- Project Area
- Likely Area of Turbine Construction

Project Facilities

- Water Extraction Site
- O&M Building
- Rail Distribution Facility
- Laydown Area (Construction Only)
- Substation

- Continental Divide
- River or Creek
- Threatened Stream Reach
- Lake or Reservoir
- Water Resources Analysis Area
- Drainage Basin

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.13-2

Impacts to Water Resources from Alternative 2

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

under this alternative as compared to Alternative 1R. Miller Creek, Upper Little Sage Creek, Middle Sugar Creek, and the unnamed 1018000021304 sub-watersheds include 28, 61, 89, and 41 acres of disturbance, respectively that account for the haul road in the off-site area totaling 220 acres.

Surface disturbance during project operations would be greater than the disturbance under Alternative 1R, with a shift in disturbance from the south to the north portion of the project area, including lower elevations. The unnamed 101800021304 (Sugar Creek) Sub-watershed would have the largest operation disturbance at 1.1 percent.

Operational disturbance in the Upper Muddy Creek watershed improvement project area totals 61 acres and is approximately 0.2 percent of the McKinney Creek sub-watershed. Of this, 26 acres fall on public lands managed as the Upper Muddy Creek Watershed/Grizzly WHMA. Operation disturbance in the Sage Creek watershed improvement project area totals 446 acres, which represents a disturbance range from approximately 0.1 percent in several sub-watersheds to 0.6 percent in Rasmussen Creek sub-watershed. The operation disturbance within each of these areas also decreases under this alternative as compared to Alternative 1R. Water use for construction of this alternative would include the same uses as Alternative 1R. Based on the same information used under Alternative 1R, the BLM estimates that this alternative would consume approximately 604 acre-feet, which is 9 percent more water than Alternative 1R. The maximum water use would occur in Year 4 and total 183 acre-feet (30 percent of total construction water). The maximum annual volume of water used equates to approximately 0.02 percent of the North Platte River's average annual flow near Sinclair of nearly 810,000 acre-feet per year (USGS 2010). PCW estimates that 10 percent of the total water need (60 acre-feet) may come from the White-Yampa Basin within the Upper Colorado River drainage (PCW 2010c). Water from this basin would be used during Years 2 and 3, and would equate to 0.22 percent of Muddy Creek's average annual flow near Baggs of nearly 14,000 acre-feet per year, or 0.04 percent of Savery Creek's average annual flow near Savery of approximately 72,000 acre-feet per year (USGS 2010). **Table 4.13-5** tabulates the water use by year and basin. Similar to Alternative 1R, water that is currently being consumed by permitted beneficial use may be temporarily changed for construction use under WSEO processes. No net increases in water consumption are anticipated, nor are changes anticipated to existing return flow timing or volumes.

Water use impacts during operation and decommissioning would be similar to those discussed under Alternative 1R.

Potential spills of hazardous materials would be similar to those discussed under Alternative 1R.

Floodplain impacts would be similar to those discussed under Alternative 1R.

4.13.4 Impacts to Water Resources from Alternative 3, No Miller Hill or South Sierra Madre

Impacts would occur in the same ways as discussed under Alternative 1R. Land disturbance within each sub-watershed during construction and operation of Alternative 3 is detailed in **Table 4.13-6** and depicted in **Figure 4.13-3**. Sub-watersheds with disturbance range from less than 0.1 percent to 7.1 percent disturbance during construction and from less than 0.1 percent to 1.3 percent disturbance during operation. There are a total of 483 locations where roads cross ephemeral streams and 11 where perennial streams are crossed (Sage Creek six times, Miller Creek, Little Sage Creek, Iron Springs Draw, Smith Draw two times). No streams are crossed within the Upper Muddy Creek Watershed/Grizzly WHMA or the Red Rim-Grizzly WHMA. Out of the total streams discussed above, 13 ephemeral streams are crossed by the haul road in the off-site area.

Construction disturbance under this alternative would be less in the southern portion of the alternative area, which increases disturbance of the central and northern portions, especially in the lower elevations, as compared to Alternative 1R and similar to Alternative 2. Sub-watersheds with construction disturbance equal to or greater than 1 percent includes 101800021304 (Sugar Creek), Hugus Draw,

Table 4.13-5 Water Use Analysis for Construction of Alternative 2

	Total	Year 1	Year 2	Year 3	Year 4	Year 5
Total Estimated Project Water Consumption (acre-feet)	604	40	118	164	183	98
Percent Estimated Water Consumption by Year		7%	20%	27%	30%	16%
North Platte Basin Estimated Project Water Consumption (acre-feet)	544	40	89	134	183	98
Percent Average Annual North Platte River Runoff Consumed by Project		0.01%	0.01%	0.02%	0.02%	0.01%
White-Yampa Basin Estimated Project Water Consumption (acre-feet)	60	0	29	30	0	0
Percent Average Annual Muddy Creek Runoff Consumed by Project		0.00%	0.22%	0.22%	0.00%	0.00%
Percent Average Annual Savery Creek Runoff Consumed by Project		0.00%	0.04%	0.04%	0.00%	0.00%

Note; North Platte River average annual runoff is 807,352 acre-feet. Muddy Creek average annual runoff is 13,979 acre-feet. Savery Creek average annual runoff is 72,354 acre-feet. Values are rounded to the nearest integer.

Table 4.13-6 Surface Disturbance of Sub-watersheds Associated with Alternative 3

Sub-watershed Name	Sub-watershed Total Area (acres)	Alternative 3 Construction Disturbance		Alternative 3 Operation Disturbance		Stream Crossings in Sub-watershed (number)
		(acres)	(percent sub-watershed)	(acres)	(percent sub-watershed	
North Platte Basin						
North Platte River-First Cottonwood Draw	46,942	254	0.5	41	0.1	18
Little Jack Creek	35,771	-	0.0	-	0.0	-
Upper Sage Creek-North Platte River[1]	40,935	297	0.7	50	0.1	33
Rasmussen Creek[1]	23,488	732	3.1	130	0.6	64
Lower Sage Creek-Upper North Platte River[1]	20,079	439	2.2	75	0.4	41
Miller Creek[1]	28,571	750	2.6	118	0.4	45
Upper Little Sage Creek[1]	30,732	48	0.2	9	<0.1	6
Lower Little Sage Creek[1]	16,898	157	0.9	36	0.2	7

Table 4.13-6 Surface Disturbance of Sub-watersheds Associated with Alternative 3

Sub-watershed Name	Sub-watershed Total Area (acres)	Alternative 3 Construction Disturbance		Alternative 3 Operation Disturbance		Stream Crossings in Sub-watershed (number)
		(acres)	(percent sub-watershed)	(acres)	(percent sub-watershed	
North Platte River-Coal Mine Draw	34,326	356	1.0	61	0.2	13
North Platte River-Lost Springs Draw	47,020	5	<0.1	<1	<0.1	-
Iron Springs Draw	18,853	882	4.7	143	0.8	45
Hugus Draw	35,341	1,795	5.1	308	0.9	97
Grenville Dome	22,059	1,000	4.5	283	1.3	66
Pass Creek-Stage Station Springs	34,785	-	0.0	-	0.0	-
Middle Sugar Creek	24,897	426	1.7	57	0.2	32
Lower Sugar Creek	42,909	111	0.3	108	0.3	
101800021304 (Sugar Creek)[2]	11,042	782	7.1	75	0.7	27
North Platte Basin Subtotals	**514,648**	**8,033**	**1.6**	**1,493**	**0.3**	**494**
White-Yampa Basin						
North Fork Savery Creek	30,812	-	0.0	-	0.0	-
Little Savery Creek	30,995	-	0.0	-	0.0	-
Muddy Creek-Littlefield Creek[3]	32,259	-	0.0	-	0.0	-
McKinney Creek[3]	30,433	-	0.0	-	0.0	-
White-Yampa Basin Subtotals	**124,499**	**0**	**0.0**	**0**	**0.0**	**0**
Grand Totals[4]	**639,147**	**8,033**	**1.3**	**1,493**	**0.2**	**494**

[1] Sub-watersheds included in Sage Creek watershed improvement project.

[2] Some 12-digit sub-watersheds (HUs) were assigned the HUC-12 number when no GNIS name was identified on the DRGs. The name in parentheses indicates the HUC-10 name.

[3] Sub-watersheds included in Upper Muddy Creek watershed improvement project.

[4] Discrepancies in total acreage due to rounding.

Note: GIS estimates use assumed component locations to generate disturbance associated with soil limitations. While these estimates may vary somewhat from disturbance estimates that were generated by assuming an average amount of disturbance associated with each project component proposed by alternative (as presented in Chapter 2.0), the difference is estimated to be less than 5 percent.

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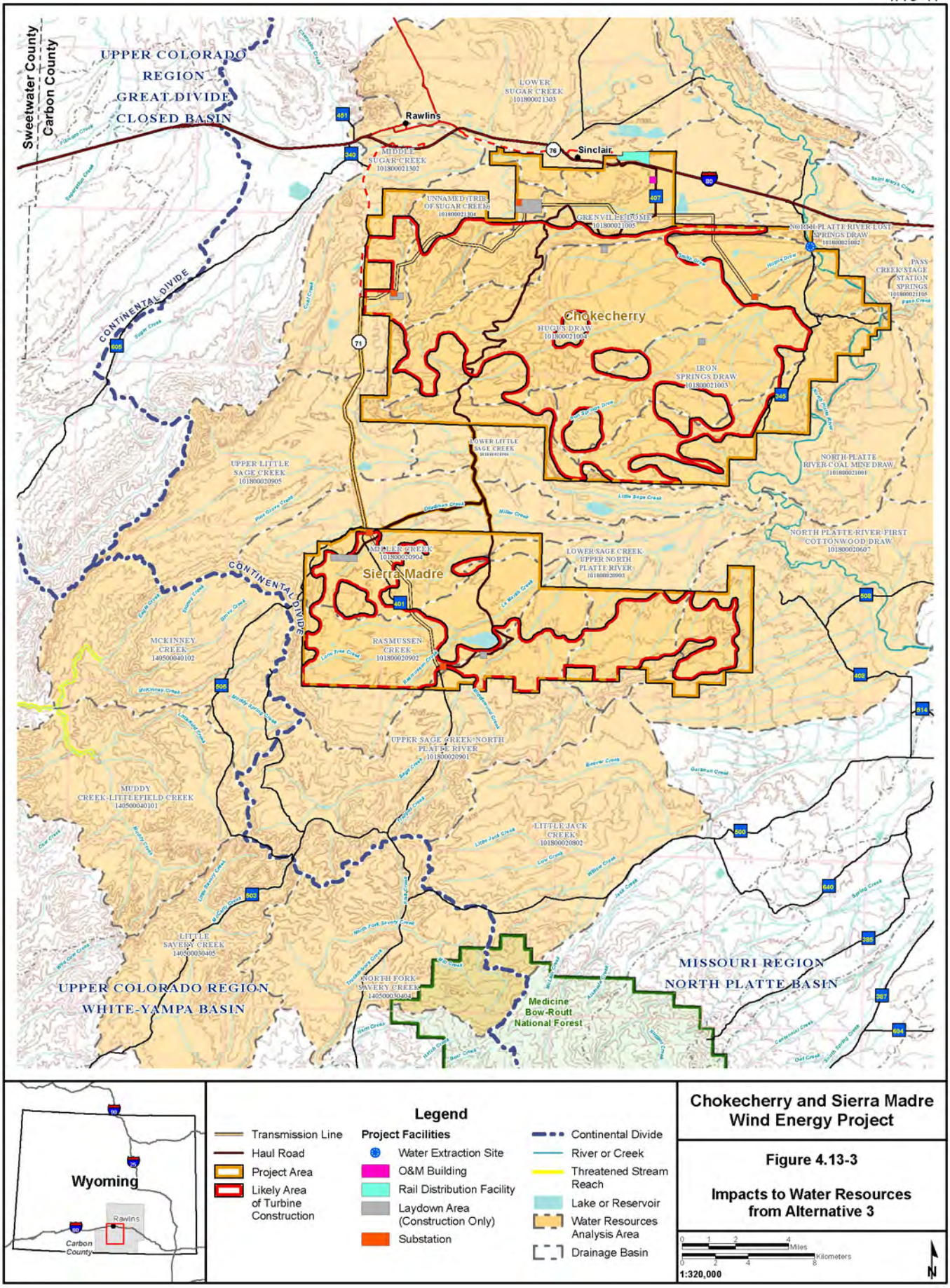

Legend

- Transmission Line
- Haul Road
- Project Area
- Likely Area of Turbine Construction

Project Facilities

- Water Extraction Site
- O&M Building
- Rail Distribution Facility
- Laydown Area (Construction Only)
- Substation

- Continental Divide
- River or Creek
- Threatened Stream Reach
- Lake or Reservoir
- Water Resources Analysis Area
- Drainage Basin

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.13-3

Impacts to Water Resources from Alternative 3

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

Iron Springs Draw, Grenville Dome, Rasmussen Creek, Miller Creek, Lower Sage Creek-Upper North Platte River, Middle Sugar Creek, and North Platte River-Coal Mine Draw.

Construction disturbance in the Upper Muddy Creek watershed improvement project area would be completely eliminated. Construction disturbance in the Sage Creek watershed improvement project area totals 2,422 acres, which represents a disturbance range from approximately 0.2 percent in Upper Little Sage Creek sub-watershed to 3.1 percent in Rasmussen sub-watershed, which is a decrease from both Alternatives 1R and 2. The Upper Muddy Creek Watershed/Grizzly WHMA and the Red Rim-Grizzly WHMA both have no disturbance within them under this alternative. Miller Creek and Lower Little Sage Creek sub-watersheds include 92 acres and 31 acres, respectively that account for the haul road in the off-site area, totaling 124 acres.

Operation disturbance would be similar to Alternative 2, with the exception of the shift from the south to the north discussed under construction disturbance above. Grenville Dome sub-watershed would have the largest operation disturbance at 1.3 percent.

Operation disturbance in the Upper Muddy Creek watershed improvement project area would be eliminated. Operation disturbance in the Sage Creek watershed improvement project area totals 417 acres and sub-watersheds with disturbance ranging from less than 0.1 percent in Upper Little Sage Creek sub-watershed to 0.6 percent in Rasmussen Creek sub-watershed, which also is a decrease from Alternatives 1R and 2.

Water use for construction of this alternative would include the same uses as Alternative 1R. Based on the same information used under Alternative 1R, the BLM estimates that this alternative would consume approximately 577 acre-feet, which is four percent more water than Alternative 1R. The maximum water use would occur in Year 4 and total 175 acre-feet (30 percent of total construction water). The maximum annual volume of water used equates to approximately 0.02 percent of the North Platte River's average annual flow near Sinclair of nearly 810,000 acre-feet per year (USGS 2010). Because there is no development in the White-Yampa Basin under this alternative, no water use from that basin would occur. **Table 4.13-7** tabulates the water use by year and basin. Similar to Alternatives 1R and 2, water that is currently being consumed by permitted beneficial use may be temporarily changed for construction use under WSEO processes. No net increases in water consumption are anticipated, nor are changes anticipated to existing return flow timing or volumes.

Table 4.13-7 Water Use Analysis for Construction of Alternative 3

	Total	Year 1	Year 2	Year 3	Year 4	Year 5
Total Estimated Project Water Consumption (acre-feet)	577	38	113	158	175	93
Percent Estimated Water Consumption by Year		7%	20%	27%	30%	16%
North Platte Basin Estimated Project Water Consumption (acre-feet)	577	38	113	158	175	93
Percent Average Annual North Platte River Runoff Consumed by Project		0.00%	0.01%	0.02%	0.02%	0.01%
White-Yampa Basin Estimated Project Water Consumption (acre-feet)	0	0	0	0	0	0

Table 4.13-7 Water Use Analysis for Construction of Alternative 3

	Total	Year 1	Year 2	Year 3	Year 4	Year 5
Percent Average Annual Muddy Creek Runoff Consumed by Project		0.00%	0.00%	0.00%	0.00%	0.00%
Percent Average Annual Savery Creek Runoff Consumed by Project		0.00%	0.00%	0.00%	0.00%	0.00%

Note: North Platte River average annual runoff acre-feet is 807,352 acre-feet. Muddy Creek average annual runoff is 13,979 acre-feet. Savery Creek average annual runoff is 72,354 acre-feet.

Water use impacts during operation and decommissioning would be similar to those discussed under Alternatives 1R and 2.

Potential spills of hazardous materials would be similar to those discussed under Alternatives 1R and 2.

Floodplain impacts would be similar to those discussed under Alternatives 1R and 2.

4.13.5 Impacts to Water Resources from Alternative 4, Private Lands Only

Impacts would occur in the same ways as discussed under Alternative 1R. Land disturbance within each sub-watershed during construction and operation of Alternative 4 is detailed in **Table 4.13-8** and depicted in **Figure 4.13-4**. Sub-watersheds with disturbance range from less than 0.1 percent to 6.2 percent disturbance during construction and from less than 0.1 percent to 1.2 percent disturbance during operation. Sub-watersheds with construction disturbance equal to or greater than 1 percent includes 101800021304 (Sugar Creek), Hugus Draw, Iron Springs Draw, Grenville Dome, Rasmussen Creek, Miller Creek, Lower Sage Creek-Upper North Platte River, Middle Sugar Creek, North Platte River-Coal Mine Draw, and Upper Sage Creek-North Platte River.

Table 4.13-8 Surface Disturbance of Sub-watersheds Associated with Alternative 4

	Sub-watershed Total Area	Alternative 4 Construction Disturbance		Alternative 4 Operation Disturbance		Stream Crossings in Sub-watershed
Sub-watershed Name	(acres)	(acres)	(percent sub-watershed)	(acres)	(percent sub-watershed)	(number)
North Platte Basin						
North Platte River-First Cottonwood Draw	46,942	179	0.4	31	0.1	22
Little Jack Creek	35,771	-	0.0	-	0.0	-
Upper Sage Creek-North Platte River[1]	40,935	434	1.1	63	0.2	41
Rasmussen Creek[1]	23,488	900	3.8	162	0.7	88
Lower Sage Creek-Upper North Platte River[1]	20,079	474	2.4	79	0.4	53
Miller Creek[1]	28,571	845	3.0	136	0.5	74

Table 4.13-8 Surface Disturbance of Sub-watersheds Associated with Alternative 4

	Sub-watershed Total Area	Alternative 4 Construction Disturbance		Alternative 4 Operation Disturbance		Stream Crossings in Sub-watershed
Sub-watershed Name	(acres)	(acres)	(percent sub-watershed)	(acres)	(percent sub-watershed)	(number)
Upper Little Sage Creek[1]	30,732	50	0.2	9	<0.1	6
Lower Little Sage Creek[1]	16,898	145	0.9	35	0.2	7
North Platte River-Coal Mine Draw	34,326	386	1.1	68	0.2	23
North Platte River-Lost Springs Draw	47,020	13	<0.1	2	<0.1	2
Iron Springs Draw	18,853	840	4.5	141	0.7	54
Hugus Draw	35,341	1,633	4.6	293	0.8	108
Grenville Dome	22,059	894	4.1	267	1.2	61
Pass Creek-Stage Station Springs	34,785	-	0.0	-	0.0	-
Middle Sugar Creek	24,897	282	1.1	34	0.1	25
Lower Sugar Creek	42,909	111	0.3	108	0.3	-
101800021304 (Sugar Creek)[2]	11,042	682	6.2	61	0.5	26
North Platte Basin Subtotals	**514,648**	**7,868**	**1.5**	**1,488**	**0.3**	**590**
White-Yampa Basin						
North Fork Savery Creek	30,812	-	0.0	-	0.0	-
Little Savery Creek	30,995	-	0.0	-	0.0	-
Muddy Creek-Littlefield Creek[3]	32,259	-	0.0	-	0.0	-
McKinney Creek[3]	30,433	248	0.8	43	0.1	6
White-Yampa Basin Subtotals	**124,499**	**248**	**0.2**	**43**	**<0.1**	**6**
Grand Totals[4]	**639,147**	**8,116**	**1.3**	**1,531**	**0.2**	**596**

[1] Sub-watersheds included in Sage Creek watershed improvement project.

[2] Some 12-digit sub-watersheds (HUs) were assigned the HUC-12 number when no GNIS name was identified on the DRGs. The name in parentheses indicates the HUC-10 name.

[3] Sub-watersheds included in Upper Muddy Creek watershed improvement project.

[4] Discrepancies in total acreage due to rounding.

Note: GIS estimates use assumed component locations to generate disturbance associated with soil limitations. While these estimates may vary somewhat from disturbance estimates that were generated by assuming an average amount of disturbance associated with each project component proposed by alternative (as presented in Chapter 2.0), the difference is estimated to be less than 5 percent.

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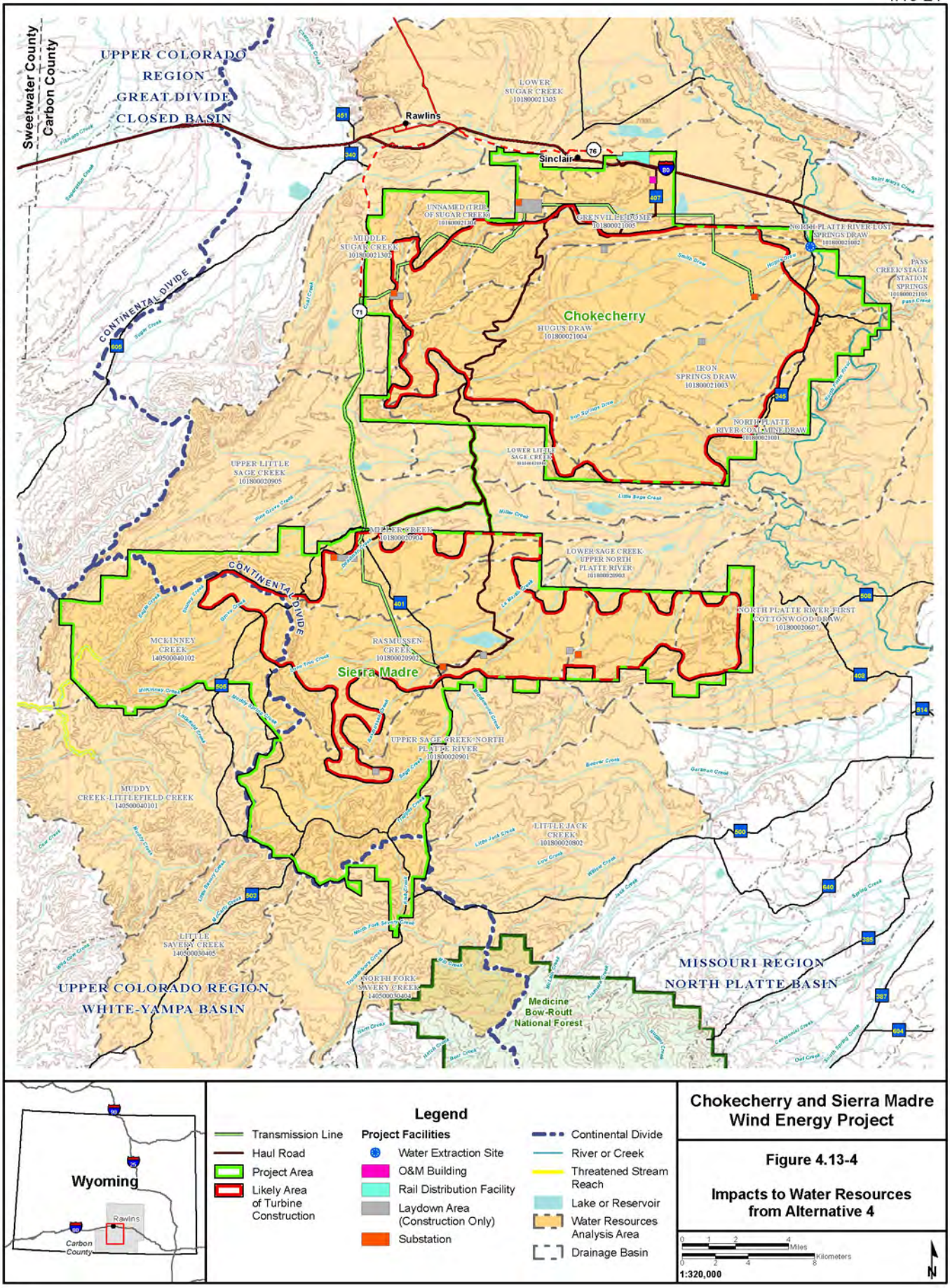


Legend

- Transmission Line
- Haul Road
- Project Area
- Likely Area of Turbine Construction

Project Facilities

- Water Extraction Site
- O&M Building
- Rail Distribution Facility
- Laydown Area (Construction Only)
- Substation

- Continental Divide
- River or Creek
- Threatened Stream Reach
- Lake or Reservoir
- Water Resources Analysis Area
- Drainage Basin

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.13-4

Impacts to Water Resources from Alternative 4

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

There are a total of 582 locations where roads cross ephemeral streams and 14 where perennial streams (Sage Creek six times, Miller Creek, Little Sage Creek, Iron Springs Draw four times, Smith Draw two times) are crossed under the development of this alternative. No streams are crossed within the Upper Muddy Creek Watershed/Grizzly WHMA or the Red Rim-Grizzly WHMA. Out of the total streams discussed above, 13 ephemeral streams are crossed by the haul road in the off-site area.

Construction disturbance under this alternative would be greater than those discussed in Alternatives 1R and 3, but less than Alternative 2. Because the WTG sites would be limited to private land only, there are less turbine locations, but a longer length of access roads to reach them. Furthermore, the overall footprint expands in all areas to lower elevations than Alternatives 1R, 2, and 3.

Construction disturbance in the Upper Muddy Creek watershed improvement project area totals 248 acres and is approximately 0.8 percent of the McKinney Creek sub-watershed, which is an increase under this alternative as compared to Alternative 3, but a decrease from Alternatives 1R and 2. Of this, 56 acres fall on public lands managed as the Upper Muddy Creek Watershed/Grizzly WHMA. Construction disturbance in the Sage Creek watershed improvement project area totals 2,848 acres and represents a range of disturbance from approximately 0.2 percent in Upper Little Sage Creek sub-watershed to 3.8 percent in Rasmussen Creek sub-watershed, which is an increase under this alternative as compared to Alternatives 1R, 2, and 3. The Red Rim – Grizzly WHMA has no disturbance under this alternative. Miller Creek and Lower Little Sage Creek sub-watersheds include 92 acres and 31 acres, respectively that account for the haul road in the off-site area, totaling 124 acres.

Operation disturbance would be greater than those discussed in Alternatives 1R, 2, and 3, for the same reasons as discussed under construction disturbance above. Operation disturbance in the Upper Muddy Creek watershed improvement project area totals 43 acres and is approximately 0.1 percent of McKinney Creek sub-watershed, which is a decrease from the Alternatives 1R and 2. Of this, 12 acres fall on public lands managed as the Upper Muddy Creek Watershed/Grizzly WHMA. Operation disturbance in the Sage Creek watershed improvement project area totals 484 acres and represents a disturbance range from less than 0.1 percent in Upper Little Sage Creek sub-watershed to 0.7 percent in Rasmussen Creek sub-watershed, which is an increase under this alternative as compared to Alternatives 2 and 3, but is less than Alternative 1R.

Water use for construction of this alternative would include the same uses as Alternative 1R. Based on the same information used under Alternative 1R, the BLM estimates that this alternative would consume approximately 602 acre-feet, which is 9 percent more water than Alternative 1R. The maximum water use would occur in Year 4 and would total 182 acre-feet (30 percent of total construction water). The maximum annual volume of water used equates to approximately 0.02 percent of the North Platte River's average annual flow near Sinclair of nearly 810,000 acre-feet per year (USGS 2010). PCW estimates that 10 percent of the total amount of water (60 acre-feet) may come from the White-Yampa Basin within the Upper Colorado River basin (PCW 2010c). Water from this basin would be used during Years 2 and 3, and would equate to 0.22 percent of Muddy Creek's average annual flow near Baggs of nearly 14,000 acre-feet per year, or 0.04 percent of Savery Creek's average annual flow near Savery of approximately 72,000 acre-feet per year (USGS 2010). **Table 4.13-9** tabulates the water use by year and basin. Similar to Alternatives 1R, 2, and 3, water that is currently being consumed by permitted beneficial use may be temporarily changed for construction use under WSEO processes. No net increases in water consumption are anticipated, nor are changes anticipated to existing return flow timing or volumes.

Water use impacts during operation and decommissioning would be similar to those discussed under Alternatives 1R, 2, and 3.

Potential spills of hazardous materials would be similar to those discussed under Alternatives 1R, 2, and 3.

Table 4.13-9 Water Use Analysis for Construction of Alternative 4

	Total	Year 1	Year 2	Year 3	Year 4	Year 5
Total Estimated Project Water Consumption (acre-feet)	602	41	118	163	182	98
Percent Estimated Water Consumption by Year	–	7%	20%	27%	30%	16%
North Platte Basin Estimated Project Water Consumption (acre-feet)	542	41	89	132	182	98
Percent Average Annual North Platte River Runoff Consumed by Project	–	0.01%	0.01%	0.02%	0.02%	0.01%
White-Yampa Basin Estimated Project Water Consumption (acre-feet)	60	0	29	31	0	0
Percent Average Annual Muddy Creek Runoff Consumed by Project	–	0.00%	0.22%	0.22%	0.00%	0.00%
Percent Average Annual Savery Creek Runoff Consumed by Project	–	0.00%	0.04%	0.04%	0.00%	0.00%

Note: North Platte River average annual runoff acre-feet is 807,352 acre-feet. Muddy Creek average annual runoff is 13,979 acre-feet. Savery Creek average annual runoff is 72,354 acre-feet.

Floodplain impacts would be similar to those discussed under Alternatives 1R, 2, and 3.

4.13.6 Mitigation and Mitigation Effectiveness

All action alternatives would incorporate ACMs and BMPs described in Chapter 2.0 and found in **Appendix C**. Mitigation measure GEN-1, from the Draft EIS, is now part of the alternatives analysis in the Final EIS as it was included as an ACM by the applicant in the January 2012 revised POD (PCW 2012a).

The following mitigation measures are common to all alternatives:

WR-1: Stream water quality monitoring sites will be identified by the BLM. Stream monitoring shall continue through construction, operation, and decommissioning of the project by the applicant to monitor for changes in water quality.

WR-2: PCW will be required to submit the site-specific SWPPP as part of the ROW grant application for approval by the BLM.

Effectiveness: Mitigation measure 1 would continue to provide data to quantify the project-related impacts of sedimentation and erosion control on water quality. This would assist the BLM in determining the effectiveness of the implemented BMPs and evaluate the need for additional measures through adaptive management. Mitigation measure 2 would provide the BLM an opportunity for input to the SWPPP ahead of issuing any ROW grant to determine compliance with BLM-required BMPs.

4.13.7 Residual Impacts

Mitigation measures are designed to identify and reduce impacts to water resources but do not fully mitigate the impacts. All of the alternatives would result in the potential for site specific increases of

upland erosion during construction and initial reclamation, thereby increasing sedimentation to streams. Long-term increases in erosion would be expected due to the continued use of constructed roads.

4.13.8 Irreversible and Irretrievable Commitment of Resources

Irreversible impacts to surface water are not anticipated since environmental measures, including reclamation, would mitigate effects on water quantity and quality over time.

Temporary reductions in water quality from erosion and sedimentation would be irretrievable. Water consumptively used during the project would be irretrievable; however, because no new depletions are allowed, the water needed for the project must be obtained from sources with existing water rights currently and historically used for another purpose or must be covered under the Wyoming depletion plan. Water rights intended for use during this project must be converted to industrial use through established WSEO procedures before construction can be approved.

4.13.9 Relationship between Local Short-term Uses and Long-term Productivity

Short-term increases in erosion and decreases in bank vegetation could potentially impact long-term channel stability.

4.14 Impacts to Wildlife and Fisheries Resources

The impacts study area for wildlife and fisheries is the applicable alternative boundary. Potential wildlife impacts from construction and operation of the proposed project can be grouped into two main categories, loss of habitat and mortality. Habitat loss can be further identified into initial and long-term impacts. Initial impacts accounts for all disturbance during construction of the project. Long-term impacts are defined as impacts that remain after reclamation and will last at least as long as the project is in operation. Examples of long-term direct impacts include areas where operation facilities (e.g., roads, tower pads, substations) are located and habitat cannot be reclaimed until after the end of the project's design life (decommissioning). Habitat impacts can further be categorized as direct and indirect. Direct habitat impact results when habitat is destroyed or converted to a form that is unusable by the affected species, and is typically long-term. The primary potential indirect impact of the proposed project is wildlife avoidance (displacement) of otherwise suitable habitat in the project area, even when the habitat is relatively undisturbed by the project. Indirect impacts are more difficult to quantify than direct impacts because for most wildlife species there is limited scientific data available describing thresholds. Habitat loss and/or displacement impacts also may result in habitat fragmentation, the separation of a block of habitat for a species into fragments, such that the genetic or demographic viability of the populations' surviving in the remaining habitat fragments is reduced (Wind Turbine Guidelines Advisory Committee 2010). Habitat fragmentation and isolation are difficult to determine and vary by species.

Displacement of wildlife species could potentially have the most significant impact on wildlife. Displacement would occur initially from construction. Avoidance of the disturbed areas, facility infrastructure (e.g., turbines and roads where increased human activity and noise levels is likely to occur) during operations and maintenance would likely result in a long-term impact for some species. The response to these potential impacts likely varies considerably with each wildlife species. Potential consequences from displacement include lower survival, lower reproductive success, lower recruitment, and ultimately lower carrying capacity and reduced populations (WGFD 2004b). These consequences are dependent upon the condition of the adjacent, undisturbed areas, and/or whether the impacts are sufficient to cause habitat fragmentation. If adjacent areas are at carrying capacity wildlife populations would likely be reduced, as a result of competition with animals already in adjacent areas or the use of less optimal habitat. Likewise, if habitats are fragmented, the areas carrying capacity would be reduced for those species impacted.

The extent of wildlife displacement is difficult to predict for most species, although data for other development activities suggest that the response severity would likely vary from species to species and can even vary between different individuals of the same species. After initial avoidance, some wildlife species may acclimate to the activity and begin to use areas previously avoided. This acclimation and reoccupation is most likely to occur following construction when the project moves into the operational phase when noise and human activity would be much reduced. Although wind energy projects do not typically create physical barriers to wildlife movement, the effective use of adjacent undisturbed habitats could diminish as densities of infrastructure and roads increase, and the infrastructure and roads themselves fragment habitat within the development area.

The road network constructed to service turbines would affect terrestrial and aquatic communities (Kuvlesky et al. 2007). There are seven general impacts to wildlife habitat associated with roads including: 1) increased morality from road construction; 2) increased mortality from collision with vehicles; 3) modification of animal behavior; 4) alteration of the physical environment; 5) alteration of the chemical environment; 6) spread of exotic species; and 7) increased alteration and use of habitats by humans (Trombulak and Frissell 2000). Not all species and ecosystems are equally affected by roads, but overall the presence of roads is highly correlated with changes in the species composition, population sizes, and hydrologic and geomorphic processes that shape aquatic and riparian systems (Trombulak and Frissell 2000).

Reclamation within construction zones should result in re-establishment of vegetation and soil stabilization in these areas over a relatively short time period. Grasses and forbs are expected to become established within the first several years following reclamation however shrub re-establishment to pre-disturbance levels would not be achieved for up to 20 to 30 years (depending on the species), delaying the return of suitable habit for some species. In this case, the impacts of the project on vegetation and soil stability would occur initially, but the impact on shrub dependent species would be long-term.

Wildlife and Fisheries Resources Impact Analysis Considerations

The environmental constraints map (**Figure 2-1**) represents the known locations of wildlife resource concerns within the Application Area. Although the turbine layouts of the alternatives avoid these areas, it is recognized that the exact location of turbines are not finalized. The analysis of impacts to wildlife assumes the final layout for turbines will adhere to constraints depicted on this map.

The Final EIS for the 2008 Rawlins RMP presents management considerations (Chapter 2.0) for wildlife and fisheries that were considered during the analyses for impacts to wildlife and fisheries resources. BLM's management goals, objectives, and actions for managing general wildlife and fisheries and consumptive uses are listed in **Table 4.14-1** (BLM 2008b). Additionally, the specific management goals, objectives, and actions associated with the Upper Muddy Creek Watershed/Grizzly WHMA also are presented in **Table 4.14-1** (BLM 2008b).

For some wildlife and fish resources additional management considerations were assessed and are presented in **Table 4.14-2**. Additionally, scoping issues specifically addressing wildlife resources also are summarized and included in **Table 4.14-2**.

Table 4.14-1 Relevant Management Considerations for Wildlife and Fisheries

2008 Rawlins RMP and ROD – Wildlife and Fisheries
General Wildlife and Fisheries Management Objectives • Maintain, restore, or enhance wildlife habitat in coordination and consultation with other local, state, and federal agencies and consistent with other agency plans, policies, and agreements. A full range of mitigation options will be considered when developing mitigation for project-level activities for wildlife and Special Status Species habitats. • Maintain, restore, or enhance T&E species habitat, in coordination and consultation with the USFWS and other local, state, and federal agencies and consistent with other agency plans, policies, and agreements. • Maintain, restore, or enhance designated BLM State Sensitive Species habitat in order to prevent listing under the ESA, in coordination and consultation with other local, state, and federal agencies and consistent with other agency plans, policies, and agreements. • Maintain, restore, or enhance habitat function in crucial winter range. Upper Muddy Creek Watershed/ Grizzly WHMA Objectives • Maintain, restore, and enhance crucial winter habitat for elk and mule deer. • Maintain, restore, and enhance habitat for the Colorado River fish species unique to the Muddy Creek watershed. • Implement an MOU with appropriate state or local agency having jurisdiction or ownership of state lands and pursue opportunities for partnership and cooperative management with adjacent property owners.

Table 4.14-1 Relevant Management Considerations for Wildlife and Fisheries

2008 Rawlins RMP and ROD – Wildlife and Fisheries
• Utilize inventory and monitoring data to support habitat management. • Utilize an integrated management approach (e.g., mechanical, chemical, biological, prescribed fire, wildlife, and livestock grazing) to enhance vegetation communities to achieve objectives for the area.
<u>General Wildlife and Fisheries Management Goals</u> • Manage for the biological integrity and habitat function of terrestrial and aquatic ecosystems to sustain and optimize distribution and abundance of all native, desirable non-native, and Special Status fish and wildlife species. • Manage or restore habitat to conserve, recover, and maintain populations of native, desirable non-native, and Special Status Species (e.g., BLM State Sensitive Species, WGFD Species of Greatest Conservation Need, Native Species Status 1 to 2 species, USFWS listed/proposed/ candidate species) consistent with appropriate local, state, and federal management plans and policies. • Manage for quality habitat to support the introduction, reestablishment, augmentation, transplant, stocking, and expansion of identified high-priority fish and wildlife species, in consultation and coordination with appropriate local, state, and federal agencies and adjacent landowners. • Manage wildlife and fish habitat to support recreational and educational benefits and opportunities for the public. <u>Upper Muddy Creek Watershed/Grizzly WHMA Management Goals</u> • Manage habitat for the Colorado River fish species unique to the Muddy Creek watershed. • Manage crucial winter habitat for elk and mule deer. • Seek the cooperation of owners of adjacent property in management of the habitat.
<u>General Wildlife and Fisheries Management Actions</u> • BLM would work cooperatively with other agencies and affected landowners for the introduction, transplant, reestablishment, augmentation, and/or stocking of wildlife and fish species. • Surface disturbing and disruptive activities would be intensively managed in all raptor concentration areas to reduce physical disturbance of raptor habitat and disturbance to the birds. This would entail a case-by-case examination of proposals. • Wildlife habitat objectives would be considered in all reclamation activity. • Manage projects through facility placement and minimization of construction disturbance to maintain connectivity between large contiguous blocks of undisturbed habitat. • Manage wildlife and fisheries habitat to meet the Wyoming Standards for Healthy Rangelands. <u>Upper Muddy Creek Watershed/Grizzly WHMA Management Actions</u> • The Upper Muddy Creek Watershed/Grizzly area will be managed as a WHMA.

Table 4.14-1 Relevant Management Considerations for Wildlife and Fisheries

2008 Rawlins RMP and ROD – Wildlife and Fisheries
• To protect the Colorado River cutthroat trout reintroduction area, 4,520 acres of public lands and 69,770,000 tons of federal coal are unsuitable for further leasing consideration. • Rehabilitation of degraded stream reaches will be carried out in specific problem areas. Livestock grazing use will be managed for the protection or enhancement of resource values for which the WHMA was designated. • The area is closed to new oil and gas leasing. Surface disturbing activities on existing leases will be intensively managed. • Public lands are open to locatable mineral entry. • Lands will be managed in accordance with 43 CFR 3809.11, Plans of operation are required for locatable mineral exploration and development (except casual use), for disturbances of 5 acres or more. • Public lands are closed to mineral material disposals. • Public lands are open to the operation of the public land laws. • Off-road motor vehicle use for “necessary tasks” is allowed. • Motorized vehicle use is limited to designated roads and vehicle routes. Closures of specific roads and vehicle routes, including seasonal closures, will be considered on a case-by-case basis to meet the objectives of the Upper Muddy Creek Watershed/Grizzly WHMA. • OHV use to retrieve big game kills or access camp sites is prohibited off designated roads and vehicle routes. • Surface disturbing activities will avoid identified 100-year floodplains, 500 feet from perennial surface water and/or wetland and riparian areas, and 100 feet from ephemeral channels. Exceptions to this would be granted by the BLM based on an environmental analysis and site-specific engineering and mitigation plans. Only those actions within areas that cannot be avoided and that provide protection for the aquatic resources in the Upper Muddy Creek Watershed/Grizzly WHMA will be approved. • New fence construction will be authorized according to BLM standards. Modification of existing fences to current BLM standards will be actively pursued (Appendix 19). Specific locations will be modified according to wildlife and livestock needs. • In-stream structures that interfere with the movement of native fishes among habitats will be removed, reconstructed, or retrofitted to allow fish passage. Barriers built to facilitate reintroduction efforts will be maintained until they have completed their purpose. • Actively pursue, in cooperation with WGFD, USFS, and private landowners, opportunities to expand reintroduction efforts for Colorado River Cutthroat Trout and other native cold and warm water fishes into adjacent habitats within the Upper Muddy Creek watershed. • Surface disturbing and disruptive activities in aspen communities will be avoided. Aspen stands will be managed to increase distribution and improve seral structure. • The area is designated an Appropriate Management Response fire suppression area. • Water impoundments in the Upper Muddy Creek Watershed/Grizzly WHMA that would result in storage of greater than 1 acre-foot per project in Muddy Creek will not be allowed. • This area has been identified in the Rawlins RMP and ROD as a wind energy avoidance area.

Table 4.14-2 Relevant Management Considerations for Wildlife and Fish Species

Resource Topic	Management Considerations
Big Game	• Lands administered by the Wyoming Game and Fish Commission (e.g., Grizzly Unit) are managed by the WGFD (W.S. §23-1-302. W.S. §23-1-30) to restore, propagate, and protect game animals, protected animals and birds, furbearing animals, game birds, and fish. • Wildlife Habitat Management Plan for Red Rim and Grizzly WHMAs (BLM and WGFD 1994). • Wyoming State Wildlife Action Plan 2010.
	The majority of concerns identified during scoping associated with big game and potential wind turbine impacts include: • Direct habitat loss of mule deer and pronghorn seasonal ranges; • Indirect habitat loss of mule deer and pronghorn seasonal ranges; • Disturbance and barrier impacts to migration routes; and • Increased human disturbance and poaching.
Bats	BLM Wyoming State Sensitive Species List (BLM 2010c) • Wyoming State Wildlife Action Plan 2010 The majority of concerns identified during scoping associated with bats and potential wind turbine impacts include: • Implement mitigation to decrease the level of bat fatalities, particularly hoary bats; • Wind turbines should be sited 1 mile from woodland habitats to reduce impacts to bats; and • Turbines should be set to have a minimum cut-in speed of 6 meters per second to avoid increased mortality risk to bats during low wind speed nights.
Birds	• Migratory Bird Treaty Act (16 USC, § 703 et seq.); • Bald and Golden Eagle Protection Act; • Wyoming Statute (W.S. 23-1-101 and W.S. 23-3-108); and • BLM Wyoming State Sensitive Species List (BLM 2010c). • Wyoming State Wildlife Action Plan 2010 The majority of concerns identified during scoping associated with birds and potential wind turbine impacts include: • Implement mitigation to decrease the level of avian fatalities, particularly passerines. Suggest different color turbines so that birds can see them; and • Turbines should be sited to minimize potential impacts to native passerines, particular BLM Sensitive Species such as the sage sparrow, Brewer's sparrow, and sage thrasher.

Table 4.14-2 Relevant Management Considerations for Wildlife and Fish Species

Resource Topic	Management Considerations
Fisheries	• Wildlife Habitat Management Plan for Red Rim and Grizzly WHMAs (BLM and WGFD 1994). • Wyoming State Wildlife Action Plan 2010 The majority of concerns identified during scoping associated with fish and potential wind turbine impacts include: • Concern about aquatic species and impacts to fisheries from construction sediment runoff into nearby streams and rivers; and • Concern about creating fish barriers at new stream crossings.

The following criteria were considered in the assessment of potential impacts on wildlife associated with the alternatives and are the same as those contained in the Final EIS for the 2008 Rawlins RMP (BLM 2008b, Chapter 4, page 450). Impacts to wildlife or fisheries would be considered significant if any of the following was to occur:

1) Substantial loss of habitat function or disruption of life history requirements of a species or population segment that would make them eligible for listing under the ESA.
2) Decreased viability or increased mortality of threatened and endangered, proposed and candidate species, or reduction or alteration of their critical habitats.
3) Management actions that result in substantial disruption or irreplaceable loss of vital and high value habitats, as defined in the WGFD (2004b) Mitigation Policy.
4) Substantial loss of habitat function or disruption of life history requirements of special status species that would preclude improvement of their status.
5) Actions preclude attainment of conservation goals, as stated in conservation plans and strategies for special status species.

The analysis for wildlife and fisheries resources assumed the BLM would continue to manage fish and wildlife habitats in coordination with the WGFD. The USFWS would have jurisdiction over the management of threatened or endangered fish and wildlife populations. The BLM, in conjunction with WGFD would continue to manage species listed on the BLM Wyoming State Director's Sensitive Species List in accordance with BLM Manual 6840. Further assumptions are that the voluntary measures committed to by the applicant and the BMPs (**Appendix C**, **Tables C-2** and **C-3**) would be implemented under all alternatives. Mitigation measure GEN-1, from the Draft EIS, is now part of the alternatives analysis in the Final EIS as it was included as an ACM by the applicant in the January 2012 revised POD (PCW 2012a).

Descriptions of analysis and additional assumptions were made for specific wildlife and fisheries resources. The resources and associated analysis methods and assumptions are provided below.

Big Game

Analyses of big game impacts were restricted to species with ranges that overlapped with all of the alternative boundaries. Assumptions for the analyses included the following: 1) direct loss of habitat that occurs in seasonal ranges outside of those designated as crucial winter range (CWR) will not adversely

affect big game; 2) indirect habitat loss (i.e., avoidance) of big game seasonal ranges will not extend beyond 0.62 mile of project infrastructure; 3) indirect habitat loss is a function of human activity and therefore is greater in the construction phase compared to operational phase; and 4) the potential for vehicle collisions, poaching, and other wildlife harassment will be directly related to the length of new permanent roads.

Bats

Total bat mortality was estimated using the mean number of bat collision fatalities/MW/year at 21 other modern wind energy facilities in western North America, which is 2.1/MW/year (Johnson and Stephens 2011). Fatality estimates based on mean number of bat fatalities/MW/year from studies of other wind energy facilities in western North America should be considered tentative, as no fatality data exist for the large 3.0-MW turbines proposed for the project. Nevertheless, it was assumed that bat fatality rates for a 3.0-MW turbine would be approximately twice as high as a 1.5-MW turbine, primarily because the rotor-swept area of a 3.0-MW turbine with a 100-m rotor diameter is 7,850 meters^2, or approximately 1.7 times larger than the rotor diameter of a typical 1.5-MW wind turbine with a rotor diameter of 77 m, which is 4,654 meters^2. In addition, the hub height of a typical 3.0-MW turbine is up to 100 m, whereas the hub height of a typical 1.5-MW turbine ranges from 65 to 80 m. Based on an analysis of bat fatality data at wind farms with turbines ranging in size from 0.04 to 1.8 MW, tower heights ranging from 24 to 94 m and rotor diameters ranging from 15 to 80 m, Barclay et al. (2007) concluded that bat fatality rates increased exponentially with the tower height of wind turbines. Even though the mortality estimates for 3.0-MW turbines were made without having any existing fatality data from these turbines, they provide a basis for comparing alternatives with regard to bat fatality impacts. For estimating impacts to bats through loss of habitat, it was assumed that the largest potential impact would be loss of wetland/riparian and woodland habitat impacted by each alternative, as riparian areas and wetlands provide the most likely foraging habitat while woodlands provide roosting habitat in the area. Because bats may forage in several land cover types, including shrublands and grasslands, it was assumed that the total acreage of temporary and permanent impacts associated with each alternative would be correlated with bat impacts.

Additional assumptions for the analysis include:

- Bat collision mortality would be similar at all 3.0-MW turbines used for the project; and
- Impacts to bats will be limited to collision mortality and direct loss of habitat; no displacement or other indirect impacts were assumed.

Birds

To predict raptor fatalities associated with each alternative, it was assumed that the estimate of 0.04 raptor fatalities/MW/year based on preconstruction raptor use and the regression analysis described below is a reasonable estimate of raptor fatality. Estimated raptor fatality rates were based on measured raptor fatality rates at existing wind energy facilities with similar pre-construction raptor use estimates. Because a similar relationship does not exist between preconstruction bird use estimates and all bird mortality, total bird mortality was estimated using the mean number of bird collision fatalities/MW/year at 21 other modern wind energy facilities in western North America, which is 1.8/MW/year (Johnson and Stephens 2011). Fatality estimates based on mean number of bird fatalities/MW/year from studies of other wind energy facilities in western North America should be considered tentative, as no fatality data exist for the large 3.0-MW turbines proposed for the project. These estimates assume raptor and all bird fatality rates for a 3.0-MW turbine would be twice as high as a 1.5-MW turbine, primarily because the rotor-swept area of a 3.0-MW turbine is nearly twice as large as a 1.5-MW turbine. Even though the mortality estimates for 3.0-MW turbines were made without having any existing fatality data from these turbines, they provide a basis for comparing alternatives with regard to bird fatality impacts. Sufficient data do not exist to predict with any accuracy how many raptor or other bird collision/electrocution fatalities could occur at new above-ground power lines. Therefore, to compare

alternatives with regard to this impact, it was assumed that direct mortality would be related to the length of new power lines proposed for each alternative. Power lines include collector lines within each alternative area as well as transmission lines that occur outside the Chokecherry and Sierra Madre areas. For assessing direct habitat loss, it was assumed all vegetation types are used by birds, and estimated the total amount of initial and long-term disturbances to all vegetation types combined. To examine impacts on sagebrush obligate species (loggerhead shrike, sage thrasher, Brewer's sparrow, sage sparrow), the total amount of disturbance to all shrub-steppe habitats containing sagebrush in the Application Area was calculated with examination of turbine densities by alternative.

To assess indirect impacts to nesting raptors, a comparison of the number of active raptor nests based on 2008-2009 survey data, as well as all raptor nests in the BLM database, within 1 mile of project infrastructure was made among the alternatives. For assessing indirect impacts to other breeding birds, we used an assumed maximum distance that displacement may occur of 200 m from turbines based on the available literature. To examine displacement of sagebrush obligate species, calculations were conducted for the amount of all shrub-steppe habitats containing sagebrush present within 200 m of turbines for each alternative. It was assumed that indirect impacts to birds would be related to the length of roads associated with each alternative. Roads occur both within each alternative area as turbine access roads as well as outside the Chokecherry and Sierra Madre areas in the form of a haul road.

Additional assumptions for the analysis include:

- Raptor and all bird collision mortality would be similar at all 3.0-MW turbines used for the project;
- For estimating impacts to birds through loss of habitat, it was assumed that the total acreage of initial and long-term impacts associated with each alternative are correlated with bird impacts;
- For the purpose of assessing direct impact to sagebrush obligate species, initial disturbances were treated the same as long-term disturbances due to the length of time it could take before sagebrush is re-established to pre-disturbance levels on disturbed sites, which could be nearly as long as, or as long as, the life of the project (20 to 30 years); and
- Direct impacts related to vehicle collisions as well as indirect impacts associated with vehicle disturbance are directly related to the length of new permanent roads.

Small Game, Furbearers, Reptiles, and Amphibians

To assess the direct habitat loss for small game, furbearers, reptiles, amphibians, it was assumed that all vegetation types are used by small game, furbearers, reptiles, and amphibians, and estimated the total amount of initial and long-term disturbances to all vegetation types combined. To assess indirect impacts to reptiles and amphibians, a 100 m buffer was applied to both sides of the proposed roads for each alternative to determine total acreage impacted. Potential direct loss from vehicular collision was evaluated based on the length of roads associated with each alternative. The length of road also was used to evaluate the potential impacts from habitat fragmentation.

Additional assumptions for the analysis include:

- For estimating impacts to small game, furbearers, reptiles, and amphibians through loss of habitat, it was assumed that the total acreage of temporary and permanent impacts associated with each alternative are correlated with small game, furbearers, reptiles, and amphibians impacts.
- Ecological indirect impacts on reptiles and amphibians from road construction extend beyond 100 m of a road edge.
- Direct impacts related to vehicle collisions as well as indirect impacts associated with vehicle disturbance were considered to be directly related to the length of new permanent roads.

- Habitat fragmentation was considered to be directly related to the length of new permanent roads.

Fisheries

Potential impacts to fish species were evaluated by: 1) reviewing the amount and general location of water extraction for construction; 2) estimating the total amount of surface disturbance; and 3) number of road-stream crossings in each sub-watershed under all action alternatives. It is anticipated that the project would require approximately 553 to 604 acre-feet of water over the five-year construction period. Currently, the exact location of water extraction has not been determined. The analysis relating to water extraction made the assumption that up to 10 percent (55 to 60 acre-feet) of water may be extracted from the Colorado River and up to 100 percent may be extracted from the North Platte River.

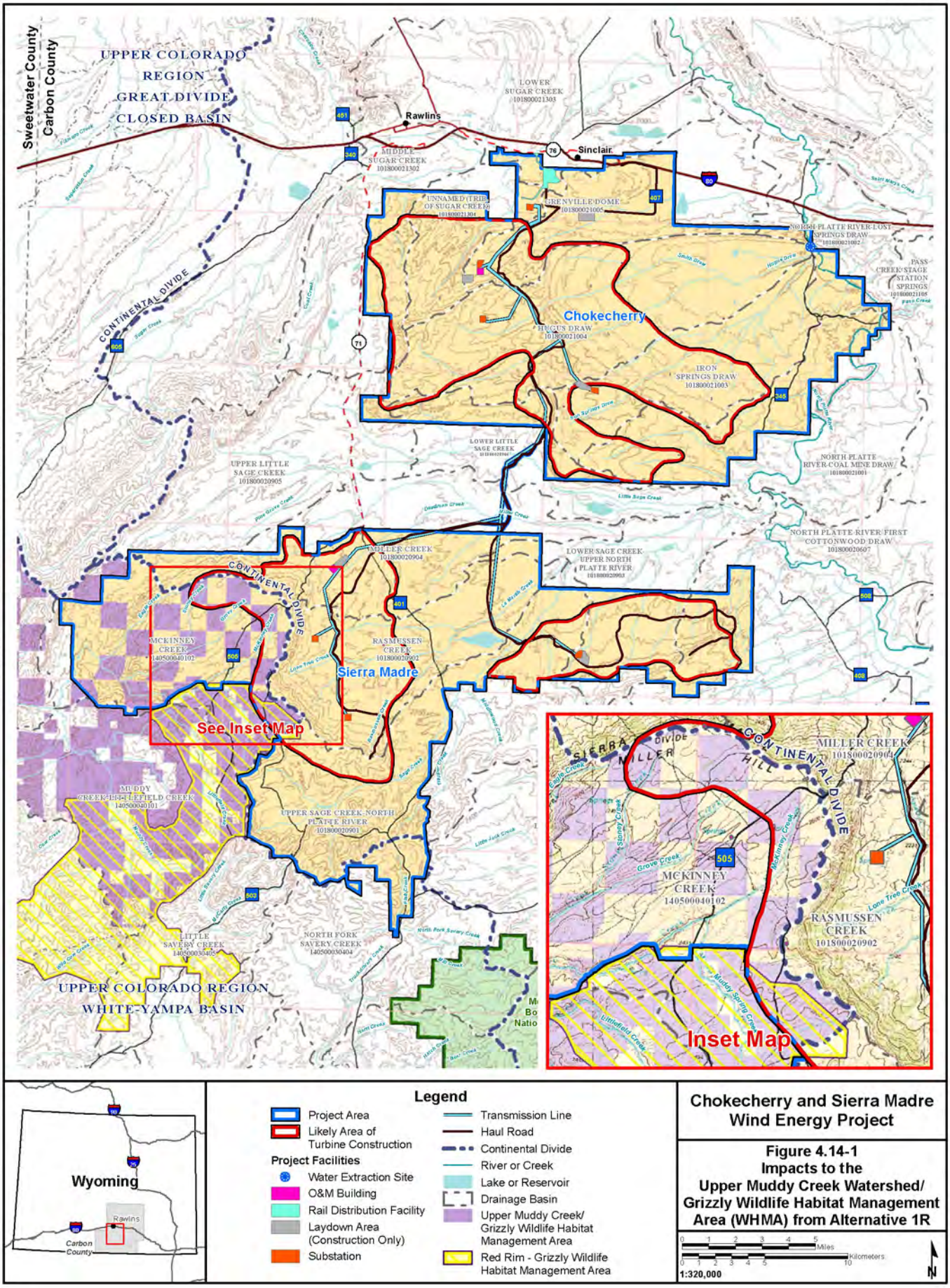
4.14.1 Impacts to Wildlife and Fisheries Resources from the No Action Alternative

Under the No Action Alternative, the proposed project would not be implemented at any scale and the area would exist under current authorizations and land uses (e.g., livestock grazing). Therefore, no impacts to wildlife or fisheries resources associated with development of the project would occur.

4.14.2 Impacts to Wildlife and Fisheries Resources from Alternative 1R

Potential impacts to terrestrial and aquatic wildlife resources under the Alternative 1R include the direct loss of habitat, indirect habitat loss due to behavioral avoidance and alterations of movement patterns, degradation of surface water habitats, and mortalities resulting from construction activities, wildlife-vehicle collisions and human interactions. The severity of these effects on wildlife species depend upon factors such as the sensitivity of the species, seasonal use patterns, type and timing of project activity and physical parameters (e.g., topography, cover, forage, climate). Construction of the proposed project would occur in one area during a given year (referred to as a phased construction sequence) which would perhaps reduce the total area avoided by wildlife due to increased human activity, but ultimately the entire project would be constructed resulting in the impacts identified in the analysis. The magnitude of the potential impacts on most wildlife species would be dependent upon the density and location of infrastructure, which would not be altered by phased construction. It is assumed that impacts associated with decommissioning of Alternative 1R would be similar to those caused during construction and the reclamation procedures would include spreading topsoil, and re-vegetating all disturbed areas. However, the decommissioning phase would have a reduced potential for inadvertent wildlife mortality through vehicle collision based on the predicted traffic levels for decommission presented in Section 4.10.5. Under Alternative 1R, 58 miles of new haul road and concurrent 230-kV transmission line as well as 68 miles of overhead 34.5 kV collection lines would be constructed. The off-site haul road/transmission lines were considered as part of the conceptual layout under Alternative 1R because wildlife and fisheries resources within the alignments do not contain sensitive, unique, or limiting habitats.

The Alternative 1R boundary includes 9,988 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 1,285 acres of the Grizzly area of the Red Rim-Grizzly WHMA. According to the Rawlins RMP, the Upper Muddy Creek Watershed/Grizzly WHMA has been designated as a wind avoidance area. Based on PCW's ACM not to site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), the "likely area for turbine construction" within the Upper Muddy Creek Watershed/Grizzly WHMA includes 3,407 acres and 1,037 acres in the Red Rim-Grizzly WHMA (**Figure 4.14-1**). However, based on the conceptual layout, the potential initial (305 acres) and long-term (50 acres) disturbance within the Upper Muddy Creek Watershed/Grizzly WHMA would equal 0.5 percent and 0.08 percent, respectively, of the entire WHMA. The initial (68 acres) and long-term (11 acres) disturbance within the Red Rim-Grizzly WHMA based on the conceptual layout would be 0.2 percent and 0.13 percent acres, respectively, of the Grizzly area of the WHMA.



Chokecherry and Sierra Madre Wind Energy Project

Figure 4.14-1
Impacts to the Upper Muddy Creek Watershed/ Grizzly Wildlife Habitat Management Area (WHMA) from Alternative 1R

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4.14.2.1 Big Game

Potential impacts from Alternative 1R to big game include: direct habitat loss of seasonal ranges, behavioral avoidance or indirect habitat loss of seasonal ranges, disruption of migration routes, and increased levels of human disturbance that could lead to higher levels of vehicle collisions and poaching. The magnitude of these impacts depends upon the density and location of infrastructure relative to big game seasonal ranges, and the amount of human activity associated with the development. To date, the potential impacts of wind power development on big game are largely unknown. However, many studies have shown that big game species tend to avoid human disturbances such as roads (Cole et al. 1997; Rowland et al. 2000), bicyclists (Taylor and Knight 2003), hikers (Miller et al. 2001), and snowmobiles (Freddy et al. 1986; Seip et al. 2007). Additionally, studies of oil and gas development suggest that big game species avoid areas near infrastructure, creating indirect habitat loss that is considerably larger than the direct habitat loss (Sawyer et al. 2009a, 2006). Across multiple years, mule deer were less likely to use areas within 1.2 to 1.8 miles of well pads in winter ranges of western Wyoming (Sawyer et al. 2009a, 2006). Given the consistent ways in which animals respond to perceived risk (Frid and Dill 2002); it is reasonable to assume that wind power development would create indirect habitat losses for big game. However, because the footprint and level of human disturbance associated with wind power is typically lower than oil and gas development, it was assumed that indirect habitat losses would not occur beyond a distance of 0.62 mile.

Although summer nutrition is key for big game reproduction and survival (Bishop et al. 2009; Cook et al. 2004; Parker et al. 2009), areas designated as CWR or parturition ranges are the only seasonal ranges considered by the WGFD to be limiting factors in maintaining big game populations, however no designated parturition ranges overlap with any of the alternatives. The WGFD describes CWR as a seasonal range that consistently receives high levels of use and is considered to be a limiting factor in maintaining population objective for a herd unit. Further, the WGFD recommends that habitat function of big game CWR be maintained so that the location, essential features, and species supported by the area are unchanged (WGFC 2010). The application of BLM seasonal restrictions to prevent construction activities on public lands within CWR between November 15 and April 30 may reduce the displacement of big game during winter, but does not eliminate it (e.g., Sawyer et al. 2006). Consistent with the 2008 Rawlins RMP, the analysis of direct and indirect habitat loss was restricted to big game CWRs that overlap with the Alternative 1R area.

The vast majority of big game animals that utilize the Alternative 1R area are migratory and sustaining populations at current levels will require that migration routes remain functional. Big game species show strong fidelity to their migration routes across years and seasons (Berger et al. 2006; Sawyer et al. 2009b), but the potential impacts of wind or other energy development on migration routes is unknown. Additionally, very few big game populations have been studied intensively enough to determine where migration routes occur. It was assumed that the potential to impact big game migration is directly related to the number of turbines and length of new roads proposed in each alternative.

Mule Deer

The Alternative 1R boundary area overlaps with two mule deer herd units, including the Platte Valley (#541) and Baggs (#427) units and contains a total of 24,693 acres of CWR, 91,376 acres of winter-year-long range, and 103,836 acres of spring-summer-fall range. Because of the concentrated deer use in CWR, both direct and indirect habitat loss may reduce the overall carrying capacity of the CWR. Direct habitat loss of shrub communities, upon which mule deer rely, would be considered a long-term impact because of the length of time (20-30 years depending on the species) required for re-establishing shrubs to pre-development levels. Similar to oil and gas development (Sawyer et al. 2009a), indirect habitat loss during the operations phase is expected to be considerably lower than the construction phase. The ability of mule deer to acclimate to large-scale wind development is unknown. However, in a 7-year study in western Wyoming, Sawyer et al. (2009a) found no evidence of mule deer acclimating to natural gas development, but noted that avoidance was primarily related to traffic levels and could be reduced by limiting vehicle traffic.

Under the conceptual design associated with Alternative 1R, mule deer would experience the second highest level of direct (232 acres) habitat loss and the lowest level of indirect habitat loss (20,158 acres) to CWR compared with the other action alternatives. As described above, CWR is considered to be the limiting factor for maintaining big game populations and management objectives, thus the potential CWR losses associated with Alternative 1R for mule deer may reduce the carrying capacity of CWR. In accordance with the BLM's environmental constraints (refer to **Appendix C**, **Table C-1**), surface disturbing and disruptive activities will not be allowed on public lands during the period of November 15 to April 30 in CWR. Additionally, disruptive activities will require the use of BMPs designed to reduce the amount of human presence and activity during the winter months. Because vehicle travel will be permitted on BLM roads during the winter to provide access to the wind energy facility on private lands, the environmental constraints and BMPs may not be sufficient to reduce impacts to wintering mule deer.

Mule deer are known to migrate throughout the Alternative 1R boundary area. With the exception of the southwest portion of the area (i.e., Miller Hill), the specific locations of migration routes are largely unknown. Migration routes of mule deer that winter in the Atlantic Rim Project area (BLM 2006) were recently documented (Sawyer et al. 2009b). Most of these deer migrate 20 to 40 miles northeast to their respective summer ranges. A portion of these deer migrate to and from Miller Hill. These deer migrate along the northwest edge of Miller Hill or through the two drainages (Grove Creek and McKinney Creek) and access the north and northeast slopes of Miller Hill. Mule deer can easily traverse dirt roads and maneuver around isolated development features, however the development threshold at which mule deer will no longer move through an area is unknown. Depending on the level of development on Miller Hill, it is possible that multiple turbine strings may have a barrier effect on mule deer migration routes.

New road construction increases the potential for inadvertent mortality through vehicle collision, poaching and general disturbance resulting from increased human activity. However, the ACM/BMP for Air-Dust Control (**Appendix C**, **Table C-3**) that requires speed limits to be posted on all access roads also would reduce the potential for vehicle-wildlife collisions. This alternative includes the construction of approximately 438 miles of new roads within seasonal ranges for mule deer, which is the lowest amount among the action alternatives. Alternative 1R would have the lowest potential for inadvertent mortalities, poaching and general disturbance from human activities among the action alternatives.

The portion of the Upper Muddy Creek Watershed/Grizzly WHMA within the Alternative 1R boundary does not contain any CWR for mule deer, therefore the use of this area would not conflict with the management objective to maintain, restore and enhance mule deer CWR. Mule deer have been identified as a priority wildlife species of the Red Rim-Grizzly WHMA and are known to concentrate outside of the Alternative 1R boundary in the southwestern portion of the Red Rim-Grizzly WHMA during the winter months (BLM and WGFD 1994). It is not likely that the inclusion of the identified portion of the WHMAs would result in any indirect impacts to the mule deer beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of either WHMA in regards to mule deer.

The direct loss of CWR, combined with expansive areas of potential indirect impacts during construction and operation of the facility, would likely result in habitat loss and disturbance levels exceeding significance criteria 3.

Elk

The Alternative 1R boundary area overlaps with two elk herd units, including the Snowy Range (#533) and Sierra Madre (#425) units. Overall, 74 percent of the Alternative 1R boundary area is not classified as elk range. Of the 26 percent that is considered elk range, there is 129 acres of CWR, 1,060 acres of winter range, 33,462 acres of winter-year long range, and 20,863 acres of spring-summer-fall range. Direct or indirect loss of CWR habitat is unlikely to occur with the conceptual design for Alternative 1R; however elk may be displaced from portions of their yearlong or spring-summer-fall ranges. In

accordance with the BLM's environmental constraints (**Appendix C**, **Table C-1**), surface disturbing and disruptive activities will not be allowed on public lands during the period of November 15 to April 30 in CWR. Additionally, disruptive activities will require the use of BMPs designed to reduce the amount of human presence and activity during the winter months.

Elk avoidance of roads is well-documented (Cole et al. 1997; Rowland et al. 2000) and tends to be exacerbated in areas without forest cover (Sawyer et al. 2007). New road construction increases the potential for wildlife-vehicle collisions, poaching, habitat fragmentation and general disturbance resulting from increased human activity. However, as mentioned above, the ACM/BMP for Air-Dust Control (**Appendix C**, **Table C-3**) that requires speed limits to be posted on all access roads also would reduce the potential for vehicle-wildlife collisions. Under Alternative 1R approximately 58 miles of new road would be constructed within elk seasonal ranges. Alternative 1R would have the highest potential for wildlife-vehicle collisions, poaching and general disturbance from human activities among the action alternatives.

Elk are known to migrate throughout the Alternative 1R boundary area, but their migration routes are largely unknown. However, probable migration routes have been depicted in **Figure 3.14-2**. Placement of infrastructure under Alternative 1R would overlap with the eastern portion of the probable migration routes, thus, there is potential that Alternative 1R would interfere with elk movement between ranges. Based on the amount of infrastructure proposed in elk seasonal ranges among the action alternatives, Alternative 1R has the highest potential for disrupting migration paths.

The portion of the Upper Muddy Creek Watershed/Grizzly WHMA included in the Alternative 1R boundary does not contain any CWR for elk. Therefore the use of this area would not conflict with the management objective to maintain, restore and enhance elk CWR. Similarly, elk have been identified as a priority wildlife species of the Red Rim-Grizzly WHMA and are known to occur within the WHMA year-round with CWR located outside of the Alternative 1R boundary in the southwestern portion of the WHMA (BLM and WGFD 1994). It is not likely that the inclusion of this area would result in any indirect impacts to elk beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of either WHMA in regards to elk.

Pronghorn

The Alternative 1R boundary area overlaps with four pronghorn herd units, including Iron Springs (Unit #630), South Ferris (#637), Baggs Herd Unit (#438) and Elk Mountain (#528) units. The Alternative 1R boundary contains 265 acres of CWR, 923 acres of spring-summer-fall range and 110,555 acres of winter-yearlong range. Reduction in the size or quality of the winter range may decrease the overall carrying capacity of the range. There are no published studies that document how pronghorn respond to wind or other energy development, but preliminary results from an ongoing study in western Wyoming suggest that pronghorn distribution may be less affected by development than mule deer (Beckman et al. 2008). The conceptual design for Alternative 1R would result in no direct habitat loss to pronghorn CWR and a low level of indirect habitat loss (379 acres) to pronghorn CWR. In accordance with the BLM's environmental constraints (refer to **Appendix C**, **Table C-1**), disruptive activities on public lands will require the use of BMPs designed to reduce the amount of human presence and activity during the winter months.

Pronghorn tend to increase vigilance and reduce their feeding time in areas with heavy traffic (>200 vehicles/week) (Berger et al. 1983). Gavin and Komers (2006) found that pronghorn response (i.e., vigilance and reduced feeding) to roads increased with traffic levels. New road construction increases the potential for wildlife-vehicle collisions, poaching and general disturbance resulting from increased human activity. However, as mentioned above, the ACM/BMP for Air-Dust Control (**Appendix C**, **Table C-3**) that requires speed limits to be posted on all access roads also would reduce the potential for vehicle-wildlife collisions. This alternative includes the construction of 438 miles of new roads within seasonal ranges for pronghorn, which is the lowest amount among the action alternatives.

Alternative 1R would have the lowest potential for wildlife-vehicle collisions, poaching and general disturbance from human activities among the action alternatives.

Pronghorn are known to migrate throughout the Alternative 1R boundary area, but their migration routes are largely unknown. However, probable migration routes have been depicted in **Figure 3.14-3**. Fences that do not allow pronghorn to move underneath create movement barriers and can block migration routes. Accordingly, if fence construction is required, potential impacts to pronghorn migration may be reduced by constructing wildlife-friendly fences which allow pronghorns to move underneath. Alternative 1R proposed facility layout intersects both migration routes known to occur within the Chokecherry Area, however development around the known migration route to the east would be sparse. Based on the amount of infrastructure proposed in pronghorn seasonal ranges among the action alternatives, Alternative 1R has the lowest potential for disrupting pronghorn movement or migration.

Management objectives of the Upper Muddy Creek Watershed/Grizzly WHMA do not specifically address pronghorn. Pronghorn have been identified as a priority wildlife species of the Red Rim-Grizzly WHMA and are known to utilize sagebrush dominated and riparian areas of the WHMA during the summer and generally are not found in the WHMA during the winter (BLM and WGFD 1994). It is not likely that the inclusion of this small portion of the Red Rim-Grizzly WHMA would result in any indirect impacts to pronghorn beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of the Red Rim-Grizzly WHMA in regards to pronghorn.

4.14.2.2 Small Game and Furbearers

Potential impacts from Alternative 1R to small game and furbearers are similar to big game and include initial and long-term habitat loss, indirect habitat loss due to behavioral avoidance, and increased levels of human disturbance potentially resulting in wildlife-vehicle collisions and poaching. Similar to big game, the magnitude of these impacts depends upon the density and location of infrastructure and the amount of human activity associated with the development. The potential impacts of wind power development on small game and furbearers are largely unknown and population data for small game and furbearers is generally lacking.

Initial construction activities would result in a temporary loss of habitat, which through reclamation efforts and the lack of permanent structures should recover. Construction of permanent infrastructure, such as substations, roads, and turbines, would result in long-term habitat loss, thus reducing the availability of habitat. The loss of habitat may result in animals utilizing lower quality habitats, which may lead to the reduction in reproduction rates and increased predation. Some direct impacts to individuals may occur during construction due to wildlife vehicle collisions and destruction of burrows, dens, and nests. Indirect impacts including displacement, avoidance, and inter- and intra-species competition for resources are more difficult to quantify. Small game and furbearers are generally widespread species that utilize multiple habitats and have high reproduction rates (BLM 2006), therefore it is anticipated that potential direct mortalities associated with initial construction and indirect impacts would be minor.

The conceptual design for Alternative 1R would result in the initial loss of approximately 7,733 acres and the long-term loss of 1,545 acres of potential habitat. This would result in the loss of a relatively small percentage of the Application Area (3.5 percent and 0.7 percent, respectively) and the lowest among the alternatives.

New road construction increases the potential for inadvertent mortality through vehicle collision, poaching and general disturbance resulting from increased human activity (Trombulak and Frissell 2000). However as stated for big game, the ACM/BMP for Air-Dust Control (**Appendix C**, **Table C-3**) that requires speed limits to be posted on all access roads also would reduce the potential for vehicle-wildlife collisions. Alternative 1R includes the construction of 438 miles of new roads, which is the lowest amount among the action alternatives, thus Alternative 1R would have the lowest potential for

wildlife-vehicle mortalities, poaching and general disturbance from human activities among the action alternatives.

Management objectives of the Upper Muddy Creek Watershed/Grizzly WHMA do not specifically address small game and furbearers, thus the inclusion of the WHMA within Alternative 1R boundary would not result in any indirect impacts beyond what has been described. Small game and furbearers are considered in the Red Rim-Grizzly WHMA management goals by the general statement to ensure that native wildlife and vegetation communities are the primary benefactors of management decisions. Beavers are identified as a priority wildlife species of the Red Rim-Grizzly WHMA although the current beaver population or locations are not documented. It is not likely that the inclusion of this small portion of the Red Rim-Grizzly WHMA would result in any indirect impacts to the small game and furbearers beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of the Red Rim-Grizzly WHMA in regards to small game and furbearer species.

4.14.2.3 Nongame

Bats

Potential impacts from Alternative 1R to bats include direct impacts consisting of fatalities and loss of foraging and roosting habitat, as well as indirect impacts associated with habitat loss and modification The magnitude of these impacts depends upon the number of turbines constructed for each alternative and the amount of bat foraging and roosting habitat lost due to construction of the project.

Direct Impacts

Fatalities resulting from collisions with turbines are expected to be the primary impact on bats from Alternative 1R. Bat fatality estimates at 21 wind energy facilities located throughout western North America have ranged from 0.07/MW/year at a facility in California to 12.4/MW/year over a 3-year period at a facility in Alberta, and averaged 2.1 fatalities/MW/year, based on turbine nameplate capacity, which is slightly higher than mean avian mortality at those same wind energy facilities (Johnson and Stephens 2011). Although most bat fatalities at wind energy facilities have been assumed to be caused by blunt trauma from rotor contact, Baerwald et al. (2008) reported that 90 percent of bat fatalities necropsied at a facility in Alberta showed internal lung hemorrhaging consistent with barotrauma caused by rapid reduction in air pressure near moving turbine blades. Baerwald et al. (2008) hypothesized that direct contact with turbine blades may have accounted for only about half of the fatalities.

Among 2,285 bat fatalities reported from studies conducted in western North America, the hoary bat comprised 55.9 percent, silver-haired bat 33.1 percent, and Brazilian free-tailed bat (*Tadarida brasiliensis*) comprised 6.8 percent of the fatalities. Species each comprising <2 percent of the identified fatalities included little brown bat (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), eastern red bat, western red bat (*Lasiurus blossevillii*), and evening bat (*Nycticeius humeralis*). Approximately 90 percent of bat fatalities occur from mid-July through the end of September, with over 50 percent occurring in August (Johnson 2005). At most sites, mortality during the spring migration and breeding season is much lower.

Bats are long-lived species with relatively low reproductive rates, so their populations are much slower to recover from large mortality events than more fecund species such as most bird species (Kunz et al. 2007a). Because migratory tree bats are primarily solitary tree dwellers that do not hibernate, no field methods are available to estimate their population sizes (Carter et al. 2003) and consequently it is impossible to evaluate turbine mortality from a population perspective. Although bat mortality at most wind energy facilities in western North America is lower than in other portions of the U.S. (Arnett et al. 2008; Johnson 2005), the potential for significant population-level impacts in western North America cannot be determined without estimates of population sizes.

Some studies at wind energy facilities have recorded both bat echo locations per night using acoustic detectors and bat mortality (**Table 4.14-3**). The number of bat passes per night as determined from bat acoustic detectors shows a rough correlation with bat mortality, but may be misleading because effort, timing of sampling, species recorded, and detector settings (equipment and locations) varied among studies (Kunz et al. 2007b). Nevertheless, the best available estimate of mortality levels at a proposed wind energy facility involves evaluation of on-site bat acoustic data in terms of activity levels, seasonal variation, species composition, and topographic features of the proposed wind energy facility.

Table 4.14-3 Wind Energy Facilities in the U.S. with Both Pre-construction Acoustic Sampling Data Using the Anabat Detector and Post-construction Mortality Data for Bats (adapted from Kunz et al. 2007b)

Wind Energy Facility	Activity (#/detector night)	Mortality (bats/MW/year)	Reference
Chokecherry and Sierra Madre, Wyoming	4.3	--	WEST 2008j
Foote Creek Rim, Wyoming	2.2	1.3	Gruver 2002
Buffalo Ridge, Minnesota	2.1	2.2	Johnson et al. 2004
Buffalo Mountain, Tennessee	23.7	20.8	Fiedler 2004
Top of Iowa, Iowa	34.9	10.2	Koford et al. 2005
Mountaineer, West Virginia	38.3	38	Arnett et al. 2005

Bat activity within the Application Area(mean = 4.29 bat passes per detector-night) was somewhat higher than that observed at wind energy facilities located in Minnesota (Johnson et al. 2004, 2003) and at Foote Creek Rim, also located in Carbon County, Wyoming, where bat mortality was low (Gruver 2002). However, bat activity was much lower than activity recorded at facilities in West Virginia (Arnett et al. 2005) and Tennessee (Fiedler 2004), where bat mortality rates were high. Thus, based on the presumed relationship between pre-construction bat activity and post-construction fatalities, bat mortality rates can be expected to be greater than the 1.3 bat fatalities/MW/year reported for Foote Creek Rim (Gruver 2002), but much lower than the 20.8 fatalities/MW/year reported at Buffalo Mountain, Tennessee (Fiedler 2004). Alternative 1R is assumed to be constructed using up to 1,000 3.0-MW wind turbines for analysis purposes.

Alternative 1R would potentially result in 6,300 bat fatalities per year using the average of 2.1 bat fatalities/MW/year at 21 wind energy facilities in western North America. Unlike with birds, where mortality would occur to numerous species throughout the year, bat mortality would likely be spread primarily among two species (hoary and silver-haired bats), and would be concentrated during one season (late summer/early fall). Because bats have slow reproductive rates and little is known about their population sizes, the loss of an estimated 6,300 individuals per year would be considered significant under significance criteria 4. This estimate is based strictly on bat mortality estimates at other wind energy facilities in the western U.S., and many of these facilities did not develop Avian and Bat Protection Plans (ABPPs) or other avoidance, minimization and mitigation measures to reduce bat mortalities during project development.

PCW is in the process of collecting additional data on bat use of the Application Area through acoustic and radar surveys. These data, along with data previously collected in the Application Area, will be used to develop a Bat Protection Plan (BPP) that will include measures to avoid and minimize impacts to bats when designing and operating the facility. The BPP will include measures to mitigate bat mortality, if fatality rates exceed certain thresholds agreed to by the USFWS, BLM, and WGFD. Any project constraints and mitigation measures identified through the development of the BPP will be approved

prior to issuance of any Notice to Proceed for the Chokecherry and Sierra Madre Wind Energy Project and, in turn, stipulations would be incorporated into ROW grants. Therefore, the estimated 6,300 bat fatalities could be substantially reduced with a BPP in place to levels not considered significant under significance criteria 4.The alternative boundary is not located near any large known bat colonies or features that are likely to attract large numbers of bats. Additionally, the alternative boundary does not contain topographic features that may funnel migrating bats, and is lacking large tracts of forest cover, unlike high-mortality wind energy facilities in the eastern U.S. However, the relatively large numbers of bat fatalities recently reported in non-forested environments (croplands, grasslands) in northern Iowa (Jain 2005), Wisconsin (BHE Environmental, Inc. 2010; Gruver et al. 2009), and southwestern Alberta (Baerwald 2006) indicate that an open landscape is no guarantee of low mortality. Based on the relative scarcity of bat foraging and roosting habitat in the alternative boundary (e.g., wetlands and forested areas), the majority of bat fatalities are expected to be individuals migrating through the alternative boundary rather than local, breeding bats.

Of the 10 species of bats likely to occur in the Application Area, 4 are known to have been found as fatalities at wind energy facilities, including big brown bat, hoary bat, little brown bat, and silver-haired bat. With the exception of hoary bat, bat species presence in the Application Area were unable to be determined using the Anabat acoustic detectors. However, calls could be categorized as species emitting high or low-frequency calls. Sixty-three percent of passes were by high-frequency bats, suggesting higher relative abundance of species such as mouse-eared bats (*Myotis* spp.) in the Application Area. These species generally show much lower mortality levels at existing wind energy facilities in the U.S. presumably because they are not long-distance migrants (Arnett et al. 2005; Fiedler 2004; Gruver 2002; Johnson et al. 2004; Koford et al. 2005).

Alternative 1R, however, would potentially result in a loss of some available foraging and roosting habitat. Under the conceptual design for Alternative 1R there would be initial impacts to 103 acres and long-term impacts to 23 acres of riparian areas/wetlands that provide potential habitat for bat foraging and roosting. This alternative also would result in initial impacts to 99 acres of woodlands and steep, rocky areas, which is potential bat roosting habitat. For both riparian areas/wetlands and woodlands combined, this alternative would result in initial impact to 202 acres of bat foraging and roosting habitat.

Bats are considered in management goals by the general statement to ensure that native wildlife and vegetation communities are the primary benefactors of management decisions. Based on the small percentage (2.7 percent; or 1,037 acres) of the total Grizzly area associated with the Red Rim-Grizzly WHMA that would potentially be impacted by construction, it is not likely that the inclusion of this area would result in indirect impacts to bats beyond what has been described above. Nor would the inclusion jeopardize stated management objectives of the Red Rim-Grizzly WHMA in regards to non-game species.

Sensitive Bat Species

Three species of bats potentially occurring in the area are considered sensitive species by the BLM RFO, including long-eared myotis, fringed myotis, and Townsend's big-eared bat. None of these three species are included among the 2,285 bat fatalities reported from 21 wind energy facilities in western North America (Johnson and Stephens 2011). The vast majority of bat fatalities at wind energy facilities are migratory tree bats, which include hoary and silver-haired bats in the western U.S. These two species comprised approximately 90 percent of bat fatalities in western North America, and bats in the genus *Myotis* represent only 1.7 percent of the 2,285 identified fatalities, all of which were little brown bats. At most wind facilities evaluated in the U.S., bat collision mortality during the breeding season was virtually non-existent, despite the fact that relatively large populations of resident bats of several species were documented breeding in close proximity to the wind energy facility (Arnett et al. 2007; Johnson 2005). Based on these studies, it appears that wind projects would pose little risk to non-migratory bat populations potentially occurring in the alternative boundary, including the long-eared myotis, fringed myotis, and Townsend's big-eared bat. In addition, a Biological Assessment prepared to

address the potential for a wind energy facility in West Virginia to impact the federally endangered Virginia big-eared bat, a subspecies of Townsend's big-eared bat, concluded that the collision risk to this species is very low because it is non-migratory and forages well below the space occupied by turbine blades (Johnson and Strickland 2003). These conclusions also are likely applicable to Townsend's big-eared bat.

Alternative 1R would result in minor impacts to the sensitive bat species as they are non-migratory and it is anticipated that they would forage in spaces below the turbine blades.

Indirect Impacts

No information is available to indicate that wind energy facilities displace bats. In fact, there is some information which suggests that bats may at least occasionally be attracted to turbines (Horn et al. 2008). However, construction and operation of wind energy facilities may indirectly impact bats through habitat loss, fragmentation and alteration. In forested situations, clearing trees for turbine placement is thought to increase foraging and commuting habitat for bats, but also may result in loss of roosting habitat (Arnett et al. 2008). In non-forested areas, however, indirect impacts on bats are largely unknown. It is unlikely that noise generated by turbines influences roosting bats, but increased human activity at wind facilities could disturb roosting bats. However, there are no data to support or refute either one of these hypotheses (Arnett et al. 2008). Alteration of bat habitat may result from road construction and maintenance, buildings and structures associated with turbines, as well as power lines associated with wind energy facilities; however, the influences of habitat characteristics on bats at large spatial scales are poorly understood (NAS 2008).

4.14.2.4 Birds

Potential impacts from Alternative 1R to birds include direct impacts consisting of fatalities and loss of habitat, as well as indirect impacts associated with habitat loss and modification and displacement of birds from project facilities. The magnitude of these impacts depends upon the number of turbines and other infrastructure constructed for each alternative and the amount of direct and indirect habitat lost due to construction and operation of the project.

Bird species are considered in the Red Rim-Grizzly WHMA management goals by the general statement to ensure that native wildlife and vegetation communities are the primary benefactors of management decisions. Raptors are identified as a priority wildlife species within the Red Rim-Grizzly WHMA; with most known nests occurring in the southern portion of the WHMA outside of what would be included in the Alternative 1R boundary. Based on the small portion of the Red Rim-Grizzly WHMA that would potentially be impacted by construction, potential indirect impacts to birds within the Red Rim-Grizzly WHMA would be as described in the following analysis.

Direct Impacts

Fatality estimates for bird species are publicly available for 21 modern wind- energy facilities in western North America (Johnson and Stephens 2011). Bird fatality rates in the western North America have ranged from 0.1 to 4.4/MW/year, and averaged 1.8/MW/year, much lower than the U.S. national average (3.1/MW/year; NWCC 2004). Based on data from these 21 facilities during the period 2000 through 2009, where 1,247 avian fatalities representing 128 species were reported, raptors comprised 19.4 percent of the identified fatalities. Passerines were the most common collision victims, comprising 59.3 percent of the fatalities. Upland game birds were the third most common group found, comprising 9.6 percent of bird fatalities. Doves and pigeons comprised 3.8 percent. Waterbirds were relatively uncommon, representing 4.0 percent of all fatalities. Waterfowl also were infrequently found (1.9 percent of all fatalities). Only three shorebirds (0.2 percent of all fatalities) were found. Other groups, such as nighthawks, woodpeckers, and swifts combined accounted for 1.9 percent of all fatalities. Birds that could not be identified to any avian group comprised 1.9 percent of reported fatalities (Johnson and Stephens 2011).

At 18 modern facilities in western North America where raptor fatality estimates are available, raptor fatalities rates have ranged from 0 to 1.8/MW/year, and averaged 0.2/MW/year (Johnson and Stephens 2011). The two facilities with the highest raptor fatality rates (1.8 and 0.5/MW/year) are in California. Of the 16 facilities located outside California, raptor fatality rates have ranged from 0 to 0.15, and averaged 0.07/MW/year, or approximately seven raptors for each 100 MW of development. These facilities include nine located in Washington and Oregon, three in Alberta, and one each in Montana, Wyoming, Nebraska, and Texas. Although raptor fatality rates are generally low at most modern wind energy facilities, the number of fatalities relative to the number of individuals potentially exposed to collision is still much higher among raptors than among passerines (NAS 2008).

Although presence of bird mortality at turbines is well documented at many wind energy facilities, population level effects have not been detected, but few studies have addressed this issue. Fatalities of passerines from turbine strikes generally are not significant at the population level, although exceptions to this could occur if facilities are sited in areas where migrating birds or rare species are concentrated (Arnett et al. 2007).

The most probable direct impact to birds from wind energy facilities is direct mortality or injury due to collisions with turbines or guy wires of meteorological towers. Collisions may occur with resident birds foraging and flying within the alternative boundary or with migrant birds seasonally moving through the alternative boundary. Project construction could affect birds through loss of habitat, or potential fatalities from construction equipment. Impacts from the decommissioning of the facility are anticipated to be similar to construction in terms of noise, disturbance, and equipment. Potential mortality from construction equipment is expected to be very low. Equipment used in wind energy facility construction generally moves at slow rates or is stationary for long periods (e.g., cranes). The risk of direct mortality to birds from construction is most likely the potential destruction of a nest of ground- and shrub-nesting species during initial site clearing. Direct impacts also may occur if nests are abandoned due to construction or operation of the facility.

Raptors

The annual mean raptor use within the Application Area (0.46 raptors/plot/20-minute survey), as determined though fixed-point bird use surveys, was compared with other wind energy facilities that implemented similar protocols and had data for three or four seasons. Similar studies were conducted at 36 other wind energy facilities. The annual mean raptor use at these wind energy facilities ranged from 0.09 to 2.34 raptors/plot /20-minute survey. Based on the results from these wind energy facilities, a ranking of seasonal raptor mean use was developed as: low (0 to 0.5 raptors/plot/20-minute survey); low to moderate (0.5 to 1.0); moderate (1.0 to 2.0); high (2.0 to 3.0); and very high (>3.0). Under this ranking, mean raptor use (number of raptors divided by the number of 800-m plots and the total number of surveys) in the Application Area is considered to be low, with the Application Area ranking 22nd when compared with the 36 other wind energy facilities.

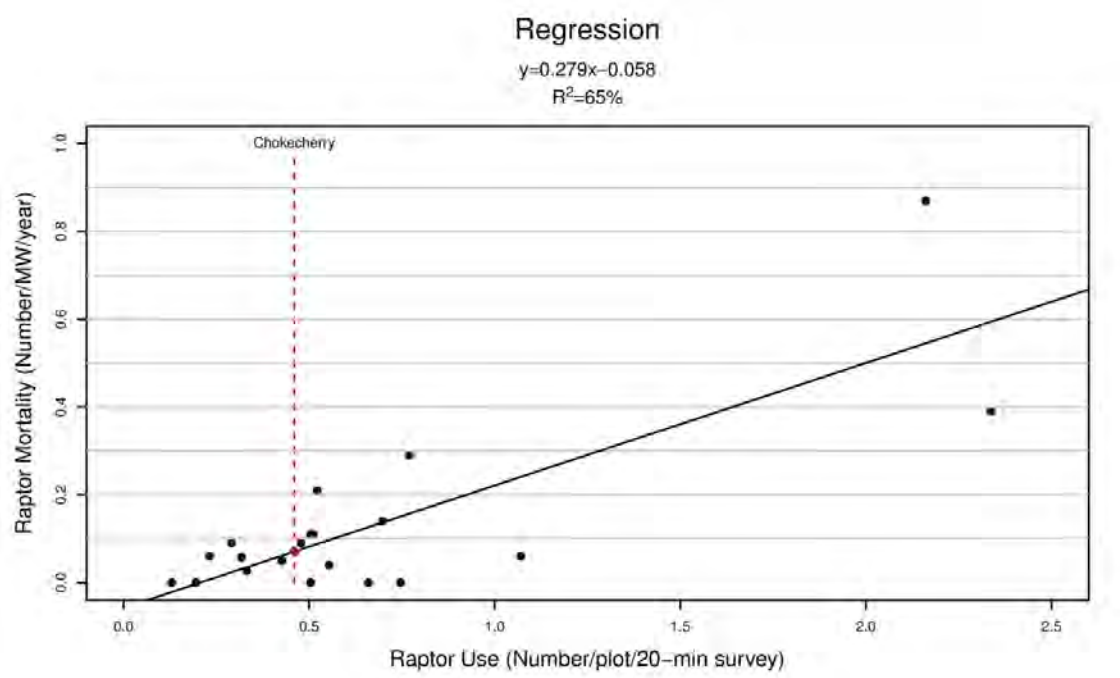
An exposure index analysis may provide insight into what species have a higher likelihood of turbine casualties. The index considers relative probability of exposure based on abundance, proportion of daily activity spent flying, and proportion of flight height of each species within the zone of risk (ZOR) for turbines likely to be used at the wind energy facility. For the Application Area, the raptor species with the highest exposure index was the golden eagle, which was ranked second of all species, at 0.06. The relatively higher exposure index for the golden eagle was due to flight height data showing that 45.0 percent of flying observations were within the ZOR based on initial observations. The exposure index analysis is based on observations of birds during the daylight period and does not take into consideration flight behavior (e.g., during foraging or courtship) or abundance of nocturnal migrants. It also does not take into consideration habitat selection by birds, the ability to detect and avoid turbines, and other factors that may vary among species and influence likelihood for turbine collision. For these reasons, the actual risk for some species may be lower or higher than indicated by this index. Based on species composition of the most common raptor fatalities at other western North America wind energy

facilities and species composition of raptors observed in the Application Area during the surveys, the majority of the fatalities of diurnal raptors will likely consist of red-tailed hawks, American kestrels, and golden eagles. Based on the seasonal use estimates, it is expected that risk to raptors would be unequal across seasons, with the lowest risk in the winter and the highest risk during the fall. However, the winter use estimates were only based on three surveys that were completed prior to the area becoming inaccessible due to snow. Therefore, winter use as based on these three surveys may not be representative of actual use throughout the entire winter, but is the best data available for predicting winter use of the alternative boundary by raptors.

Comparable pre-construction raptor use and post-construction raptor mortality information is publically available for 20 new-generation wind energy facilities. Of these, eight facilities were classified as having relatively low raptor use (less than 0.5 raptors/plot/20-min survey), nine were classified as having low to moderate raptor use (between 0.5 and 1.0), and three were classified as having moderate or high raptor use (greater than 1.0). Using these data in a regression analysis, a positive association (R^2 = 65.0%) appears to exist between pre-construction raptor use and post-construction raptor mortality (**Figure 4.14-2**). As such, this regression model examines the relationship between overall raptor use and mortality and provides a means to quantify potential raptor mortality at a proposed wind energy facility; however, the regression analysis is heavily influenced by data from two wind energy facilities that had both high raptor use and high raptor mortality. Due to the relatively low sample size and other biological factors that can influence raptor fatality rates, it is not known if the relationship between raptor use and fatality rates is a simple linear relationship. Additionally, mortality estimation for wind resource areas with moderate to high raptor use is subject to greater uncertainty due to a lack of available data; the amount of available data for wind resource areas with moderate or high pre-construction raptor use estimates are limited at this time. Furthermore, variation in species composition is likely to influence overall raptor mortality; however, data are not available at this time to perform species-specific regression analyses.

The available data on raptor mortality at wind energy facilities and the regression equation were used to assess risk to raptors in two ways. One method to assess potential mortality at a project is to examine the mean and range of mortality for wind energy facilities considered to have low, moderate, or high raptor use. The Chokecherry and Sierra Madre Wind Energy Project has relatively low raptor use, and raptor fatality rates for this project may be within the range of other wind energy facilities that also have low raptor use (i.e., mean 0.05 and range of 0 to 0.09 raptors/MW/year). A second approach uses the results of the regression model (**Figure 4.14-2**) to predict the point estimate and range of raptor fatality rates. For the Chokecherry and Sierra Madre Wind Energy Project, the prediction is 0.07 raptor fatalities/MW/year, with a 90% prediction interval of zero to 0.29 raptor fatalities/MW/year based on an adjusted mean diurnal raptor use of 0.46 raptors/20-minute survey. This estimate is the same as the average raptor fatality rate of 0.07 fatalities/MW/year at existing modern wind energy facilities in western North America (Johnson and Stephens 2011). Based on these analyses, assuming raptor mortality from the proposed project is similar to raptor mortality at existing wind energy facilities with similar low raptor use estimates (0.05/MW/year), estimated mean annual mortality would be approximately 150 raptors for a 3,000-MW project, while results of the regression analysis indicate that annual raptor mortality would be approximately 210 raptors for a 3,000-MW project.

Active raptor nest density was 0.07 nests/mile^2 within the Chokecherry area and associated 1-mile buffer surrounding the Application Area and 0.14 nests/mile^2 within the Sierra Madre area and associated 1-mile buffer surrounding the Application Area. This is low to moderate in comparison to 16 other wind facilities evaluated in the western U.S., where active raptor nest density ranged from 0.03 to 0.43 nests/mile^2 and averaged 0.22 nests/mile^2. The low active raptor nest density of the Application Area will minimize the potential impact of the proposed project to nesting raptors. Since few raptor species targeted during nest surveys have been observed as fatalities at newer wind energy facilities, correlations are very low between the number of collision fatalities and raptor nest density within 1 mile of the wind energy facility. Raptors nesting closest to turbines likely have higher probabilities of being



Overall Diurnal Raptor Use: 0.46
90.0% Prediction Interval: (0, 0.29 fatalities/MW/year)

Data from the following sources:

Study and Location	Raptor Use (birds/plot/20-min survey)	Reference	Raptor Mortality (fatalities/MW/yr)	Reference
High Winds, CA	2.34	Kerlinger et al. 2005	0.39	Kerlinger et al. 2006
Diablo Winds, CA	2.16	WEST 2006	0.87	WEST 2008
Elkhorn, OR	1.07	WEST 2005b	0.06	Jeffrey et al. 2009b, Enk et al. 2010
Tuolumne (Windy Point), WA	0.77	Johnson et al. 2006	0.29	Enz and Bay 2010
Combine Hills, OR	0.75	Young et al. 2003c	0	Young et al. 2006
Hopkins Ridge, WA	0.70	Young et al. 2003a	0.14	Young et al. 2007
Vansycle, OR	0.66	WCIA and WEST 1997	0	Erickson et al. 2000
Foote Creek Rim, WY	0.55	Johnson et al. 2000b	0.04	Young et al. 2003b
Leaning Juniper, OR	0.52	Kronner et al. 2005	0.21	Kronner et al. 2007
Bighorn, WA	0.51	Johnson and Erickson 2004	0.11	Kronner et al. 2008
Klondike II, OR	0.50	Johnson 2004	0.11	NWC and WEST 2007
Klondike, OR	0.50	Johnson et al. 2002a	0	Johnson et al. 2003
Stateline, OR/WA (2002)	0.48	Kerlingeret al. 2006	0.09	Erickson et al. 2004
Zintel (Nine Canyon), WA	0.43	Erickson et al. 2002	0.05	Erickson et al. 2003a
Buffalo Ridge, MN	0.33	Johnson et al. 2000a	0.03	Johnsonet al. 2000a, 2002b
Biglow Canyon, WA	0.32	WEST 2005a, 2005c	0.06	Jeffrey et al. 2009a
Wild Horse, WA	0.29	Erickson et al. 2003b	0.09	Erickson et al. 2008
Wessington Springs, SD	0.23	Derby et al. 2008	0.06	Derby et al. 2010a
Grand Ridge, IL	0.20	Derby et al. 2009	0	Derby et al. 2010b
Dry Lake I, AZ	0.13	Thompson et al. 2011	0	Thompsonet al. 2011

Figure 4.14-2 Prediction of Raptor Mortality at the Chokecherry and Sierra Madre Wind Energy Project Based on Raptor Use Estimation from Fixed-point Bird Use Survey Data and a Linear Regression Model Relating Estimated Pre-construction Raptor Use and Post-construction Raptor Mortality from other Comparable Studies

impacted from collision with turbines, but existing data on nests very close to turbines (e.g., within 0.5 mile) are currently inadequate to determine the level of these impacts. The existing wind energy facility with the highest reported nest density is the Foote Creek Rim wind energy facility in Wyoming, which lies approximately 60 miles east of Rawlins. Most of the nests within 2 miles of the wind energy facility are of red-tailed hawk (Johnson et al. 2000b), but no red-tailed hawk fatalities were documented at this site during post-construction studies (Young et al. 2003a,b).

Using the predicted raptor fatality rate of 0.05 to 0.07 fatalities/MW/year indicates that 150–210 raptor fatalities could occur per year under Alternative 1R. These fatalities would be spread over several species, seasons, and between resident, migrant and wintering birds. The conceptual design for Alternative 1R has 126 miles of new aboveground collection power lines. Alternative 1R has 11 active raptor nests located within 1 mile of turbines based on 2008-2009 surveys. Using the BLM database of all raptor nests documented in the area since 1980, which may be an indicator of the suitability of raptor nesting habitat, 278 raptor nest locations are present within 1 mile of turbines.

The raptor fatality estimate is based on pre-construction raptor use as well as raptor fatality estimates at other wind energy facilities in the western U.S., many of which did not develop specific plans to address raptor fatalities prior to construction. PCW is in the process of collecting additional data on raptor use of the Application Area, including diurnal point count and radar surveys as well as additional raptor nest surveys. Avian survey protocols for the proposed project were developed by PCW and submitted to the USFWS for review in December 2010. The protocols were also submitted to the BLM and WGFD for review and comment. The agencies verbally approved the protocols and PCW began implementing the monitoring program in December 2010. These protocols comply with and exceed the recommendations made by the USFWS, BLM, and WGFD in each agency's recommendations for avian use surveys for wind energy development. The survey protocols were developed to be in compliance with the following guidance: U.S. Fish and Wildlife Service Draft Land-Based Wind Energy Guidelines (2011), USFWS Draft Eagle Conservation Plan Guidance (2011), BLM Rawlins Field Office Wildlife Survey Protocols for Wind Energy Development, and Wildlife Protection Recommendations for Wind Energy Development in Wyoming (WGFD 2010).

Data from these extensive studies along with data previously collected in the Application Area will be used to develop an Avian Protection Plan (APP) that will include measures to avoid high use areas as well as minimize impacts to raptors when designing and operating the facility, including turbines, met towers, and overhead power lines. Since issuance of the NOI, the BLM has coordinated closely with the USFWS through their cooperating agency process and the renewable energy pilot program in the Rawlins Field Office. The APP will be developed in consultation with the BLM, USFWS, and WGFD, and will require approval from those agencies before it is finalized. Any project constraints and mitigation measures identified through the development of the APP will be approved prior to issuance of any Notice to Proceed for the project and, in turn, associated stipulations would be incorporated into the ROW grants. The measures included in the APP to avoid and minimize raptor fatalities will likely result in observed raptor fatality rates below those predicted above. If raptor fatality rates exceed certain thresholds agreed to by the USFWS, BLM and WGFD, additional avoidance, minimization and mitigation measures would be developed in consultation with the USFWS, BLM, and WGFD to reduce impacts to raptors.

Eagles

Baseline avian studies conducted for the project indicate extremely low use of the Application Area by bald eagles; as such no significant impacts to this species are anticipated. Golden eagles had the highest use of the Application Area of any raptor species, comprising 30.4 percent of all raptor use. Mean use of the Application Area by golden eagles (0.14/plot/20-minute survey) was moderate compared to 24 other wind resource areas evaluated in the western U.S., where golden eagle use has ranged from 0 to 0.49/plot/20-minute survey, and averaged 0.11/plot/20-minute survey (**Table 4.14-4**). Assuming that species composition of raptor mortalities would be related to species abundance during

the baseline surveys, and given that the total estimated number of raptor fatalities for Alternative 1R is 150–210, then approximately 46–64 golden eagle fatalities could occur on an annual basis.

Table 4.14-4 Golden Eagle Use Estimates Standardized to Number of Golden Eagles Observed/800-m Plot/20-Minute Period

Project Name and State	Average[1] Overall Use[†]	Reference
Glenrock, Wyoming	0.49	Johnson et al. 2008a
Dunlap, Wyoming	0.28	Johnson et al. 2009a
Foote Creek Rim, Wyoming[2]	0.27	Johnson et al. 2000b
Elkhorn Valley, Oregon	0.26	WEST 2005a
Seven Mile Hill, Wyoming	0.26	Johnson et al. 2008b
High Winds, California[3]	0.20	Kerlinger et al. 2005
Diablo Winds, California[3]	0.20	WEST 2006
Chokecherry/Sierra Madre, Wyoming	0.14	WEST 2009b
Morton Pass Reference, Wyoming[2]	0.12	Johnson et al. 2000b
Antelope Ridge, Oregon	0.11	Enk et al. 2010
Simpson Ridge, Wyoming[2]	0.10	Johnson et al. 2000b
Wild Horse, Washington[3]	0.06	Erickson et al. 2003a
High Plains, Wyoming	0.05	Johnson et al. 2009c
Leaning Juniper, Oregon	0.04	NWC and WEST 2005
Swauk Ridge, Washington	0.03	Erickson et al. 2003b
Windy Point, Washington	0.02	Johnson et al. 2006
Maiden, Washington[3]	0.02	Young et al. 2002
Windy Flats, Washington	0.02	Johnson et al. 2007
Hopkins Ridge, Washington[3]	0.02	Young et al. 2003a
Golden Hills, Washington[1,3]	0.02	Jeffrey et al. 2008
White Creek, Washington	0.01	Johnson et al. 2003
Sunshine, Arizona[3]	0.01	WEST and CPRS 2006
Klondike, Oregon[3]	0.01	Johnson et al. 2002
Biglow, Oregon	0	WEST 2005b
Mean	0.11	

[1] Non-weighted averages of seasonal use estimates.

[2] Adjusted from 40-minute surveys.

[3] Adjusted from 30-minute surveys.

[†] Average overall use adjusted to the number of golden eagles/20-minute survey.

The eagle fatality estimate is based on pre-construction raptor use of the Application Area, species composition of raptors observed during surveys, and raptor fatality estimates at other wind energy facilities in the western U.S., many of which did not develop plans to address eagle fatalities while designing and operating the project. PCW is in the process of collecting additional data on eagle use of the Application Area, including diurnal point count and radar surveys as well as additional nest surveys. Data from these studies, along with data previously collected in the Application Area, will be used to identify locations of breeding territories, communal roosts, and important foraging areas, and to develop an Eagle Conservation Plan (ECP) that will include measures to avoid, minimize and mitigate impacts to eagles when designing and operating the facility. The ECP will likely be a large component of the APP. Similar to the BPP and APP, the ECP will be developed in consultation with the BLM, USFWS, and WGFD, and will require approval from those agencies before it is finalized. BLM IM 2010-156 states that the BLM authorized officer may issue a Record of Decision or Decision Record approving the project; however, the BLM authorized officer will not issue a Notice to Proceed until the USFWS letter of concurrence for the APP (ECP) is received for the project.

Any project constraints and mitigation measures identified through the development of the ECP will be approved prior to issuance of any Notice to Proceed for the project and, in turn, associated stipulations would be incorporated into the ROW grants. The measures included in the ECP to avoid and minimize eagle fatalities will likely result in observed eagle fatality rates below those predicted above. If eagle fatality rates exceed certain thresholds agreed to by the USFWS, BLM and WGFD, adaptive management, including development of additional avoidance, minimization and mitigation measures would be initiated in consultation with the USFWS, BLM, and WGFD to reduce impacts to eagles.

Migratory Birds

Most bird species in the U.S. are protected by the MBTA. Passerines (primarily small perching and songbirds) have been the most common bird fatality at wind energy facilities outside California (Erickson et al. 2002a,b, 2001; Johnson and Stephens 2011), often comprising more than 80 percent of the bird fatalities. Both migrant and resident passerine fatalities have been observed. Given that passerines made up a large proportion of the birds observed during the baseline study, passerines would be expected to make up the largest proportion of fatalities in the Alternative boundary. Exposure indices indicate that the horned lark is the passerine most likely to be exposed to collision from wind turbines in the area. Most non-raptors had relatively low exposure indices due to the majority of individuals flying below the likely ZOR. Unlike with raptors, there appears to be little correlation between avian use for passerines and turbine caused mortality, perhaps because many of the passerine fatalities at wind turbine are nocturnal migrants that diurnal surveys do not account for. However, assuming that mortality of non-raptors would be within the range of that at other wind energy facilities in western North America (averaging 1.8/MW/year), approximately 5,400 fatalities could occur on an annual basis with 3,000 MW of wind energy production associated with Alternative 1R. These fatalities are spread across numerous species and bird groups, as well as across seasons. Therefore, the overall impact to any given species or population of a species is substantially less. Therefore, it is unlikely that migratory bird populations (e.g., passerines, waterfowl, waterbirds, doves) will be significantly impacted by direct mortality from operation of the wind energy facility.

The migratory bird fatality estimate is based on avian mortality estimates at other wind energy facilities in the western U.S., many of which did not develop specific plans to address avian fatalities prior to construction. PCW is in the process of collecting additional data on avian use of the Application Area, including diurnal point count surveys as well as diurnal and nocturnal radar surveys. Data from these studies will be used to develop an APP that will include measures to avoid and minimize impacts to migratory birds when designing and operating the facility. The APP will be developed in consultation with the BLM, USFWS, and WGFD, and will require approval from those agencies before it is finalized. The measures included in the APP to avoid and minimize migratory bird fatalities will likely result in observed migratory bird fatality rates below those predicted above. If migratory bird fatality rates exceed certain thresholds agreed to by the USFWS, BLM and WGFD, additional avoidance, minimization and mitigation

measures would be developed in consultation with the USFWS, BLM, and WGFD to reduce impacts to migratory birds.

Sensitive and Sagebrush Obligate Species

No federally-listed threatened or endangered species were observed in the Application Area point bird use surveys or incidentally. Thirty-five groups totaling 151 greater sage-grouse were observed. Impacts to greater sage-grouse are discussed in Section 4.15. Other BLM sensitive species documented in the Application Area during surveys included ferruginous hawk, burrowing owl, loggerhead shrike, sage thrasher, Brewer's sparrow, and sage sparrow. The most frequently observed sensitive bird species were Brewer's sparrow (80 individuals), sage thrasher (65), and sage sparrow (59); these also were among the most common passerine species recorded in the Application Area. In addition, four loggerhead shrikes were observed during point count surveys. Brewer's sparrows, sage thrashers, sage sparrows and loggerhead shrikes are all considered sagebrush obligate species. However, none of these species were observed flying within the ZOR. Therefore, significant risk of collision mortality is not expected for these species. Only five ferruginous hawks were recorded during avian point count surveys, with another eight individuals recorded incidentally. One burrowing owl was recorded incidentally (i.e., not as a part of avian use surveys). Use of the Application Area by these two species was relatively low and significant impacts are not anticipated, although some individual fatalities may occur over the life of the project.

Indirect Impacts

In addition to direct impacts through collision mortality, wind energy development results in the direct loss of habitat where infrastructure is placed and indirect loss of habitat through behavioral avoidance and habitat fragmentation for some species. Direct loss of habitat associated with wind energy development is relatively minor compared to most other forms of energy development. Although wind energy facilities can cover substantial areas, the permanent footprint of facilities such as the turbines, access roads, maintenance buildings, substations and overhead transmission lines, generally occupies only 5 to 10 percent of the entire development area (BLM 2005b). The POD for the project estimates that temporary impacts will average 1.62 acres per turbine, while long-term impacts will average 0.18 acre per turbine (PCW 2012a). Under Alternative 1R with the conceptual design initial disturbance would be 3.2 percent of the alternative area, with long-term disturbance of 0.7 percent. Behavioral avoidance, however, may reduce habitat suitability over much larger areas for some species of wildlife, depending on how far a species is displaced from wind energy facilities. Based on some studies in Europe, displacement impacts may have a greater impact on birds than collision mortality (Gill et al. 1996). The greatest concern with displacement impacts has been where facilities were constructed in native habitats such as grasslands or shrublands (Leddy et al. 1999; Mabey and Paul 2007).

Raptors

Most studies on raptors at existing wind energy facilities indicate displacement impacts to be negligible. A before-after/control impact study of avian use at the Buffalo Ridge wind energy facility in Minnesota found evidence that northern harriers (*Circus cyaneus*) avoid turbines on small scale (328 feet [<100 m] from turbines) and large scales (range of 345 to 17,598 feet [105 to 5,364 m]) in the year following construction (Johnson et al. 2000a). Two years following construction, however, no large-scale displacement was detected. The only published report of avoidance of wind turbines by nesting raptors occurred at the Buffalo Ridge facility, where raptor nest density on 101 mile^2 (261.6 square kilometers [km^2]) of land surrounding the facility was 5.94 nests/39 mile^2 (5.94 nests/101.0 km^2) yet no nests were present in the 12 mile^2 (31.1 km^2) facility itself, even though habitat was similar (Usgaard et al. 1997). At a facility in eastern Washington, raptors still nested in the study area at approximately the same levels after construction, and several nests were located within a 0.5 mile of turbines (Erickson et al. 2004). Similar numbers of raptor nests before and after construction of Phase 1 of the Montezuma Hills facility in California, and anecdotal evidence indicates that raptor use of the Altamont Pass Wind Resource Area in California may have increased since installation of wind turbines (Orloff and Flannery 1992). At the

Foote Creek Rim wind energy facility in southern Wyoming, one pair of red-tailed hawks nested within 0.3 mile of the nearest turbine, and seven red-tailed hawk nests, one great horned owl (*Bubo virginianus*) nest, and one golden eagle nest located within 1 mile of the facility successfully fledged young (Johnson et al. 2000b; WEST, unpublished data). The golden eagle pair successfully nested 0.5 mile from the facility for three different years after the project became operational.

Migratory Birds

Studies in the western U.S. concerning displacement of non-raptor species have concentrated on grassland passerines and waterfowl. Wind energy facility construction appears to cause small-scale local displacement of some grassland passerines and is likely due to the birds avoiding turbine noise and maintenance activities. Construction also reduces habitat effectiveness because of the presence of access roads and large gravel pads surrounding turbines (Johnson et al. 2000a; Leddy 1996). Leddy et al. (1999) surveyed bird densities in Conservation Reserve Program (CRP) grasslands at the Buffalo Ridge wind energy facility in Minnesota, and found mean densities of 10 grassland bird species were four times higher at areas >591 feet from turbines than they were at grasslands nearer turbines. Johnson et al. (2000a) found reduced use of habitat within 328 feet of turbines by 7 of 22 grassland-breeding birds following construction of the Buffalo Ridge facility. At the Stateline wind energy facility in Oregon and Washington, use of areas <164 feet from turbines by grasshopper sparrows (*Ammodramus savannarum*) was reduced by approximately 60 percent, with no reduction in use >164 feet from turbines (Erickson et al. 2004). At the Combine Hills facility in Oregon, use of areas within 492 feet of turbines by western meadowlarks was reduced by 86 percent, compared to a 12.6 percent reduction in use of reference areas over the same time period (Young et al. 2006). Horned larks, however, showed significant increases in use of areas near turbines at both of these facilities, possibly because the cleared turbine pads and access roads provided habitat preferred by this species. Shaffer and Johnson (2008) examined displacement of grassland birds at two wind energy facilities in the northern Great Plains. Intensive transect surveys were conducted on plots with and without turbines. The study focused on five species at two study sites, one in South Dakota and one in North Dakota. Based on this analysis, killdeer (*Charadrius vociferous*), western meadowlark, and chestnut-collared longspur (*Calcarius ornatus*) showed no avoidance of wind turbines. However, grasshopper sparrow and clay-colored sparrow (*Spizella pallida*) showed avoidance out to 656 feet.

At the Buffalo Ridge facility, the abundance of several bird types including shorebirds and waterfowl was significantly lower at survey plots with turbines than at reference plots without turbines, indicating that the area of reduced use was limited primarily to areas within 328 feet of the turbines (Johnson et al. 2000a). These results are similar to those of Osborn et al. (1998), who reported that birds at Buffalo Ridge avoided flying in areas with turbines.

The conceptual design for Alternative 1R would result in initial and long-term impacts to 6,920 acres and 1,510 acres, respectively, of all vegetation types combined. This alternative would result in combined initial and long-term disturbance to 7,314 acres of sagebrush or other shrub-steppe communities containing sagebrush. The Alternative 1R conceptual design also has 438 miles of new road construction. The conceptual design for Alternative 1R has 30,516 acres within 656 feet of all turbines, of which 27,113 acres are sagebrush or shrub-steppe communities with a sagebrush component. These acreages represent 13.8 percent and 12.3 percent of the Alternative 1R boundary area, respectively. A recent study documented significant declines in sage sparrow and Brewer's sparrow populations as gas field densities reached 16 wells per square mile (Gilbert and Chalfoun 2011). It is not known if turbine densities would have similar impacts on sagebrush obligate birds. Turbine density within turbine development areas for Alternative 1R may be up to 5.78 turbines/mile^2.

The estimated number of raptor fatalities, as well as the estimated proportion of the Alternative 1R boundary area with reduced use by passerines would exceed the significance criteria (criteria numbers 3 and 4). However, development of an APP and ECP could reduce these impacts below significance criteria.

4.14.2.5 Reptiles and Amphibians

Potential impacts from wind energy development on Wyoming's reptiles and amphibians are generally unknown (WGFD 2010). However, potential impacts include the direct loss of habitat, indirect habitat loss due to behavioral avoidance and alterations of movement patterns, degradation of surface water habitats, and mortalities resulting from construction activities, wildlife-vehicle collisions and human interactions. The magnitude of these impacts depends upon the density and location of infrastructure and the amount of human activity associated with the development.

Reptiles and amphibians have unique life histories, thus they have varying responses to habitat alterations (Hampton et al. 2010), which make it difficult to assess these species. However, the loss of potential habitat would be applicable to all species and possibly result in reduced reptile and amphibian diversity and abundance in the future (Hampton et al. 2010). The conceptual design for Alternative 1R would result in the initial loss of approximately 7,733 acres and the long-term loss of 1,545 acres of potential habitat for reptiles and amphibians. This would result in the loss of a relatively small percentage of the total Alternative 1R boundary area (3.5 percent and 0.7 percent, respectively) and the lowest among the action alternatives.

Alternative 1R conceptual design includes the construction of 438 miles of new roads, thus increasing potential impacts such as wildlife-vehicle collisions, poaching, disrupting migrations paths, and general disturbance from increased human activity. Based on a literature review conducted by Jochimsen et al. (2004), the adverse ecological impacts of roads and traffic on amphibians and reptiles is estimated to extend outward from the road edge to approximately 328 feet. This literature review documented that altered roadside habitats have been shown to modify amphibian and reptile behavior and movement patterns. Additionally increased mortality and barriers to movement from road construction may influence species demography and gene flow, potentially having an impact on overall population stability and persistence (Jochimsen et al. 2004). The combined indirect ecological impacts of road construction under the conceptual design for Alternative 1R on reptiles and amphibians were calculated to be an estimated 31,620 acres based on 328 feet from either side of the road edge. This calculation assumes that herptiles are uniformly distributed, which is unlikely. However, because population information is lacking for herptiles in the area, this calculation was determined to at least provide some level of estimation. This acreage represents approximately 14 percent of the Alternative 1R boundary area.

Amphibians are highly dependent upon water to complete their lifecycle (aquatic tadpole or larval phase). The loss or degradation of surface water during the larval period could negatively affect amphibian populations (WGFD 2010). Increased erosion and runoff would potentially change the surface water quantity and quality. The analysis conducted for surface water in Section 4.13.2 assumed that the surface disturbance within a given watershed serves as an indicator of the potential for increased sediment and salt runoff. The conceptual design for Alternative 1R would result in the total surface disturbance within sub-watersheds ranging from 0.1 to 4.8 percent during construction and 0.1 to 1.0 percent during operations. Section 4.13 identifies that the implementation of erosion control methods, application of BMPs, and the ACMs, would minimize impacts of land disturbance on surface water quantity and quality. Degradation of amphibian habitats by potential spills of hazardous materials from construction equipment is not anticipated based on the establishment of the project's SPCC Plan. The number of stream crossings from the construction of new roads would directly affect amphibian habitat. The conceptual design for Alternative 1R would result in 343 ephemeral road-stream crossings and five perennial road-stream crossing, which is the least for any action alternative. Direct impacts to wetlands, which would reduce potential amphibian habitat, have been estimated along 14,989 linear feet of wetland and riparian zone drainages under Alternative 1R (Section 4.11). PCW has committed to BMPs that would avoid, minimize, or mitigate wetland impacts (**Appendix C**, **Table C-3**). Furthermore, the 2008 Rawlins RMP requires that surface disturbing activities avoid the following areas: the identified 100-year floodplains, 500 feet from perennial surface water and/or wetland and riparian areas, and 100 feet from ephemeral channels (BLM 2008a). The avoidance of these areas would reduce the potential impacts on reptiles and amphibians. Exceptions would be granted by the BLM based on an

environmental analysis and site-specific engineering and mitigation plans, but would only be granted if the areas cannot be avoided and protection for the aquatic resources would be ensured.

Direct mortality during construction may be expected with common slow-moving reptiles. Construction of turbine pads, roads, or other facilities could kill individuals in underground burrows, rock refuges, or hibernacula. Quantifying impacts is not possible because population data are lacking. However, any impact is likely to be minor, and the high reproductive potential of these species would enable populations to quickly occupy the area following successful reclamation. Amphibians may be more vulnerable to vehicle mortalities because their life histories often involve migration between wetlands and upland habitats, and individuals are inconspicuous and sometimes slow-moving (Trombulak and Frissell 2000).

Potential impacts to reptiles and amphibians during the operational phase of the project would be associated with the presence of the infrastructure, avoidance from increased human activity, and potential inadvertent mortalities. Inadvertent mortalities are likely to be minor and displacement of some of the local population would be likely, however, it is not anticipated to result in a significant impact.

Reptiles and amphibians are considered in the Red Rim-Grizzly WHMA management goals by the general statement to ensure that native wildlife and vegetation communities are the primary benefactors of management decisions. Although the Upper Muddy Creek Watershed/Grizzly WHMA does not specifically address reptiles and amphibians, surface disturbing activities within the WHMA are required to avoid the following areas: the identified 100-year floodplains, 500 feet from perennial surface water and/or wetland and riparian areas, and 100 feet from ephemeral channels (BLM 2008a). The avoidance of these areas would reduce the potential impacts on reptiles and amphibians. Exceptions may be granted by the BLM based on an environmental analysis and site-specific engineering and mitigation plans, but would only be granted if the areas cannot be avoided and protection for the aquatic resources would be ensured. A majority of the Red Rim-Grizzly WHMA within the boundary of Application 1R is within the Upper Muddy Creek Watershed/Grizzly WHMA, therefore this protection for amphibians and reptiles would be beneficial to the objectives of the Red Rim-Grizzly WHMA. It is not likely that the inclusion of the identified portion of the WHMAs would result in any indirect impacts to the reptiles or amphibians beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of either WHMA in regards to reptiles or amphibians.

4.14.2.6 Fisheries

Potential impacts to fish habitat from Alternative 1R include: reduction in surface flow due to water extraction for dust control and construction; degradation of habitat due to increased sedimentation and salt runoff; alteration of hydrologic conditions from new road construction that could lead to sedimentation, erosion, and channel adjustments resulting in a loss of deep pool habitats; and construction of new road-stream crossings which could result in fragmentation of aquatic habitats and limit access to required habitats or block fish migration. The magnitude of these impacts will depend upon the amount and location of water extraction, the density of road construction within watersheds, the number of road-stream crossings, and the design of the road-stream crossings.

The boundary for Alternative 1R includes sub-watersheds that are part of the North Platte Basin, with the exception of McKinney Creek sub-watershed which is part of the White-Yampa Basin of the Colorado River drainage. The sub-watersheds within the Alternative 1R boundary contain important trout fisheries; three creeks considered locally important (Middlewood, Grove, and Stoney), two creeks considered regionally important (Sage and McKinney), and Rawlins Reservoir. These trout fisheries are located within the North Platte River-Coal Mine Draw, Upper Sage Creek-North Platte River, and McKinney Creek sub-watersheds. The Upper Muddy Creek, which extends into McKinney Creek sub-watershed basin, is delineated by the WGFD as a *priority habitat* in accordance with the Strategic Habitat Plan (WGFD 2009b). Additionally, Alternative 1R contains portions of the Upper Muddy Creek Watershed/Grizzly WHMA and Red Rim-Grizzly WHMA. The Upper Muddy Creek Watershed/Grizzly

WHMA is managed to maintain, restore, and enhance habitat for the Colorado River fish species unique to the Muddy Creek watershed (BLM 2008a) and the Red-Rim-Grizzly WHMA is managed to improve stream and riparian habitat for Colorado River cutthroat trout reintroductions (**Figure 4.14-1**). The Conservation Agreement and Strategy for Colorado River Cutthroat Trout, requires reintroductions in suitable habitat within the historic range. Although historic records reference "speckled trout" present a couple miles downstream from the northern most Bridger Pass road crossing, given the current management situation including the three warm water species, the goal is not to restore cutthroat this far downstream. However, with successful management it is very possible that seasonal use this far down could occur. At this time the goal is to restore cutthroat trout to the current existing coldwater areas and also maintain the warm water fisheries downstream.

As explained in Section 4.13.2, 553 acre-feet of water will be required during the 5-year construction phase, with the greatest use (168 acre-feet) occurring during Year 4. It is possible that all of the water might come from the North Platte River watershed; however, PCW estimates that 10 percent (55 acre-feet) of the water required for construction could be extracted from the Colorado River watershed and would occur during years 2 and 3 (PCW 2012). The maximum annual volume of water consumed equates to approximately 0.02 percent of the North Platte River's average annual flow near Sinclair and approximately 0.20 percent of the average annual flow of Muddy Creek near Baggs, Wyoming, or 0.04 percent of Savery Creek's average annual flow near Savery, Wyoming. This level of depletion could have an impact to the local fishery and could potentially alter survival of fish in the system through changes such as water temperature, in-stream habitat, and sediment dynamics. The level of impact would also depend on the water year (i.e. wet, average, dry).This type of impact does not coincide with the management goals for the Upper Muddy Creek Watershed/Grizzly WHMA and Red Rim-Grizzly WHMA for fish and would potentially contribute to the decline of populations. This also may preclude the recovery of BLM sensitive fish species. Depletions from the North Platte River would not be allowed to impact current users or interstate agreements through the water rights processes required by the WSEO. Tentative specific water rights have been identified (PCW 2012) and are evaluated in relation to potential impacts to fisheries in the Biological Assessment for this project (**Appendix L**).

New roads and construction of other facilities have been demonstrated to increase sedimentation that can have a variety of ecological impacts to fish habitat such as a change in channel depth, pool-to-riffle ratio, percent fines in substrates, and cover availability (Angermeier et al. 2004). Sediment can extend miles downstream of the construction site and persist in stream channels for years (Angermeier et al. 2004). The surface water analysis conducted in Section 4.13 assumed that the surface disturbance within a given watershed serves as an indicator of the potential for increased sediment and salt runoff. Given PCW's phased construction sequence approach, the amount of time between ground disturbance and reclamation activities would be reduced. This reduction in time would decrease the amount of time that barren soil is exposed to overland flow events that could potentially cause erosion. Subsequently, the potential impacts from increased erosion and runoff on fish habitat would likely be reduced.

Under Alternative 1R the total surface disturbance within the sub-watersheds ranged from less than 0.1 percent to 4.8 percent during construction and from less than 0.1 percent to 1.0 percent disturbance during operation. The total surface disturbance in the North Platte River-Coal Mine Draw sub-watershed, which contains a statewide important fishery, would be 0.4 percent during construction and 0.1 percent during operations. The total surface disturbance in the Upper Sage Creek-North Platte River sub-watershed, which contains three of the noted fisheries and two reservoirs (Adams and Rawlins), would be 1.2 percent during construction and 0.2 percent during operations. Total surface disturbance in the McKinney Creek sub-watershed, which contains three noted trout fisheries as well as the portions of the Upper Muddy Creek Watershed/Grizzly WHMA and Red Rim-Grizzly WHMA, would be 1.7 percent during construction and 0.3 percent during operations. Additionally, three sub-watersheds basins that contain reservoirs, lakes or impoundments that contain fish populations (see **Table 3.14-6**) occur within the Alternative 1R boundary including North Platte River-First Cottonwood Draw, North Platte River-Lost Springs Draw, and Middle Sugar Creek. Total surface disturbances within these sub-watersheds are

relatively low ranging from less than 0.1 to 0.8 percent during construction and 0.0 to 0.1 percent during operations.

Although these appear to be small percentages the location and proximity to streams is an important consideration. Based on the current conceptual layout for Alternative 1R, project development will generally be concentrated in higher-altitude upland areas away from streams and reservoirs with the exception of road-stream crossings. Section 4.13 concludes that the implementation of erosion control methods, application of BMPs, and the ACMs, would minimize impacts of land disturbance on surface water quantity and quality. The management actions associated with the 2008 Rawlins RMP and the Upper Muddy Creek Watershed/Grizzly WHMA require that floodplains, riparian areas and wetlands be avoided (BLM 2008a). Exceptions to the avoidance would be granted by the BLM based on an environmental analysis and site-specific engineering and mitigation plans, but would only be granted if the areas cannot be avoided and protection for the aquatic resources would be ensured.

Degradation of fisheries habitats by potential spills of hazardous materials from construction equipment is not anticipated based on the implementation of the project's SPCC Plan. The use of magnesium chloride for dust abatement would potentially result in an increase in salinity of slow moving surface water or pond. However, a study conducted by Colorado Department of Transportation and University of Colorado concluded that the application of magnesium chloride as a deicer is highly unlikely to cause or contribute to environmental damage at distances greater than 20 yards from the roadway (American Association of State Highway and Transportation Officials 2009). Furthermore, as described in Section 4.13.2, storm water management including a surface water quality monitoring program would be implemented during active construction until reclamation is achieved.

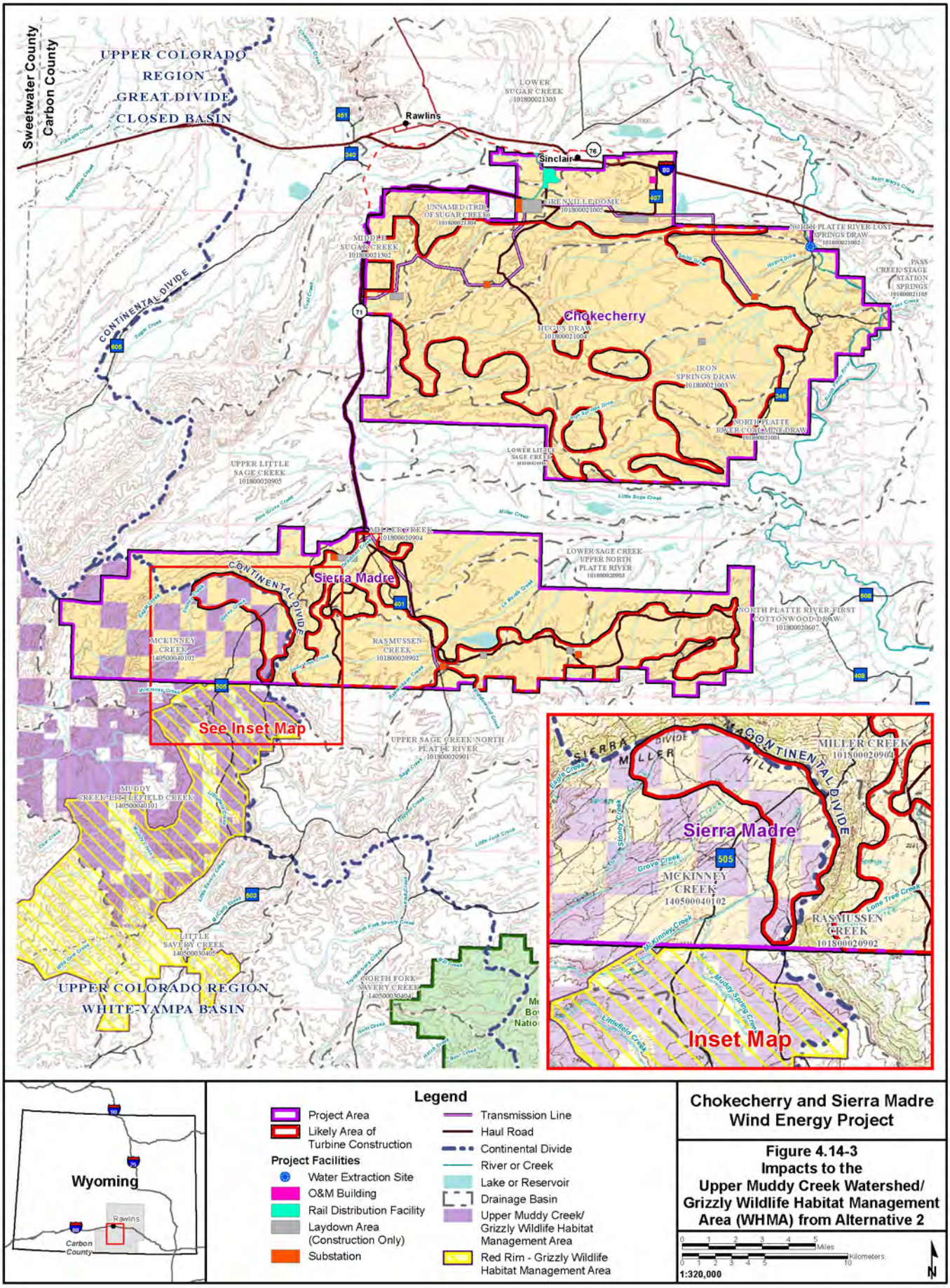
Alternative 1R includes the construction of 438 miles of new roads, thus increasing potential impacts from road construction associated with the interception of shallow groundwater flow paths by roads. Road construction typically results in water frequently diverted along the roadway and routed to surface water drainage networks at drainage crossings. This can, in turn, alter the timing, routing, and magnitude of runoff, triggering geomorphic adjustments altering the current fish habitat. However, such impacts are unlikely because, road designs would not exceed 10 percent grade and would avoid changing existing surface water runoff patterns by following natural contours and utilizing roadside ditches and subsurface culverts (Section 4.13.2). Furthermore, excessive grades would be avoided on roads, road embankments, ditches, and drainages whenever possible (see Section 2.3.3.3 for further information). Road construction would likely increase the probability of human use, which increases the potential for unsanctioned, illegal, and unintentional introductions of exotic fishes and other aquatic organisms.

Stream fishes require habitats for spawning, feeding, rearing, and refuge. The spatial heterogeneity and connectivity of the stream system can necessitate the movement of fishes among these habitats in order to complete their life cycles (Schlosser 1995). Interruption of movement among required habitats by road crossing can have demographic impacts, decreasing population viability (Gibson et al. 2005; Trombulak and Frissel 2000). Alternative 1R would result in 343 ephemeral road-stream crossings and five perennial road-stream crossings under the current conceptual layout. The five perennial road-stream crossings would include Sage Creek two times, Smith Draw two times, and Miller Creek. The current conceptual layout for Alternative 1R does not result in any perennial road-stream crossings within the Upper Muddy Creek Watershed/Grizzly WHMA or the Red Rim-Grizzly WHMA, although two ephemeral stream crossings would occur in the Upper Muddy Creek Watershed/Grizzly WHMA. As discussed in Section 4.13.2, potential impacts resulting from road-stream crossings would be minimized through design modifications and placement of structures. The 2008 Rawlins RMP (BLM 2008a) requires that any road crossing any waterbody that potentially supports fish for a portion of the year will be designed to simulate natural stream process, allowing fish passage and potentially reducing the impacts. Given PCW's phased construction sequence approach, the construction of stream crossings would occur over multiple years, allowing the BLM to determine if the BMPs associated with stream crossings are effective for fish management. This would allow the BLM to modify the construction of later stream crossings as applicable.

Construction of infrastructure and road-stream crossings within the Upper Muddy Creek Watershed/Grizzly WHMA and the Red Rim-Grizzly WHMA would potentially conflict with the stated management objectives. Under Alternative 1R, the initial surface disturbance in the Upper Muddy Creek Watershed/Grizzly WHMA and Red Rim-Grizzly WHMA (305 and 68 acres, respectively) would be a small portion (0.5 and 0.17 percent, respectively) of each WHMA. The long-term surface disturbance would be even less (less than 0.01 and 0.03 percents, respectively). The identified portion of the WHMAs included in the Alternative 1R boundary would be on the periphery of the proposed project, thus potential sedimentation resulting from heavy truck traffic at road-stream crossings would be limited to that which is required for construction and maintenance of turbines within the WHMA; no through traffic would occur. Several habitat improvement projects within the Upper Muddy Creek Watershed/Grizzly WHMA have occurred immediately outside of the western boundary of the McKinney Creek sub-watershed. The goal of these projects was to improve livestock distribution and included the implementation of livestock Best Management Practices such as cross fencing, more than 20 off-stream water developments, improved road and stream crossings, vegetation manipulation and prescribed burning of over 6,000 acres (Ellison et al. 2009). The Muddy Creek Resource Management Group (MCRMG) and the Natural Resource Conservation Service (NRCS) made significant improvements in the stream that led to the reintroduction of the Colorado River cutthroat trout (Section 3.6.4.1). The stream morphology is generally improving fish habitat in the basin with the narrowing of stream channels and floodplain expansion. Perennial vegetation is stabilizing stream banks and preventing bank sloughing. Construction activities within the WHMAs, primarily from road-stream crossings, may result in increased sedimentation downstream in Muddy Creek where these projects are located, which could alter the stream morphology. However, management of the Upper Muddy Creek Watershed/Grizzly WHMA requires that surface disturbing activities avoid the following areas: the identified 100-year floodplains, 500 feet from perennial surface water and/or wetland and riparian areas, and 100 feet from ephemeral channels (BLM 2008a). The avoidance of these areas would reduce the potential for increased sedimentation downstream. Exceptions to the avoidance would be granted by the BLM based on an environmental analysis and site-specific engineering and mitigation plans, but would only be granted if the areas cannot be avoided and protection for the aquatic resources would be ensured. However, the magnitude of these impacts cannot be determined without the final layout. Should the final layout result in the placement of infrastructure within the Upper Muddy Creek Watershed/Grizzly WHMA or the Red Rim-Grizzly WHMA a review of the potential impacts to fish in the WHMA would be required to determine if they exceed those discussed above.

4.14.3 Impacts to Wildlife and Fisheries Resources from Alternative 2, Checkerboard Only

Although the potential impacts to wildlife and fisheries from Alternative 2 would be similar to those discussed under Alternative 1R, the amount and location of surface disturbance differs. Alternative 2 would have 143 miles of overhead 230-kV and 34.5 kV collection lines, which is 17 additional miles compared to Alternative 1R.The location of infrastructure under Alternative 2 would be compressed into the northern portion of the Sierra Madre area and expanded to the east within the Chokecherry area. The Alternative 2 boundary includes 7,440 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 12 acres of the Red Rim-Grizzly WHMA. According to the Rawlins RMP, the Upper Muddy Creek Watershed/Grizzly WHMA has been designated as a wind avoidance area. Based on PCW's ACM not to site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), the "likely area for turbine construction" within the Upper Muddy Creek Watershed/Grizzly WHMA includes 1,939 acres and none within in the Red Rim-Grizzly WHMA (**Figure 4.14-3**). However, based on the conceptual layout, the potential initial (166 acres) and long-term (26 acres) disturbance within the Upper Muddy Creek Watershed/Grizzly WHMA would equal 0.3 percent and 0.04 percent, respectively, of the WHMA. There would be no disturbance within the Red Rim-Grizzly WHMA under Alternative 2. Potential impacts from the increase in surface disturbance, location of the haul road/transmission lines, and the shift in location unique to Alternative 2 are presented below.



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Impacts to wildlife and fisheries would generally be the same as Alternative 1R except Alternative 2 includes 63 miles of new haul road and 143 miles of overhead transmission line. This would involve five more road miles and 17 more overhead transmission line miles than Alternative 1R.

4.14.3.1 Big Game

Potential impacts from Alternative 2 to big game include: direct habitat loss of seasonal ranges, behavioral avoidance or indirect habitat loss of seasonal ranges, disruption of migration routes, and increased levels of human activity that could lead to higher levels of vehicle collisions and poaching.

Mule Deer

The Alternative 2 boundary includes and contains a total of 24,780 acres of CWR, 91,481 acres of winter-yearlong range, and 70,365 acres of spring-summer-fall range. The conceptual design for Alternative 2 has the highest level of direct (280 acres) and highest indirect habitat loss (22,994 acres) to mule deer CWR, due to the increased development within the Chokecherry area compared to Alternative 1R. Similar to Alternative 1R, the BLM environmental constraints (refer to **Appendix C**, **Table C-1**) restricting surface disturbance and disruptive activities on public lands during November 15 to April 30 in CWR would be followed. In addition, BMPs to reduce the amount of human presence and activity during the winter months would be applied. Because vehicle travel will be permitted on BLM roads during the winter to provide access to the wind energy facility on private lands, the environmental constraints and BMPs may not be sufficient to reduce impacts to wintering mule deer. Under Alternative 2 there also would be increased development on Miller Hill, which would occur closer to the probable migration route for mule deer than under Alternative 1R. Thus, Alternative 2 would potentially have a greater impact on migration routes for mule deer in this area compared to Alternative 1R. Based on the miles of new road required to construct and maintain the project, Alternative 2 has the third highest potential for impact, with 483 miles of new roads within mule deer seasonal ranges.

Similar to Alternative 1R, the portion of the Upper Muddy Creek Watershed/Grizzly WHMA within the Alternative 2 boundary does not contain any CWR for mule deer, therefore the use of this area would not conflict with the management objective to maintain, restore and enhance mule deer CWR. Under Alternative 2, no construction would occur within the Red Rim-Grizzly WHMA. It is not likely that the inclusion of the identified portions of the WHMAs would result in any indirect impacts to the mule deer beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of either WHMA in regards to mule deer.

The direct loss of CWR, combined with expansive areas of potential indirect impacts during construction and operation of the facility, would result in habitat loss and disturbance levels exceeding significance criteria 3.

Elk

Overall, 85 percent of the Alternative 2 boundary area is not classified as elk range. Of the 15 percent that is considered elk range, there is 129 acres of CWR, 1,060acres of winter range, and 25,596 acres of winter-year long range. Similar to Alternative 1R, Alternative 2 conceptual design has no direct or indirect habitat loss of CWR. The increased construction on Miller Hill under Alternative 2 compared to Alternative 1R would increase the potential impact on the known elk migration route. Based on the miles of new road required to construct and maintain the project, Alternative 2 and Alternative 4 have the second highest potential for impact, with 28 miles of new roads within elk seasonal ranges, thus increasing the potential impacts such as wildlife-vehicle collisions, poaching, disrupting migrations paths, and general disturbance from increased human activity.

Similar to Alternative 1R the portion of the Upper Muddy Creek Watershed/Grizzly WHMA within the Alternative 2 boundary does not contain any CWR for elk. Therefore the use of this area would not conflict with the management objective to maintain, restore and enhance elk CWR. Under Alternative 2,

no construction would occur within the Red Rim-Grizzly WHMA. It is not likely that the inclusion of the identified portions of the WHMAs would result in any indirect impacts to elk beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of either WHMA in regards to elk.

Pronghorn

The Alternative 2 boundary contains 1,265 acres of CWR, 570 acres of spring-summer-fall range and 110,630 acres of winter-yearlong range. Under the Alternative 2 conceptual design, the potential habitat loss of CWR is the same as Alternative 1R with no direct loss and only a low level (407 acres) of indirect habitat loss. As discussed for Alternative 1R, restricting surface disturbance and disruptive activities during the time period of November 15 to April 30 on public lands in accordance with the BLM constraints table (**Appendix C**, **Table C-1**) would occur. The increased construction in the eastern portion of the Chokecherry area associated with Alternative 2 would increase the potential impact on known pronghorn migration routes. Similar to Alternative 1R, if fence construction is required, potential impacts to pronghorn migration may be reduced by constructing wildlife-friendly fences allowing pronghorn movement. Based on the miles of new road required to construct and maintain the project (483 miles), Alternative 2 has the third highest potential for wildlife-vehicle collisions, poaching, disrupting migration paths, and general disturbance from increased human activity.

Management objectives of the Upper Muddy Creek Watershed/Grizzly WHMA do not specifically address pronghorn. Under Alternative 2, no construction would occur within the Red Rim-Grizzly WHMA. Thus, the inclusion of the identified portions of the Red Rim-Grizzly WHMA would not result in any impacts to the pronghorn beyond what has been described above.

4.14.3.2 Small Game and Furbearers

Potential impacts from Alternative 2 to small game and furbearers include: initial and long-term habitat loss, indirect habitat loss due to behavioral avoidance, and increased levels of human disturbance potentially resulting in wildlife-vehicle collisions and poaching.

The Alternative 2 conceptual design would result in the initial loss of approximately 8,569 acres and the long-term loss of 1,629 acres of habitat, which is the greatest amount among the alternatives. This would result in a loss of relatively small percents of the total Alternative 2 boundary area (4.6 percent and less than 1.0 percent, respectively), which is higher than Alternative 1R for initial impacts and about equal for long-term disturbance. The loss of habitat may result in small game and furbearers utilizing lower quality habitat, which may affect decrease reproduction and increase predation rates. However, small game and furbearers utilize multiple habitat types and have high reproduction rates. This alternative includes the construction of 483 miles of new roads, which is the third highest amount of road construction among the action alternatives. Thus, Alternative 2 has the third highest potential for wildlife-vehicle collisions, poaching, disrupting migration paths, and general disturbance from increased human activity.

Management objectives of the Upper Muddy Creek Watershed/Grizzly WHMA do not specifically address small game and furbearers. Under Alternative 2, no construction would occur within the Red Rim-Grizzly WHMA. It is not likely that the inclusion of the identified portions of the WHMAs would result in any indirect impacts to small game and furbearers beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of either WHMA.

4.14.3.3 Nongame

Potential impacts from Alternative 2 to bats include direct impacts consisting of fatalities and loss of foraging and roosting habitat, as well as indirect impacts associated with habitat loss and modification.

Bats

Analysis of Alternative 2 involves constructing up to 1,000 3.0-MW wind turbines in the checkerboard portions of the ranch only. Using the average of 2.1 bat fatalities/MW/year at 21 wind energy facilities in western North America, the predicted bat fatality rate for this alternative would be 6,300 fatalities per year, which is the same as Alternative 1R.

Alternative 2 conceptual design would result in initial impacts to 84 acres and long-term impacts to 17 acres of riparian areas/wetlands, which is potential habitat for bat foraging and roosting. This alternative also would result in initial and long-term impacts to 106 acres of woodlands and steep, rocky areas, which is potential bat roosting habitat. For both riparian areas/wetlands and woodlands combined, this alternative would result in initial and long-term impacts to 190 acres of bat foraging and roosting habitat, which is 12 acres less than Alternative 1R.

As with Alternative 1R, the mortality of an estimated 6,300 bats per year would be considered significant under significance criteria 4. However, similar to Alternative 1R, the estimated 6,300 bat fatalities could be substantially reduced with a BPP in place to levels not considered significant under significance criteria 4.

Birds

Potential impacts from Alternative 2 to birds include direct impacts consisting of fatalities and loss of habitat, as well as indirect impacts associated with habitat loss and modification and displacement of birds from project facilities.

Using the predicted raptor fatality rate of 0.05–0.07 fatalities/MW/year indicates that 150–210 raptor fatalities could occur per year with this alternative, of which 46–64 may be golden eagles, which is the same as Alternative 1R. These fatalities would be spread over several species, seasons, and between resident, migrant and wintering birds. The conceptual design for Alternative 2 has 143 miles of new above-ground collection power lines. Alternative 2 has 10 active raptor nests located within 1 mile of turbines based on 2008-2009 surveys. Using the BLM database of all raptor nests documented in the area since 1980, 293 raptor nest locations are present within 1 mile of turbines. Using the average of 1.8 bird fatalities/MW/year at 21 wind energy facilities in western North America, the predicted bird fatality rate for this alternative would be 5,400 fatalities per year, which is the same as Alternative 1R.

The measures included in the APP to avoid and minimize raptor fatalities as described above for Alternative 1R will likely result in observed avian fatality rates below those predicted above. If bird fatality rates exceed certain thresholds agreed to by the USFWS, BLM and WGFD, additional avoidance, minimization and mitigation measures would be developed in consultation with the USFWS, BLM, and WGFD to reduce impacts.

The conceptual design for Alternative 2 would result in initial and long-term impacts to 7,772 acres and 1,610 acres, respectively, of all vegetation types combined. This alternative would result in combined initial and long-term disturbance to 7,912 acres of sagebrush or other shrub-steppe communities containing sagebrush. The conceptual design for Alternative 2 has 483 miles of new road construction. The Alternative 2 conceptual design has 33,881 acres within 656 feet of all turbines, of which 30,029 acres are sagebrush or shrub-steppe communities with a sagebrush component. These acreages represent 18.1 percent and 16.0 percent of the Alternative 2 boundary area, respectively, compared to 13.8 and 12.3 percent, respectively, for Alternative 1R. Turbine density within turbine development areas for Alternative 2 may be up to 5.21 turbines/square mile.

The estimated number of raptor fatalities, as well as the estimated proportion of the Alternative 2 area with reduced use by passerines, would exceed the significance criteria (criteria numbers 3 and 4). However, similar to Alternative 1R, development of an APP and ECP could reduce these impacts below significance criteria.

4.14.3.4 Reptiles and Amphibians

Potential impacts likely to occur under Alternative 2 include the direct loss of habitat, indirect habitat loss due to behavioral avoidance and alterations of movement patterns, degradation of surface water habitats, and mortalities resulting from construction activities, wildlife-vehicle collisions and human interactions. The magnitude of these impacts depends upon the density and location of infrastructure and the amount of human activity associated with the development.

The Alternative 2 conceptual design would result in the initial loss of approximately 8,569 acres and the long-term loss of 1,629 acres for habitat. The loss of habitat may result in reduced reptile and amphibian diversity and abundance in the future. The initial and long-term losses would result in the loss of relatively small percentages of the total Alternative 2 boundary area (4.6 percent and less than 1.0 percent, respectively), which is higher than Alternative 1R for initial impacts and about equal for long-term disturbance.

Alternative 2 includes the construction of 483 miles of new road, thus increasing the potential impacts such as wildlife-vehicle collisions, poaching, disrupting migrations paths, and general disturbance from increased human activity. The combined ecological impacts of road construction on reptiles and amphibians, which influence species demography and gene flow potentially impacting overall population stability and persistence, were calculated to be an estimated 35,433 acres based on 328 feet from either side of the road edge. This amount is greater than Alternative 1R, and represents approximately 19 percent of the total Alternative 2 area.

As discussed under Alternative 1R, amphibians are dependent upon water for completion of their lifecycles and degradation to the aquatic habitats could negatively impact amphibian populations. Based on the assumption that surface disturbance within a given watershed serves as an indicator of the potential for increased sediment and salt runoff, Alternative 2 would result in a slightly greater impact on amphibian habitats as the range of total surface disturbance within sub-watersheds would range from less than 0.1 to 7.8 percent during construction. Surface disturbance during operations would range from less than 0.1 to 1.1 percent which is similar to all action alternatives (refer to Section 4.13.3). However, as discussed in Section 4.13, Impacts to Water Resources, with the implementation of erosion control methods, application of BMPs and the ACMs would minimize impacts of land disturbance on surface water quantity and quality. Similar to Alternative 1R, degradation of amphibian habitats by potential spills of hazardous materials from construction equipment is not anticipated based on the establishment of the project's SPCC Plan. The number of stream crossings from the construction of new roads would directly affect amphibian habitats. Under the conceptual design for Alternative 2 there would be 520 ephemeral road-stream crossings and 11 perennial road-stream crossings. Direct impacts to wetlands, which would reduce potential amphibian habitat, have been estimated along 19,930 linear feet of wetland and riparian zone drainages under Alternative 2 (see Section 4.11). PCW has committed to BMPs that would avoid, minimize, or mitigate wetland impacts (**Appendix C**, **Table C-3**).

Management of the Upper Muddy Creek Watershed/Grizzly WHMA requires that surface disturbing activities avoid the following areas: the identified 100-year floodplains, 500 feet from perennial surface water and/or wetland and riparian areas, and 100 feet from ephemeral channels (BLM 2008a). The avoidance of these areas would reduce the potential impacts on reptiles and amphibians within the Upper Muddy Creek Watershed/Grizzly WHMA. Exceptions to the avoidance would be granted by the BLM based on an environmental analysis and site-specific engineering and mitigation plans, but would only be granted if the areas cannot be avoided and protection for the aquatic resources would be ensured. Reptiles and amphibians are considered in the Red Rim-Grizzly WHMA management goals by the general statement to ensure that native wildlife and vegetation communities are the primary benefactors of management decisions. Only a small percentage (0.3 percent; or 166 acres) of the total Upper Muddy Creek Watershed/Grizzly WHMA would potentially be impacted by construction of the project and no construction would occur within the Red Rim-Grizzly WHMA. It is not likely that the inclusion of this area would result in any indirect impacts to the reptiles or amphibians beyond what has

been described above. Nor would the inclusion jeopardize the stated management objectives of either WHMA in regards to reptiles or amphibians. If the final layout results in placement of infrastructure within either WHMA, impacts to reptiles and amphibians within either WHMA would be the same as those described above.

4.14.3.5 Fisheries

Potential impacts to fish habitat associated with the proposed project include: reduction in surface flow due to water extraction for dust control and construction; degradation of habitat due to increased sedimentation and salt runoff; alteration of hydrologic conditions from new road construction that could lead to sedimentation, erosion, and channel adjustments resulting in a loss of deep pool habitats; and construction of new stream crossings which could result in fragmentation of aquatic habitats and limit access to required habitats or block fish migration. The magnitude of these impacts will depend upon the amount and location of water extraction, the density of road construction within watersheds, the number of stream crossings, and the design of the stream crossings.

Under Alternative 2, the impacts on fisheries from water depletions associated with construction would be similar to those discussed under Alternative 1R. As explained in Section 4.13.3, it is estimated that Alternative 2 would require up to 617 acre-feet of water from the North Platte River during the 5-year construction phase, with the greatest use (344 acre-feet) occurring during Year 4. It is possible that up to 62 acre-feet of the water required for construction would be extracted from the Colorado River watershed (PCW 2012) and would occur during Years 2 and 3. These amounts are greater than Alternative 1R. Section 4.13.3 estimates that this equates to approximately 0.02 percent of the North Platte River's average annual flow near Sinclair and approximately 0.22 percent of the average annual flow of Muddy Creek near Baggs, Wyoming, or 0.04 percent of Savery Creek's average annual flow near Savery, Wyoming. Similar to Alternative 1R, this level of depletion could impact the local fishery and could potentially alter survival of fish in the system through changes such as water temperature, in-stream habitat, and sediment dynamics. The level of impact also would depend on the water year (i.e., wet, average, dry).This type of impact does not coincide with the management goals for the Upper Muddy Creek Watershed/Grizzly WHMA and Red Rim-Grizzly WHMA for fish and would potentially contribute to the decline of populations. This also may preclude the recovery of BLM sensitive fish species. Depletions from the North Platte River would not be allowed to impact current users or interstate agreements through the water rights processes required by the WSEO. Tentative specific water rights have been identified (PCW 2012) and are evaluated in relation potential impacts to fisheries in the Biological Assessment for this project (**Appendix L**).

The potential impacts from increased sedimentation including shifting habitat structure, percent fines in substrates and cover availability was assessed based on the amount of total surface disturbance within sub-watersheds. Under Alternative 2, the total surface disturbance in the North Platte River-Coal Mine Draw sub-watershed, which contains a statewide important fishery, would be 0.9 percent during construction and 0.2 percent during operations. The total surface disturbance in the Upper Sage Creek-North Platte River sub-watershed, which contains three of the noted fisheries, would be 0.8 percent during construction and 0.1 percent during operations, which are greater and lower respectively than Alternative 1R. Under Alternative 2 conceptual design, total surface disturbance in the McKinney Creek sub-watershed, which contains the other three noted fisheries plus portions of the Upper Muddy Creek Watershed/Grizzly WHMA and Red Rim-Grizzly WHMA, would be greater than Alternative 1R both during construction and operation (1.2 percent and 0.2 percent, respectively). As discussed under Alternative 1R, implementation of BMPs and ACMs would minimize the potential impacts including sedimentation, contamination, and changes in habitat structure resulting from surface disturbance; accidental contamination from construction spills; and construction of access road-stream crossings.

As with Alternative 1R, disruption in fish movement resulting from access road-stream crossings would potentially result in demographic impacts, decreasing population viability. The conceptual design for

Alternative 2 would result in a greater number of ephemeral road-stream crossings (520) compared to Alternative 1R (343). A total of 11 perennial streams would be crossed including; Sage Creek five times, Miller Creek, Little Sage Creek, Iron Springs Draw, Smith Draw three times. Sage Creek is a regionally important trout stream. Under the current conceptual layout, two ephemeral road-stream crossing would occur in the Upper Muddy Creek/Grizzly WHMA and no road-stream crossings would occur within the Red Rim-Grizzly WHMA. As discussed in Section 4.13.2, potential impacts resulting from road-stream crossings would be minimized through design modifications and placement of structures. The 2008 Rawlins RMP (BLM 2008a) requires that any road crossing any waterbody that potentially supports fish for a portion of the year will be designed to simulate natural stream process, thus allowing fish passage potentially reducing the impacts.

As stated previously under Alternative 1R, construction of infrastructure and road-stream crossings within the Upper Muddy Creek Watershed/Grizzly WHMA would potentially conflict with the stated management objectives. No construction would occur within the Red Rim-Grizzly WHMA as a result of the conceptual layout of Alternative 2. However, an initial (166 acres) and long-term (26 acres) surface disturbance would potentially occur within the Upper Muddy Creek Watershed/Grizzly WHMA (**Figure 4.14-3**), which equate to relatively small proportions (0.3 percent and 0.04 percent, respectively) of the entire WHMA. The magnitude of the potential impacts resulting from possible construction within the Upper Muddy Creek Watershed/Grizzly WHMA cannot be determined without the final layout. Should the final layout result in the placement of infrastructure within the Upper Muddy Creek Watershed/Grizzly WHMA a review of the potential impacts to fish in the WHMA would be required by the BLM to determine if they exceed those discussed above.

4.14.4 Impacts to Wildlife and Fisheries Resources from Alternative 3, No Miller Hill or South Sierra Madre

Although types of potential impacts to wildlife and fisheries from Alternative 3 would be similar to those discussed under Alternative 1R, the amount and location of the surface disturbance differs. Alternative 3 would have 115 miles of new overhead collection lines, which is 11 miles less than Alternative 1R. Under Alternative 3 infrastructure would not occur within the Miller Hill or southern portion of Sierra Madre, but would increase construction in the eastern portion of the Sierra Madre area. Development in the Chokecherry area would be the same as Alternative 2. The Alterative 3 boundary does not include the Upper Muddy Creek Watershed/Grizzly WHMA or the Red Rim-Grizzly WHMA (**Figure 4.14-4**). Potential impacts from surface disturbance, location of the haul road/transmission lines, and the shift in location unique to Alternative 3 are presented below. Under Alternative 3, 40 miles of new haul road and concurrent 230-kV transmission line, as well as 75 miles of overhead 34.5-kV transmission line would be constructed; this represents 18 less road miles and 11 less miles of overhead transmission line compared to Alternative 1R.

4.14.4.1 Big Game

Similar to the other action alternatives, potential impacts from Alternative 3 to big game include: direct habitat loss of seasonal ranges, behavioral avoidance or indirect habitat loss of seasonal ranges, disruption of migration routes, and increased levels of human activity that could lead to higher levels of vehicle collisions and poaching.

Mule Deer

The Alternative 3 boundary area contains a total of 24,704 acres of CWR, 91,338 acres of winter yearlong range, and 44,257 acres of spring-summer-fall range. The conceptual design for Alternative 3 has the second lowest level of direct habitat loss (200 acres) and third highest level of indirect habitat loss (21,657 acres) of mule deer CWR. Similar for Alternatives 1R and 2, the BLM environmental constraints (refer to **Appendix C**, **Table C-1**) restricting surface disturbance and disruptive activities during the time period of November 15 to April 30 would be observed. Furthermore, the use of BMPs designed to reduce the amount of human presence and activity during winter months would be applied.

Based on the miles of new road required to construct and maintain the project, Under Alternative 3 there would be no development on Miller Hill, thus the known migration route for mule deer would not likely be affected. This is the only alternative that would avoid development in this area, thus, Alternative 3 would potentially have the least impact on migration routes for mule deer in this area. The Alternative 3 conceptual design has the second lowest potential for impact, with 456 miles of new roads within mule deer seasonal ranges. The direct loss of CWR, combined with expansive areas of potential indirect impacts during construction and operation of the facility, would result in habitat loss and disturbance levels exceeding significance criteria 3.

Elk

Overall, 99 percent of the Alternative 3 boundary area is not classified as elk range. Of the 1 percent that is considered elk range, there is no CWR, 587 acres of winter range, and 424 acres of winter-year long range. The conceptual design for Alternative 3 has no direct or indirect habitat loss of CWR, which is similar to Alternatives 1R and 2. Under Alternative 3 there would be no development on Miller Hill, thus no anticipated impacts to probable elk migration routes would occur. Furthermore, no new road construction is proposed in elk seasonal ranges, thus Alternative 3 has the lowest potential for impact to elk compared to Alternatives 1R and 2.

Pronghorn

The Alternative 3 boundary contains 1,265 acres of CWR, 49,284 acres of spring-summer-fall range and 110,590 acres of winter-yearlong range. The Alternative 3 conceptual design has no direct habitat loss and a low level of indirect habitat loss (267 acres) of CWR for pronghorn, which is consistent with Alternatives 1R and 2. Similar for Alternatives 1R and 2, the BLM environmental constraints (refer to **Appendix C**, **Table C-1**) restricting surface disturbance and disruptive activities during the time period of November 15 to April 30 would be observed. Furthermore, the use of BMPs designed to reduce the amount of human presence and activity during winter months would be applied. Construction in the Chokecherry area is the same as Alternative 2, thus the proposed construction in the eastern portion of the Chokecherry area would increase the potential impact on probable pronghorn migration routes. Similar to Alternatives 1R and 2, if fence construction is required, potential barriers to pronghorn migration may be reduced by constructing wildlife-friendly fences allowing pronghorn movement. The Alternative 3 conceptual design would require the second lowest amount of new road construction with 457 miles within pronghorn seasonal ranges. Based on the miles of new road construction, Alternative 3 would have less potential impacts such as wildlife- vehicle collisions, poaching, and general disturbance from increased human activity compared to Alternative 2, but greater potential than Alternative 1R.

4.14.4.2 Small Game and Furbearers

Potential impacts from Alternative 3 to small game and furbearers include: initial and long-term habitat loss, indirect habitat loss due to behavioral avoidance, and increased levels of human disturbance potentially resulting in wildlife-vehicle collisions and poaching.

The Alternative 3 conceptual design would result in the initial loss of approximately 8,115 acres and the long-term loss of 1,506 acres of habitat. The loss of habitat may result in small game and furbearers utilizing lower quality habitat which may affect decrease reproduction and increase predation rates. However, small game and furbearers utilize multiple habitat types and have high reproduction rates. The loss of habitat would result in the relatively small percentages of the total area encompassed by Alternative 3 boundary (5.0 percent and less than 1.0 percent, respectively), but is the highest initial disturbance among alternatives. The conceptual design for this alternative includes the construction of 460 miles of new roads, which increases the potential for wildlife-vehicle collisions, poaching, disrupting migration paths, and general disturbance from increased human activity.

4.14.4.3 Nongame

Potential impacts from Alternative 3 to bats include direct impacts consisting of fatalities and loss of foraging and roosting habitat, as well as indirect impacts associated with habitat loss and modification.

Bats

Analysis of Alternative 3 involves constructing up to 1,000 3.0-MW wind turbines in the alternative area but excludes placement of project infrastructure in the Miller Hill and Sierra Madre areas. Using the average of 2.1 bat fatalities/MW/year at 21 wind energy facilities in western North America, the predicted bat fatality rate for this alternative also would be 6,300 fatalities per year, which is the same as Alternative 1R.

Alternative 3 conceptual design would cause initial impacts to 6,785 acres and long-term impacts to 13 acres of riparian areas/wetlands, which is potential habitat for bat foraging and roosting. The conceptual design for Alternative 3 also would result in initial and long-term impacts to 111 acres of woodlands and steep, rocky areas, which is potential bat roosting habitat. For both riparian areas/wetlands and woodlands combined, this alternative would result in initial and long-term impacts to 183 acres of bat foraging and roosting habitat, which is 19 acres less than Alternative 1R.

As with Alternative 1R, the mortality of an estimated 6,300 bats per year would be considered significant under significance criteria 4.

Birds

Potential impacts from Alternative 3 to birds include direct impacts consisting of fatalities and loss of habitat, as well as indirect impacts associated with habitat loss and modification and displacement of birds from project facilities.

Using the predicted raptor fatality rate of 0.05–0.07 fatalities/MW/year indicates that 150–210 raptor fatalities could occur per year under this alternative, of which 46–64 may be golden eagles. These fatalities would be spread over several species, seasons, and between resident, migrant and wintering birds. Alternative 3 has 115 miles of new above-ground collection lines. Alternative 3 has 9 active raptor nests located within 1 mile of turbines based on 2008-2009 surveys. Using the BLM database of all raptor nests documented in the area since 1980, 279 raptor nest locations are present within 1 mile of turbines. Using the average of 1.8 bird fatalities/MW/year at 21 wind energy facilities in western North America, the predicted bird fatality rate for this alternative would be 5,400 fatalities per year, which is the same as Alternative 1R.

The measures included in the APP to avoid and minimize raptor fatalities as described above for Alternative 1R will likely result in observed avian fatality rates below those predicted above. If bird fatality rates exceed certain thresholds agreed to by the USFWS, BLM and WGFD, additional avoidance, minimization and mitigation measures would be developed in consultation with the USFWS, BLM, and WGFD to reduce impacts.

The Alternative 3 conceptual design would result in initial and long-term impacts to 7,357 acres and 1,491 acres, respectively, of all vegetation types combined. The conceptual design would result in initial and long-term disturbance to 7,148 acres of sagebrush or other shrub-steppe communities containing sagebrush. Alternative 3 conceptual design has 460 miles of new road construction. The conceptual design for Alternative 3 has 34,069 acres within 656 feet of all turbines, of which 29,980 acres are sagebrush or shrub-steppe communities with a sagebrush component. These acreages represent 21.1 percent and 18.6 percent of the Alternative 3 boundary area, respectively, compared to 13.8 and 12.3 percent, respectively, for Alternative 1R. Turbine density within turbine development areas for Alternative 3 may be up to 5.23 turbines/square mile.

The estimated number of raptor fatalities, as well as the estimated proportion of the alternative boundary with reduced use by passerines would exceed the significance criteria (criteria numbers 3 and 4). However, similar to Alternative 1R, development of an APP and ECP could reduce these impacts below significance criteria.

4.14.4.4 Reptiles and Amphibians

Potential impacts likely to occur under Alternative 3 include the direct loss of habitat, indirect habitat loss due to behavioral avoidance and alterations of movement patterns, degradation of surface water habitats, and mortalities resulting from construction activities, wildlife-vehicle collisions and human interactions. The magnitude of these impacts depends upon the density and location of infrastructure and the amount of human activity associated with the development.

The conceptual design for Alternative 3 would result in the loss of approximately 8,115 acres for the initial disturbance and 1,506 acres of long-term disturbance. The loss of habitat may result in reduced reptile and amphibian diversity and abundance in the future. The initial and long-term losses would result in the loss of relatively small percentages of the total Alternative 3 boundary area (5.0 percent and less than 1.0 percent, respectively), but the initial disturbance would be the highest among the alternatives.

This alternative conceptual design includes the construction of 460 miles of new roads, thus increasing the potential impacts such as wildlife-vehicle collisions, poaching, disrupting migrations paths, and general disturbance from increased human activity. The combined ecological impacts of road construction on reptiles and amphibians, which influence species demography and gene flow potentially impacting overall population stability and persistence, were calculated to be an estimated 34,423 acres, based on 328 feet from either side of the road edge. This amount is greater than Alternative 1R, and represents approximately 21 percent of the total Alternative 3 boundary area.

As discussed under Alternative 1R, amphibians are dependent upon water for completion of their life cycles and degradation to the aquatic habitats could negatively impact amphibian populations. Based on the assumption that surface disturbance within a given watershed serves as an indicator of the potential for increased sediment and salt runoff, Alternative 3 would have a slightly greater impact on amphibian habitats compared to Alternatives 1R and 2 as the range of total surface disturbance within sub-watersheds would range from less than 0.1 to 7.1 percent during construction. Surface disturbance during operations would range from 0.1 to 1.3 percent which is similar to all action alternatives (refer to Section 4.13.4). However, as discussed in Section 4.13, with the implementation of erosion control methods, application of BMPs and the ACMs would minimize impacts of land disturbance on surface water quantity and quality. Similar to Alternative 1R, degradation of amphibian habitats by potential spills of hazardous materials from construction equipment is not anticipated based on the establishment of the project's SPCC Plan. The number of stream crossings from the construction of new roads would directly affect amphibian habitats. Under the conceptual design for Alternative 3 there would be 483 ephemeral road-stream crossings and 11 perennial stream crossings. Direct impacts to wetlands, which would reduce potential amphibian habitat, have been estimated along 15,788 linear feet of wetland and riparian zone drainages under Alternative 3 (see to Section 4.11). PCW has committed to BMPs that would avoid, minimize, or mitigate wetland impacts (**Appendix C**, **Table C-3**).

4.14.4.5 Fisheries

Potential impacts to fish habitat associated with the proposed project include reduction in surface flow due to water extraction for dust control and construction; degradation of habitat due to increased sedimentation and salt runoff; alteration of hydrologic conditions from new road construction that could lead to sedimentation, erosion, and channel adjustments resulting in a loss of deep pool habitats; and construction of new road-stream crossings which could result in fragmentation of aquatic habitats and limit access to required habitats or block fish migration. The magnitude of these impacts will depend upon the amount and location of water extraction, the density of road construction within watersheds, the number of stream crossings, and the design of the stream crossings.

Under Alternative 3, the impacts on fisheries from water depletions associated with construction would be similar to those discussed under Alternative 1R. As explained in Section 4.13.4, it is estimated that Alternative 3 would require up to 589 acre-feet of water from the North Platte River during the 5-year construction of the proposed project, with the greatest use (179 acre-feet) occurring during the Year 4, which is slightly more than Alternative 1R but less than Alternative 2. Because there would be no development in the White-Yampa Basin under Alternative 3, no water would be extracted from the Colorado River watershed. Section 4.13.4 estimates that the maximum volume of water equates to approximately 0.02 percent of the North Platte River's average annual flow near Sinclair. Similar to Alternatives 1R and 2, this level of depletion could impact the local fishery and could potentially alter survival of fish in the system through changes such as water temperature, in-stream habitat, and sediment dynamics. The level of impact also would depend on the water year (i.e. wet, average, dry). Depletions from the North Platte River would not be allowed to impact current users or interstate agreements through the water rights processes required by the WSEO. Tentative specific water rights have been identified (PCW 2012) and are evaluated in relation potential impacts to fisheries in the Biological Assessment for this project (**Appendix L**).

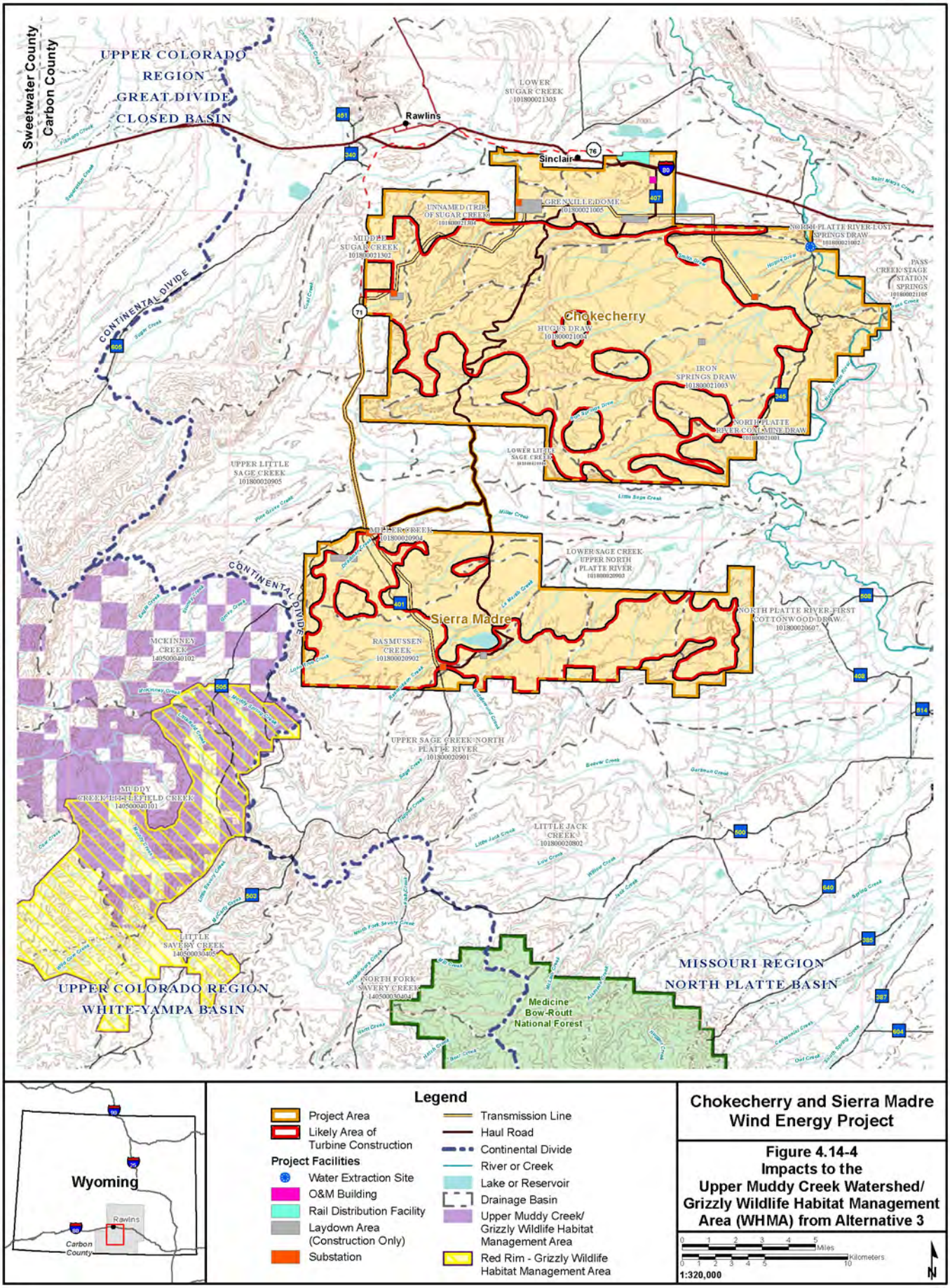
The potential impacts from increased sedimentation including shifting habitat structure, percent fines in substrates and cover availability was assessed based on the amount of total surface disturbance within sub-watersheds. Under Alternative 3 conceptual design, the total surface disturbance in the North Platte River-Coal Mine Draw sub-watershed, which contains a statewide important fishery, would be 1.0 percent during construction and 0.2 percent during operations, which is slightly greater than Alternatives 1R and 2. The total surface disturbance in the Upper Sage Creek-North Platte River sub-watershed, which contains three of the noted fisheries, would be 0.7 percent during construction, and 0.1 percent during operations, which is less than Alternatives 1R and 2. Under the conceptual design for Alternative 3, no surface disturbance would occur within the McKinney Creek sub-watershed, thus fisheries associated with the Upper Muddy Creek Watershed/Grizzly WHMA and the Red Rim-Grizzly WHMA would not be affected (**Figure 4.14-4**). As discussed under Alternative 1R, implementation of BMPs and ACMs would minimize the potential impacts including sedimentation, contamination, and changes in habitat structure resulting from surface disturbance; accidental contamination from construction spills; and construction of access road-stream crossings.

As with Alternative 1R, disruption in fish movement resulting from access road-stream crossings would potentially result in demographic impacts, decreasing population viability. The Alternative 3 conceptual design would result in a greater number of ephemeral stream crossings (483) compared to Alternative 1R (348), but less than Alternative 2 (520). Similar to Alternative 2, a total of 11 perennial streams would be crossed including; Sage Creek six times, Miller Creek, Little Sage Creek, Iron Springs Draw, and Smith Draw two times. Sage Creek is a regionally important trout stream. Similar to Alternatives 1R and 2, no perennial stream crossings would occur in the McKinney Creek sub-watershed. As discussed in Section 4.13.2, potential impacts resulting from road-stream crossings would be minimized through design modifications and placement of structures. The 2008 Rawlins RMP (BLM 2008a) requires that any road crossing any waterbody that potentially supports fish for a portion of the year will be designed to simulate natural stream process, thus allowing fish passage potentially reducing the impacts.

4.14.5 Impacts to Wildlife and Fisheries Resources from Alternative 4, Private Lands Only

Although types of potential impacts to wildlife and fisheries from Alternative 4 would be similar to those discussed under Alternative 1R, the amount and location of surface disturbance differs. The location of infrastructure under Alternative 4 would occur only on private lands, which would result in infrastructure to be constructed throughout most of the Alternative 4 area. Approximately 100 miles of overhead collection lines would be required, which is 26 miles less than Alternative 1R. Additionally, as opposed to all other alternatives, only up to 846 turbines would be constructed under Alternative 4.

The boundary for Alternative 4 is the same as Alternative 1R and includes portions of the Upper Muddy Creek Watershed/Grizzly WHMA and the Red Rim-Grizzly WHMA (9,988 and 1,285 acres, respectively),



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but the conceptual layout only includes development on the private land within the Upper Muddy Creek Watershed/Grizzly WHMA and no development within the Red Rim-Grizzly WHMA. According to the Rawlins RMP, the Upper Muddy Creek Watershed/Grizzly WHMA has been designated as a wind avoidance area. Additionally, based on PCW's ACM not to site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), the "likely area for turbine construction" within the Upper Muddy Creek Watershed/Grizzly WHMA includes 1,320 acres (**Figure 4.14-5**). However, based on the conceptual layout, the potential initial (56 acres) and long-term (12 acres) disturbance within the Upper Muddy Creek Watershed/Grizzly WHMA would equal 0.09 percent and 0.02 percent, respectively, of the WHMA. There would be no disturbance within the Red Rim-Grizzly WHMA under Alternative 4. Potential impacts from the surface disturbance, location of the haul road/transmission lines, and the expansion throughout the alterative area unique to Alternative 4 are presented below. Under Alternative 4, 38 miles of new haul road and 100 miles of overhead transmission line would be constructed. This would be 20 less road miles and 26 less transmission line miles than Alternative 1R.

4.14.5.1 Big Game

Potential impacts from Alternative 4 to big game include: direct habitat loss of seasonal ranges, behavioral avoidance or indirect habitat loss of seasonal ranges, disruption of migration routes, and increased levels of human activity that could lead to higher levels of vehicle collisions and poaching.

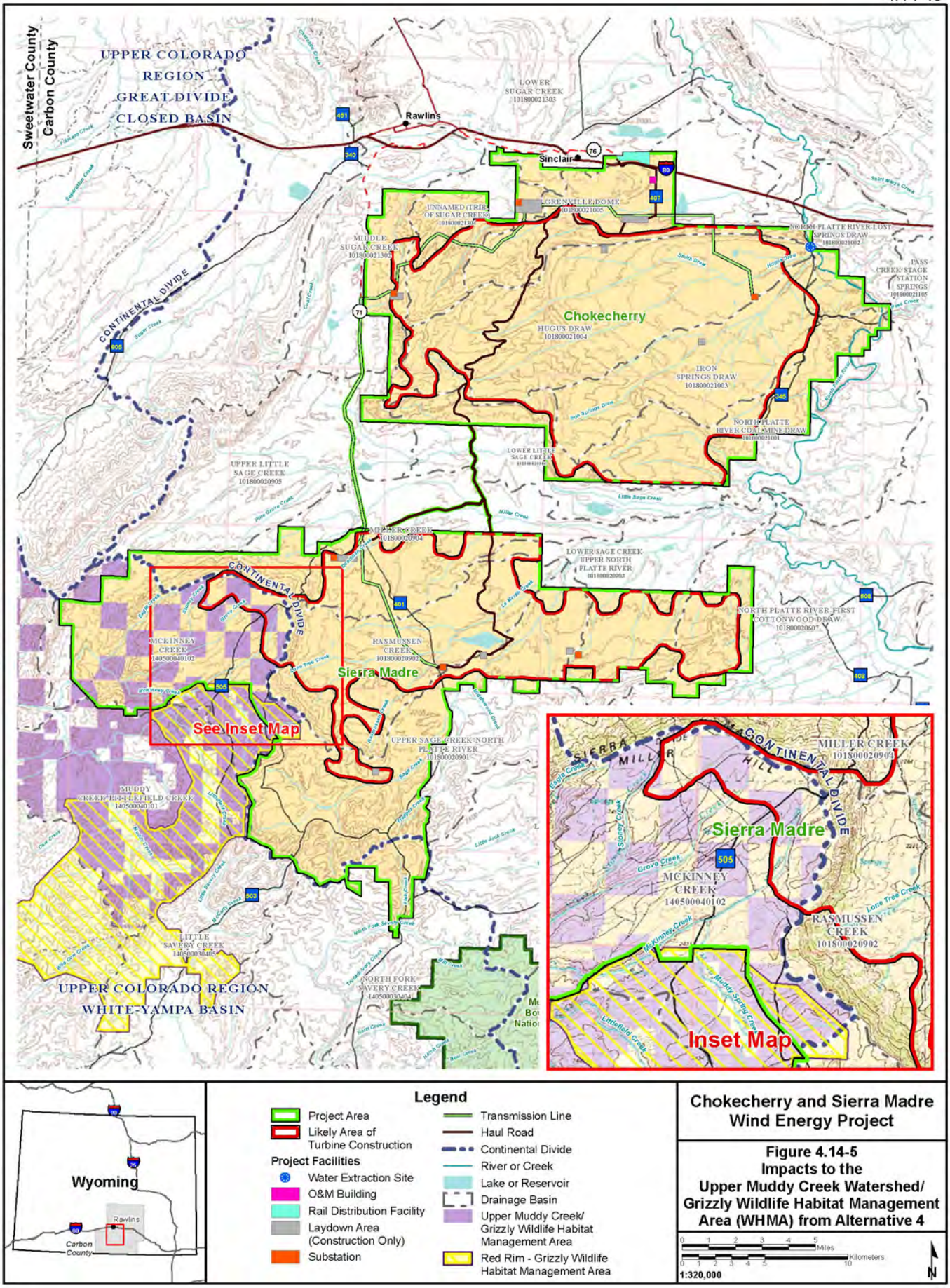
Mule Deer

Alternative 4 contains a total of 24,693 acres of CWR, 91,324 acres of winter-year-long range, and 104,063 acres of spring-summer-fall range. The Alternative 4 conceptual design has the lowest level of direct habitat loss (191 acres) and the second lowest level of indirect habitat loss (21,618 acres) to mule deer CWR. Although Alternative 4 expands the distribution of turbines throughout the Chokecherry area, there would be fewer turbines and a reduction in direct loss of CWR habitat for mule deer compared to Alternatives 2 and 3. However, the expansion would result in a greater indirect impact to mule deer CWR as noted above. Under Alternative 4 development on Miller Hill would be similar to Alternative 2, which would occur closer to the known migration route for mule deer than Alternative 1R. Alternative 3 avoids construction on Miller Hill. Therefore Alternatives 2 and 4 would potentially have the greatest impact on migration routes for mule deer in this area. Based on the conceptual design the miles of new road required to construct and maintain the project (488 miles) in mule deer seasonal ranges, Alternative 4 has the highest potential for wildlife-vehicle collisions, poaching, disrupting migration paths, and general disturbance from increased human activity.

Similar to Alternative 1R, the portion of the Upper Muddy Creek Watershed/Grizzly WHMA within the Alternative 1R boundary does not contain any CWR for mule deer, therefore the use of this area would not conflict with the management objective to maintain, restore and enhance mule deer CWR. As described under Alternative 1R, mule deer have been identified as a priority wildlife species of the Red Rim-Grizzly WHMA and are known to concentrate outside of the Alternative 4 boundary in the southwestern portion of the Red Rim-Grizzly WHMA during the winter months (BLM and WGFD 1994). It is not likely that the inclusion of the identified portions of the WHMAs would result in any indirect impacts to the mule deer beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of either WHMA in regards to mule deer. The direct loss of CWR, combined with expansive areas of potential indirect impacts during construction and operation of the facility, would result in habitat loss and disturbance levels exceeding significance criteria number 3.

Elk

Similar to Alternative 1R, 74 percent of the Alternative 4 boundary area is not classified as elk range. Of the 26 percent that is considered elk range, there is 129 acres of CWR, 1,060 acres of winter range, 33,462 acres of winter-year long range, and 20,863 acres of spring-summer-fall range. Similar to all other alternatives, Alternative 4 conceptual design has no direct or indirect habitat loss of CWR. As with all the other action alternatives, with the exception of Alternative 3, Alternative 4 would include



Chokecherry and Sierra Madre Wind Energy Project

Figure 4.14-5
Impacts to the Upper Muddy Creek Watershed/ Grizzly Wildlife Habitat Management Area (WHMA) from Alternative 4

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development on Miller Hill. Potential impacts to the known elk migration route in this area for Alternative 4 would be similar to Alternative 2 as it would be closer to the known route. Based on conceptual design the miles of new road required to construct and maintain Alternative 4, along with Alternative 2 have the highest potential for impact, with 28 miles of new roads within elk seasonal ranges. Therefore, Alternative 4 has the greatest potential for impacts such as inadvertent mortality from vehicle collisions, poaching, and general disturbance from increased human activity.

Similar to Alternative 1R, the portion of the Upper Muddy Creek Watershed/Grizzly WHMA included in the Alternative 4 boundary does not contain any CWR for elk, therefore the use of this area would not conflict with the management objective to maintain, restore and enhance elk CWR. As described under Alternative 1R elk have been identified as a priority wildlife species of the Red Rim-Grizzly WHMA and are known to occur within the WHMA year-round with CWR located outside of the Alternative 4 boundary in the southwestern portion of the WHMA (BLM and WGFD 1994). It is not likely that the inclusion of this area would result in any indirect impacts to elk beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of either WHMA in regards to elk.

Pronghorn

The Alternative 4 boundary contains 1,265 acres of CWR, 109,129 acres of spring-summer-fall range and 110,525 acres of winter-yearlong range. The conceptual design for Alternative 4 has no direct habitat loss and a low level of indirect habitat loss (265 acres) that is consistent with the other alternatives. Based on the miles of new road required to construct and maintain the project (488 miles), Alternative 4 has the highest potential for wildlife-vehicle collisions, poaching, disrupting migration paths, habitat fragmentation, and general disturbance from increased human activity.

Pronghorn have been identified as a priority wildlife species of the Red Rim-Grizzly WHMA and are known to utilize sagebrush dominated and riparian areas of the WHMA during the summer and generally not found in the WHMA during the winter (BLM and WGFD 1994). However, under Alternative 4 no construction would occur within the Red Rim-Grizzly WHMA. It is not likely that the inclusion of this area would result in any indirect impacts to pronghorn beyond what has been described above.

4.14.5.2 Small Game and Furbearers

Potential impacts from Alternative 4 to small game and furbearers include: initial and long-term habitat loss, indirect habitat loss due to behavioral avoidance, and increased levels of human disturbance potentially resulting in wildlife-vehicle collisions and poaching.

The conceptual design for Alternative 4 would result in the initial loss of approximately 8,195 acres and the long-term loss of 1,541 acres of habitat. The loss of habitat may result in small game and furbearers utilizing lower quality habitat, which may affect decrease reproduction and increase predation rates. However, small game and furbearers utilize multiple habitat types and have high reproduction rates. This would result in the loss of a relatively small percentage of the total Alternative 4 boundary area (3.7 percent and 0.7 percent, respectively), which is similar to the alternatives. However, the conceptual design for this alternative includes the construction of the greatest amount of new roads, 488 miles, which increases the potential for wildlife-vehicle collisions, poaching, disrupting migration paths, and general disturbance from increased human activity.

Management objectives of the Upper Muddy Creek Watershed/Grizzly WHMA do not specifically address small game and furbearers, thus the inclusion of the WHMA within Alternative 4 boundary would not result in any indirect impacts beyond what has been described. Small game and furbearers are considered in the Red Rim-Grizzly WHMA management goals by the general statement to ensure that native wildlife and vegetation communities are the primary benefactors of management decisions. However, under Alternative 4 no construction would occur within the Red Rim-Grizzly WHMA. It is not likely that the inclusion of this area would result in any indirect impacts to small game and furbearers

beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of either WHMA.

4.14.5.3 Nongame

Bats

Potential impacts from Alternative 4 to bats include direct impacts consisting of fatalities and loss of foraging and roosting habitat, as well as indirect impacts associated with habitat loss and modification.

Alternative 4 would entail constructing up to 846 3.0-MW wind turbines only on private lands within the Alternative 4 area. Because Alternative 4 only has up to 846 turbines, bat collision mortality would be approximately 15 percent lower than the other alternatives, or 5,380 fatalities per year.

The conceptual design for Alternative 4 would cause initial impacts to 71 acres and long-term impacts to 12 acres of riparian areas/wetlands, which is potential habitat for bat foraging and roosting. The conceptual design for this alternative also would result in initial and long-term impacts to 117 acres of woodlands and steep, rocky areas, which is potential bat roosting habitat. For both riparian areas/wetlands and woodlands combined, this alternative would result in initial and long-term impacts to 188 acres of bat foraging and roosting habitat, which is 14 acres less than Alternative 1R.

Collision mortality of an estimated 5,380 bats per year would be considered significant under significance criteria 1. However, similar to Alternative 1R, the estimated 5,380 bat fatalities could be substantially reduced with a BPP in place to levels not considered significant under significance criteria 4.

Birds

Potential impacts from Alternative 4 to birds include direct impacts consisting of fatalities and loss of habitat, as well as indirect impacts associated with habitat loss and modification and displacement of birds from project facilities.

Because Alternative 4 only has up to 846 turbines, raptor and all bird collision mortality would be approximately 15 percent lower than the other three alternatives, or 128–179 raptor fatalities, of which 39–55 may be golden eagles, and 4,612 bird fatalities per year. These fatalities would be spread over several species, seasons, and between resident, migrant and wintering birds. Alternative 4 has 100 miles of new above-ground collection lines. Alternative 4 has 13 active raptor nests located within 1 mile of turbines based on 2008-2009 surveys. Using the BLM database of all raptor nests documented in the Alternative 4 area since 1980, 357 raptor nest locations are present within 1 mile of turbines.

The measures included in the APP to avoid and minimize raptor fatalities as described above for Alternative 1R will likely result in observed avian fatality rates below those predicted above. If bird fatality rates exceed certain thresholds agreed to by the USFWS, BLM and WGFD, additional avoidance, minimization and mitigation measures would be developed in consultation with the USFWS, BLM, and WGFD to reduce impacts.

The conceptual design for Alternative 4 would result in initial and long-term impacts to 7,441 acres and 1,529 acres, respectively, of all vegetation types combined. This alternative conceptual design would result in combined initial and long-term disturbance to 7,041 acres of sagebrush or other shrub-steppe communities containing sagebrush. The Alternative 4 conceptual design has 488 miles of new road construction. The conceptual design for Alternative 4 has 16,209 acres within 656 feet of all turbines, of which 15,336 acres are sagebrush or shrub-steppe communities with a sagebrush component. These acreages represent 7.3 percent and 6.9 percent of the Alternative 4 boundary area, respectively, compared to 13.8 and 12.3 percent, respectively, for Alternative 1R. Turbine density within turbine development areas for Alternative 4 would be 3.79 turbines/square mile, the lowest among all four alternatives.

The estimated number of raptor fatalities, as well as the estimated proportion of the Alternative 4 boundary area with reduced use by passerines would exceed the significance criteria 3 and 4. However, similar to Alternative 1R, development of an APP and ECP could reduce these impacts below significance criteria.

4.14.5.4 Reptiles and Amphibians

Potential impacts likely to occur under Alternative 4 include the direct loss of habitat, indirect habitat loss due to behavioral avoidance and alterations of movement patterns, degradation of surface water habitats, and mortalities resulting from construction activities, wildlife-vehicle collisions and human interactions. The magnitude of these impacts depends upon the density and location of infrastructure and the amount of human activity associated with the development.

The Alternative 4 conceptual design would result in the initial loss of approximately 8,195 acres and the long-term loss of 1,541 acres of habitat. The loss of habitat may result in reduced reptile and amphibian diversity and abundance in the future. The initial and long-term losses would result in the loss of relatively small percentages of the total Alternative 4 boundary area (3.7 percent and 0.7 percent, respectively) which would be similar to the other alternatives.

The conceptual design for Alternative 4 includes the construction of 488 miles of new road, thus increasing the potential impacts such as wildlife-vehicle collisions, poaching, disrupting migrations paths, and general disturbance from increased human activity. The combined ecological impacts of road construction on reptiles and amphibians, which influence species demography and gene flow potentially impacting overall population stability and persistence, were calculated to be an estimated 36,876 acres, based on 328 feet from either side of the road edge. This amount is greater than Alternative 1R, and represents approximately 17 percent of the total Alternative 4 boundary area.

As discussed under Alternative 1R, amphibians are dependent upon water for completion of their lifecycles and degradation to the aquatic habitats could negatively impact amphibian populations. Based on the assumption that surface disturbance within a given watershed serves as an indicator of the potential for increased sediment and salt runoff, Alternative 4 conceptual design would have a slightly lower impact on amphibian habitats as the range of total surface disturbance within sub-watersheds would range from less than 0.1 to 6.2 percent during construction. Surface disturbance during operations would range from 0.1 to 1.2 percent which is similar to all action alternatives (refer to Section 4.13.5). However, as discussed in Section 4.13, with the implementation of erosion control methods, application of BMPs and the ACMs would minimize impacts of land disturbance on surface water quantity and quality. Similar to Alternative 1R, degradation of amphibian habitats by potential spills of hazardous materials from construction equipment is not anticipated based on the establishment of the project's SPCC Plan. The number of stream crossings from the construction of new roads would directly affect amphibian habitats. Under the conceptual design for Alternative 4 there would be 582 ephemeral road-stream crossings and 14 perennial road-stream crossings. Direct impacts to wetlands, which would reduce potential amphibian habitat, have been estimated along 22,579 linear feet of wetland and riparian zone drainages under Alternative 4 (Section 4.11). PCW has committed to BMPs that would avoid, minimize, or mitigate wetland impacts (**Appendix C**, **Table C-3**).

Reptiles and amphibians are considered in the Red Rim-Grizzly WHMA management goals by the general statement to ensure that native wildlife and vegetation communities are the primary benefactors of management decisions. As explained under Alternative 1R, although the Upper Muddy Creek Watershed/Grizzly WHMA does not specifically address reptiles and amphibians surface disturbing activities within the WHMA are required to avoid the following areas: the identified 100-year floodplains, 500 feet from perennial surface water and/or wetland and riparian areas, and 100 feet from ephemeral channels (BLM 2008a). The avoidance of these areas would reduce the potential impacts on reptiles and amphibians. Exceptions to the avoidance would be granted by the BLM based on an environmental analysis and site-specific engineering and mitigation plans, but would only be granted if the areas cannot

be avoided and protection for the aquatic resources would be ensured. It is not likely that the inclusion of this area would result in any indirect impacts to the reptiles or amphibians beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of either WHMA.

4.14.5.5 Fisheries

Potential impacts to fish habitat associated with the proposed project include: reduction in surface flow due to water extraction for dust control and construction; degradation of habitat due to increased sedimentation and salt runoff; alteration of hydrologic conditions from new road construction that could lead to sedimentation, erosion, and channel adjustments resulting in a loss of deep pool habitats; and construction of new road-stream crossings which could result in fragmentation of aquatic habitats and limit access to required habitats or block fish migration. The magnitude of these impacts will depend upon the amount and location of water extraction, the density of road construction within watersheds, the number of road-stream crossings, and the design of the road-stream crossings.

Under Alternative 4, the impacts on fisheries from water depletions associated with construction would be similar to those discussed under Alternative 1R. As explained in Section 4.13.5, it is estimated that Alternative 4 would require up to 614 acre-feet of water from the North Platte River during the 5-year construction of the proposed project, with the greatest use (186 acre-feet) occurring during the Year 4. It is possible that up to 61 acre-feet of the water required for construction would be extracted from the Colorado River watershed (PCW 2010a) and would occur during Years 2 and 3. These amounts are greater than any of the other alternatives. Section 4.13.5 estimates that this equates to approximately 0.02 percent of the North Platte River's average annual flow near Sinclair and approximately 0.22 percent of the average annual flow of Muddy Creek near Baggs, Wyoming, or 0.04 percent of Savery Creek's average annual flow near Savery, Wyoming. Similar to the other alternatives, this level of depletion could impact the local fishery and could potentially alter survival of fish in the system through changes such as water temperature, in-stream habitat, and sediment dynamics. The level of impact also would depend on the water year (i.e. wet, average, dry).This type of impact does not coincide with the management goals for the Upper Muddy Creek Watershed/Grizzly WHMA and Red Rim-Grizzly WHMA for fish and would potentially contribute to the decline of populations. This also may preclude the recovery of BLM sensitive fish species. Depletions from the North Platte River would not be allowed to impact current users or interstate agreements through the water rights processes required by the WSEO. Tentative specific water rights have been identified (PCW 2012) and are evaluated in relation potential impacts to fisheries in the Biological Assessment for this project (**Appendix L**).

The potential impacts from increased sedimentation including shifting habitat structure, percent fines in substrates and cover availability was assessed based on the amount of total surface disturbance within sub-watersheds. Under the conceptual design for Alternative 4, the total surface disturbance in the North Platte River-Coal Mine Draw sub-watershed, which contains a statewide important fishery, would be 1.1 percent during construction and 0.2 percent during operations. The construction percent is the greatest among all the action alternatives, but the operations percent would be similar. The total surface disturbance in the Upper Sage Creek-North Platte River sub-watershed, which contains three of the noted fisheries, would be 1.1 percent during construction, and 0.2 percent during operations. This amount is similar to Alternatives 2 and 3, but less than Alternative 1R during construction. Under the conceptual design for Alternative 4, total surface disturbance in the McKinney Creek sub-watershed, which contains the other three noted fisheries plus fisheries associated with the Upper Muddy Creek Watershed/Grizzly WHMA and the Red Rim-Grizzly WHMA, would be less than Alternatives 1R and 2 during construction and slightly more than Alternative 2 during operation (0.8 percent and 0.1 percent, respectively). As discussed under Alternative 1R, implementation of BMPs and ACMs would minimize the potential impacts including sedimentation, contamination, and changes in habitat structure resulting from surface disturbance; accidental contamination from construction spills; and construction of access road-stream crossings.

As with Alternative 1R, disruption in fish movement resulting from access road-stream crossings would potentially result in demographic impacts, decreasing population viability. The Alternative 4 conceptual design would result in the greatest number of ephemeral (582) and perennial (14) road-stream crossings compared to all other alternatives. The perennial stream crossings would include Sage Creek six times, Miller Creek, Little Sage Creek, Iron Springs, Draw four times, and Smith Draw two times. Sage Creek is a regionally important trout stream. Similar to all action alternatives conceptual designs, no perennial road-stream crossings would occur in the McKinney Creek sub-watershed. As discussed in Section 4.13.2, potential impacts resulting from road-stream crossings would be minimized through design modifications and placement of structures. The 2008 Rawlins RMP (BLM 2008a) requires that any road crossing any waterbody that potentially supports fish for a portion of the year will be designed to simulate natural stream process, thus allowing fish passage potentially reducing the impacts.

Construction of infrastructure and road-stream crossings within the Upper Muddy Creek Watershed/Grizzly WHMA would potentially conflict with the stated management objectives. Only a small percentage (less than 0.1 percent; or 56 acres) of the Upper Muddy Creek Watershed/Grizzly WHMA would potentially be impacted by construction of Alternative 4, which is the less than Alternatives 1R and 2. The Alternative 3 boundary is outside of the WHMAs.

4.14.6 Mitigation and Mitigation Effectiveness

There are two broad categories for mitigation approaches for wildlife: resource maintenance and resource compensation (WGFD 2010). Resource maintenance consists of avoiding, minimizing, rectifying or reducing adverse wildlife impacts through project planning. This approach has been applied through the development of the environmental constraints table, the incorporation of the BMPs and ACMs (**Appendix C**). Mitigation measure GEN-1, from the Draft EIS, is now part of the alternatives analysis in the Final EIS as it was included as an ACM by the applicant in the January 2012 revised POD (PCW 2012a). Resource compensation involves the development and implementation of measures to replace or provide substitute resources to address impacts, including (as a last resort) financial compensation to be used by the WGFC or another entity for that purpose (WGFD 2010).

A wildlife monitoring and mitigation plan (**Appendix J**) was developed for the project that should prevent, reduce and detect impacts to wildlife species throughout the life of the project. The wildlife monitoring and mitigation plan will be designed with two purposes. The first purpose will be to provide protocols to monitor wildlife responses, habitats, and behavioral shifts, etc. due to the project. The other purpose will be to provide protocols to protect wildlife species and track the effectiveness of these protections. The following recommendation and guideline documents were considered during the development of the monitoring and mitigation plan: *WGFD Wildlife Protection Recommendations for Wind Energy Development in Wyoming* (WGFD 2010) and *Developing a Diverse Conservation Portfolio for Colorado River Cutthroat Trout* (Haak et al. 2011).

The presence of workers during construction and maintenance may increase the potential for disturbance and possible poaching of big game. The potential construction of snow fences to maintain the new roads may result in unintentional entrapment of big game. To minimize these potential impacts, the following mitigation measures (WFM-1 and WFM-2) are recommended.

WFM-1: Workers, with the exception of security personnel, will not be allowed to possess firearms during work activities and will attend mandatory training (provided by WGFD) on wildlife regulations and ways to reduce disturbance to wildlife.

Effectiveness: Discouraging workers from carrying firearms and educating them on wildlife regulations will reduce the risk of poaching and harassment of wildlife.

WFM-2: Snow fences, if used, will be limited to segments of one-quarter mile or less. In addition, escape openings will be provided along roads, every one-quarter mile or less, to facilitate exit of big game animals from snowplowed roads.

Effectiveness: Limiting snow fence length and providing escape openings along roads will reduce the risk of vehicle collisions with big game.

Bat migration occurs through the Application Area from August through September, which could result in an increase in bat mortality during this time period. To minimize the potential increase in bat mortality, the following mitigation measure is recommended.

WFM-3: If measured bat mortality is determined to be above levels of concern for the project (as presented earlier in this section), measures appropriate to avoid, minimize, and mitigate impacts to bat species will be identified in the Bat Protection Plan for the Project. Thresholds of impacts to bats and appropriate responses to exceeding such impact thresholds will be determined by BLM in coordination with the WGFD, and if appropriate, the USFWS, as part of the conservation, avoidance, minimization and mitigation measures identified in the Bat Protection Plan.

Effectiveness: Appropriate avoidance, minimization and mitigation measures will reduce the risk of bat mortalities when they migrate through the Application Area.

Operation activities would likely result in a significant level of bat mortality. Most bat mortality occurs during low wind speed nights (Arnett et al. 2008). While curtailment is still being evaluated as a method of reducing collision risks for bats, at wind energy facilities where bat mortality is high, curtailment of turbines during these low wind situations has been shown to reduce bat mortality by 50 to 70 percent at a site in Alberta (Baerwald et al. 2009) and from 53 to 87 percent at one site in Pennsylvania (Arnett et al. 2009). Because most of the bats likely to be impacted by the wind energy facility are not local bats, but long-distance migratory tree bats that breed north of the Application Area, habitat enhancement measures on site would not be productive. To mitigate project-specific bat impacts through habitat enhancements would require habitat enhancements in other parts of the country (e.g., forested areas of the Pacific Northwest, Idaho, and Montana) or even in Canada, which is likely not feasible.

WFM-4: Instream construction (stream crossings and stream construction activities) will occur during the low flow period (July 15 to September 30).

Effectiveness: Restriction of instream construction will reduce the potential barriers during native fish spawning periods.

4.14.7 Residual Impacts

Even with the wildlife mitigation measures effectively implemented there will be some residual impacts specifically wildlife mortalities. It is assumed that the reclamation efforts will be successful and thus no residual impact will occur to habitats. However, reclamation involving plant maturity will require a long time period during which time there would be some loss of habitat as well as loss of habitat function through fragmentation.

4.14.8 Irreversible and Irretrievable Commitment of Wildlife and Fisheries Resources

No irreversible commitments are anticipated for Wildlife and Fisheries. Construction and operation of any of the action alternatives would lead to the loss of some wildlife and fisheries resources. Native vegetation and wildlife habitat would be removed in order to accommodate the proposed facilities resulting in an irretrievable commitment of resources for the life of the project. However, as discussed in Section 4.11 (**Appendix D**), it is anticipated that upon decommissioning of the project with the appropriate measures for soil reclamation the vegetation would grow back. For grass and forbs it is

estimated these communities would recover within 5 years of reclamation; for sagebrush shrublands recovery time may be much longer from 20 to 50 years. It is possible that the wildlife habitat lost during the construction could return to pre-project conditions, thus there would not be an irreversible commitment of wildlife habitat.

All of the action alternatives would cause bird and bat mortality primarily through collisions during turbine operations, as well as wildlife mortality primarily through vehicle collisions on roads or during construction activities, which would be an unavoidable adverse impact and an irretrievable commitment of resources.

4.14.9 Relationship between Local Short-term Uses and Long-term Productivity

Habitat for wildlife would be diminished due to both local short-term uses and long-term uses until the reclaimed areas can be restored to a mature vegetation community. As presented in the vegetation section, these temporal losses consist of the lag time it takes to develop to pre construction conditions, generally 5 to 20 years. This would require plant community succession from grassland, to shrubland, to woodland, to forest as appropriate to achieve pre construction conditions. Construction and operation of any of the alternatives would likely impact the long-term productivity of passerines, including sagebrush obligate species, due to indirect loss of habitat.

4.15 Impacts to Special Status Species

The impacts study area for special status species in the applicable action alternative boundaries. The alternative boundaries include potential habitat for three species that are listed under ESA including the black footed ferret (endangered), Ute's ladies tresses (threatened), and Colorado butterfly plant (threatened); nine listed ESA species are found downstream of the Application Area in the Platte and Colorado River systems. Furthermore, the Application Area contains potential habitat for 30 species considered sensitive by the BLM. Species listed under the ESA or BLM sensitive species that occur within the RFO district and their associated habitats are presented in **Appendix K**.

The analysis of impacts to special status species was influenced by three levels of management considerations and by issues raised during scoping. The management considerations include those contained in the 2008 Rawlins RMP, management considerations for species covered by the ESA or the BLM Wyoming Sensitive Species List; and the additional special considerations. BLM's management goals, objectives, and actions for managing for special status species and consumptive uses are listed in **Table 4.15-1** (BLM 2008a).

Additional management considerations and scoping issues specifically addressing special status species also are presented in **Table 4.15-2**.

Table 4.15-1 Relevant Management Considerations for Special Status Species

2008 Rawlins RMP and ROD – Special Status Species[1]
<u>Management Actions (Endangered, Threatened, Proposed, and Candidate Species)</u> • Formal conferencing and consultation with the USFWS would occur for authorized activities that would potentially affect the habitat for endangered, threatened, proposed, and candidate species within the RMPPA (BLM 2008a, 2008 Rawlins RMP, Appendix 10). • Habitat and species conservation measures for threatened, endangered, candidate, and proposed species are identified in the biological assessment (BLM 2007e) and the biological opinion (BLM 2007f). Both documents would be adhered to for compliance with the ESA and the BLM Wyoming State Director's Sensitive Species List (BLM Manual 6840). Conservation measures would be applied to all surface disturbing and disruptive activities, as appropriate. Appendix 14 lists all reasonable and prudent measures and terms and conditions for threatened and endangered species and conservation measures for proposed and candidate species. Minimize disturbance to vegetation through application of BMPs, mitigation, as appropriate and practical (BLM 2008a, 2008 Rawlins RMP, Appendices 13, 14, 15, and 19), and reclamation practices (BLM 2008a, 2008 Rawlins RMP, Appendix 36). <u>Management Actions (Species Listed on the BLM Wyoming State Directors' Sensitive Species List)</u> • Surface disturbing and disruptive activities that would potentially affect the habitat of Special Status Species would be intensively managed on a case-by-case basis (BLM 2008a, 2008 Rawlins RMP, Appendices 1, 10, and 15). • Surface disturbing and disruptive activities located in potential mountain plover habitat are prohibited during the breeding period of April 10 to July 10 for the protection of breeding and nesting mountain plovers. Additional protection measures would be applied if this area were later determined to be within occupied habitat (BLM 2008a, 2008 Rawlins RMP, Appendix 16). Occupied habitat is defined as areas where broods and adults have been found.

[1] Management goals and objectives for special status species are the same as those described in **Table 4.14-1.**

Table 4.15-2 Relevant Management Considerations and Scoping Issues for Special Status Species

Resource Topic	Management Considerations/Scoping Issues
Black-Footed Ferret and White-Tailed Prairie Dog	Scoping Issues • The EIS should evaluate impacts to white-tailed prairie dog towns which support numerous species of high priority including the mountain plover, burrowing owl, black-footed ferret, and swift fox.
Platte River System Species (whooping crane, interior least tern, piping plover, pallid sturgeon, and western prairie fringed orchid)	Management Considerations • Platte River Recovery Implementation Program (2006) • Wyoming Water Depletions Plan
Colorado River System Species (Colorado pikeminnow, bonytail, humpback chub, and razorback sucker, Colorado River cutthroat trout, roundtail chub, bluehead sucker, and flannelmouth sucker)	Management Considerations • Upper Colorado River Endangered Fish Recovery Program which consists of five elements including provisions of instream flows; habitat development and maintenance; native fish stocking; management of nonnative species and sport fishing; and research, monitoring, and data management. (USFWS 2010b). • The conservation agreement for Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) in the states of Colorado, Utah, and Wyoming establishes a collaborative and cooperative effort among resources agencies to assures the long-term viability of Colorado River cutthroat trout throughout their historic range (Colorado River Cutthroat Trout [CRCT] Conservation Team 2006a). • Conservation strategy for Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus)* in the States of Colorado, Utah, and Wyoming identifies management for population and habitat monitoring; habitat improvement; non-native species; establishment, maintain and salvage populations; and systematic conservation planning (CRCT Conservation Team 2006b). • The Range Wide Conservation Agreement and Strategy for roundtail chub (*Gila robusta*), bluehead sucker (*Catostomus discobolus*), and flannelmouth sucker (*Catostomus latipinnis*) outlines measures that states can implement and expand upon to ensure the persistence of the three species populations throughout their ranges (UDNR 2006).
Pygmy Rabbit	Scoping Issues • BLM should conserve sensitive species that occur in the Application Area in a manner that contributes to their removal from BLM's sensitive species (e.g., the greater sage-grouse, pygmy rabbit, white-tailed prairie dog, and possibly the burrowing owl). • The Application Area should be surveyed for presence of pygmy rabbit and if documented, the appropriate mitigation should be applied.

Table 4.15-2 Relevant Management Considerations and Scoping Issues for Special Status Species

Resource Topic	Management Considerations/Scoping Issues
Wyoming Pocket Gopher	Scoping Issues • The Application Area should be surveyed for the presence of the Wyoming pocket gopher and if needed, the appropriate mitigation to preserve the habitat should be applied.
Greater Sage-grouse	Management Considerations • Some of the Application Area is designated by the State of Wyoming as being within a greater sage-grouse core breeding area. Wyoming Governor's State EO 2011-5 mandates that "New development or land uses within Core Population Areas should be authorized or conducted only when it can be demonstrated that the activity will not cause declines in greater sage-grouse populations." • WGFC position on greater sage-grouse core breeding areas and wind farm siting dated August 5, 2009. Wind farms constructed in Wyoming will require a permit from the Industrial Siting Council. The Commission directed the WGFD to recommend to the Industrial Siting Council that no wind turbines be constructed in a core area without clear demonstration from the project proponent that the activity will not cause a decline in greater sage-grouse populations. • BLM IM No. WY-2012-019 states that Field Offices must analyze, in the site-specific or project-level NEPA documentation, an alternative that limits development (including wind) to one disturbance location per 640 acres in greater sage-grouse core breeding areas. In addition, the IM states that a greater sage-grouse habitat evaluation shall extend, at a minimum, out 11 miles from the project boundary for large-scale proposed actions, including wind energy development. • The WGFD has developed a greater sage-grouse conservation plan that identifies recommended management practices necessary to sustain and perpetuate greater sage-grouse populations across the state (WGFD 2003).
	Scoping Issues • Concern regarding impacts to greater sage-grouse core breeding areas. • Concern regarding impacts to greater sage-grouse leks, nesting and winter habitat. • Concern regarding the effects of habitat fragmentation. • Concern regarding the potential effects of noise on greater sage-grouse. • Concern regarding greater sage-grouse avoidance of tall structures (turbines and power lines). • Recommendation for surveys for new or undiscovered leks. • Recommendation for mitigation such as timing restrictions on construction activity.

Table 4.15-2 Relevant Management Considerations and Scoping Issues for Special Status Species

Resource Topic	Management Considerations/Scoping Issues
Mountain Plover	Scoping Issues • Pre-siting surveys of bird habitat use and migration pathways, as well as raptor and mountain plover nesting areas should be conducted prior to determining tower locations and arrays. • Pre-construction surveys should identify prairie dog towns because of their importance to bird species. • BLM should conserve sensitive species that occur in the Application Area in a manner that contributes to their removal from BLM's sensitive species (e.g., the greater sage-grouse, pygmy rabbit, white-tailed prairie dog, and possibly the burrowing owl).

The following criteria were considered in the assessment of impacts to special status species for each alternative and are the same as those contained in the 2008 Rawlins RMP (BLM 2008a). Impacts to special status species would be considered significant if any of the following occurs:

1. Substantial loss of habitat function or disruption of life history requirements of a species or population segment that would make them eligible for listing under the ESA;
2. Decreased viability or increased mortality of threatened and endangered, proposed and candidate species, or reduction or alteration of their critical habitats;
3. Management actions that result in substantial disruption or irreplaceable loss of vital and high value habitats, as defined in the WGFD (2004b) Mitigation Policy;
4. Substantial loss of habitat function or disruption of life history requirements of special status species that would preclude improvement of their status; or
5. Actions preclude attainment of conservation goals, as stated in conservation plans and strategies for special status species.

The analysis for all wildlife and fisheries assumed the BLM would continue to manage fish and wildlife habitats in coordination with the WGFD, the USFWS would have jurisdiction over the management of threatened or endangered fish and wildlife populations, and the BLM, in conjunction with WGFD would continue to manage species listed on the BLM Wyoming State Director's Sensitive Species List in accordance with BLM Manual 6840. Further assumptions are that the ACMs and the BMPs (**Appendix C**, **Tables C-2** and **C-3**) would be implemented under all alternatives.

A draft Wildlife Monitoring and Protection Plan (**Appendix J**) has been developed in coordination with the BLM, WGFD, and USFWS. This plan is designed to prevent, reduce, and detect impacts to threatened, endangered, proposed, and candidate wildlife and fish species throughout the life of the project. The Wildlife Monitoring and Protection Plan serves two purposes. One is to describe the protocols to monitor wildlife responses, habitats, behavioral shifts, etc. The other is to provide protocols to protect wildlife species and evaluate the effectiveness of these protections.

4.15.1 Impacts to Special Status Species from the No Action Alternative

Under the No Action Alternative, the proposed project would not be implemented at any scale and the area would exist under current authorizations and land uses (e.g., livestock grazing). Therefore, impacts to special status species associated with development of the project would not occur.

4.15.2 Impacts to Special Status Species from the Alternative 1R

4.15.2.1 Federally Listed Species

Wyoming Species

Black-footed Ferret

Two legal/regulatory guidelines are applicable to black-footed ferrets, the ESA and the BLM Wyoming State Sensitive Species List. The ESA and the BLM regulation set objectives and management guidelines to restore habitat to conserve, recover, and maintain populations of black-footed ferret. The ESA recovery plan (USFWS 1988) requires: 1) increase the number of captive ferrets to a facility capacity of 200 breeders by 1991; and 2) establish populations, which before breeding, number 1,500 black-footed ferrets in 10 or more populations in the wild. A six-step process has been outlined to reach this objective, beginning with ensuring success of captive breeding, locating reintroduction habitat, finding other populations of ferrets, devising release strategies, managing reintroduced and other populations, and building programs for public support of the recovery effort.

As discussed in Section 3.15, the non-block cleared areas of the Application Area contain no physical evidence of prairie dog colonies; thus the area is considered to be poor quality for black-footed ferrets. In the unlikely event that black-footed ferrets would occur within the alternative boundary potential impacts from this alternative include: 1) direct loss of habitat resulting from the construction of roads and turbine pads within portions of prairie dog towns present at the site; 2) indirect loss of habitat due to avoidance of human activity; 3) increased traffic on roads and human activity may result in prairie dog, and potentially black-footed ferrets fatalities; and 4) increased human activity may increase the presence of pets, which potentially could result in the introduction of canine distemper.

Analysis was completed using the results of surveys conducted within the original Application Area (WEST 2008e) and existing data for the area provided by the Wyoming Natural Diversity Database (WYNDD 2008). The geographic extent of potential impacts to black-footed ferret included the boundaries of each proposed alternative, plus the area occupied by white-tailed prairie dog populations that may be potentially affected by the project. It is assumed that impacts would not occur within USFWS block-cleared portions of the Application Area.

Alternative 1R has the second lowest initial and long-term potential impact to white-tailed prairie dog habitat with 92 acres and 22 acres, respectively. Alternative 1R would construct 8 miles of new roads within white-tailed prairie dog habitat, which potentially would result in some vehicle collision fatalities of black-footed ferrets and white-tailed prairie dogs. This amount of road construction is the second highest among the alternatives.

Alternative 1R is designed for up to 1,000 turbines and all infrastructure associated with the project would lead to increased human activity on the site. The increased human activity on the site could result in the presence of dogs on site with personnel associated with the project. The presence of dogs could lead to exposure of the area to canine distemper which is a fatal disease for black-footed ferret.

Surveys for black-footed ferrets would be required before ground disturbing activities within white-tailed prairie dog colonies located in the Bolten Ranch Prairie Dog Complex. The remaining white-tailed prairie dog colonies within the project are in the “block clearance” area, where surveys for black-footed ferrets are not warranted.

Rare Plants

Two plant species listed as threatened under the ESA could occur within the boundaries of the action alternatives, Ute ladies'-tresses and Colorado butterfly plant. The impacts study area considered for these plants includes the project boundaries of each of the action alternatives; however, cumulative effects may extend beyond the project boundaries. Potential impacts to these threatened plants are analyzed using predictive models for mapping habitats capable of supporting special-status plant species. Limited surveys were conducted for rare plants (including threatened species and BLM sensitive species) in 2008, primarily in road and power line corridors and pad locations where appropriate habitat was present. No rare plants were found. Surveys were discontinued because final siting of project facilities is not complete and surveying the entire Application Area was not practical. Using the predictive models, this analysis estimates the amount of acreage of potential habitat for each threatened plant that could be impacted by each alternative. This analysis assumed that surveys will be conducted for sensitive plants prior to construction, once final siting of project facilities is complete. Potential impacts to threatened plants could include:

- Direct loss of special-status plants due to infrastructure placement;
- Loss of sensitive/unique habitats or habitats that support special-status plant species due to infrastructure placement; and
- Increase the distribution of existing noxious and invasive weed species within the alternative boundary and cause the introduction of new weed species due to surface disturbances (e.g., grading) and increased vehicular traffic.

Based on the predictive model of the potential distribution of Ute ladies'-tresses and Colorado butterfly plant (Fertig and Thurston 2003), potential habitat for both of these species is not likely to be found in the Alternative 1R boundary, therefore impacts to either species is unlikely. As described in the ACMs, **Appendix C**, **Table C-3**, "Site-specific surveys for both plant species will be completed prior to surface disturbing activities in suitable habitat". If potential impacts would occur, they would be addressed according to BLM policy and the provisions of the 2008 Rawlins RMP and ROD (**Table 4.15-1**). Surveys will occur during flowering or fruiting (whichever is appropriate) for proper identification.

Platte River System Species

Five federally listed species occur downstream of the alternative boundary within the Platte River system in Nebraska: whooping crane; interior least tern; piping plover; pallid sturgeon; and, western prairie fringed orchid. Though these species exist only far downstream of the alternative boundary, water depletions for dust control and construction may impact stream flows in the Platte River system overall, in combination with other diversions in the basin. According to broadly-applicable federal and state programs, the impact from water depletions in stream flows is a function of reduction in USFWS target flows for the whooping crane, interior least tern, and piping plover in central Nebraska and the potential benefits for the pallid sturgeon in the lower Platte River in eastern Nebraska. These species occur at great distance from the project area and downstream of five large storage reservoirs and other diversions on the North Platte River. While these target flows were designed for the habitat of four animal species, depletions in these flows also could contribute to impacts to the western prairie fringed orchid, a wetland species occupying wet meadows, important whooping crane foraging habitat within the floodplain of the Platte River in central Nebraska. According to the federal and state cooperative Platte River Recovery Implementation Program, water removed from the Platte River basin greater than 0.1 acre-feet is considered a depletion and jeopardizes the continued existence of these species. On that policy basis, withdrawals from Platte River tributary flows are considered depletions and potential project impacts.

The proposed water sources and amounts necessary for construction and operations for Alternative 1R were provided by PCW (2012a, 2010c) and are the basis of this analysis. It is anticipated that the project would require approximately 553 acre-feet of water over the 5-year construction period, including up to

400 acre-feet for dust control over the construction period. This would be the least amount of water use among the alternatives. The primary sources of this water would be within the North Platte River watershed, providing 90 to 100 percent of the water supply. It is anticipated that water for construction of the Sierra Madre area would be obtained from existing alluvial ground water wells used for agricultural purposes, which are hydrologically connected to the North Platte River. Water needs for construction in the Chokecherry area would likely come from existing surface water rights and hydrologically-connected groundwater wells used in agriculture. All of these sources would require a Temporary Use Agreement from the WSEO. This agreement would temporarily convert the use of agricultural water rights to industrial use. The historic amount, rate, timing and return flows would remain the same, thus this would not be a new demand and there should be not potential for injury to other appropriators. Nevertheless, this change in use would be considered a new water-related activity under the Platte River Program and thus the depletions would result in a *May Affect, Likely to Adversely Affect* determination, and the BLM would initiate the ESA consultation process. However, because the water is a change in use, the Wyoming Depletions Plan will cover this use (i.e., act as the Reasonable and Prudent Alternative) and the USFWS would use the streamlined ESA consultation as described in the plan. The proposed water sources for this project have been identified and evaluated in the Biological Assessment (**Appendix L**).

Colorado River System Species

Four federally endangered species may occur as downstream residents of the Colorado River system: Colorado pikeminnow; bonytail chub humpback chub; and, razorback sucker. Under the Upper Colorado River Basin Endangered Fish Recovery Program, any water removed greater than 0.1 acre-feet from the Colorado River basin is considered a depletion and jeopardizes the continued existence of these fish. The removal of less than 0.1 acre-feet is considered de minimus. Tributary water is defined as water that contributes to in-stream flow habitat. Depletion is defined as water that would contribute to the river flow, but is intercepted and removed from the system. The BLM retains discretionary authority over individual projects within the alternative boundary for the purposes of endangered species consultation. If the recovery program is unable to implement the Recovery Implementation Plan in a timely manner or make sufficient progress in recovery of these endangered species, re-initiation of ESA Section 7 consultation may be required so that new reasonable and prudent alternative can be developed. The USFWS has determined that progress made under the Recovery Implementation Plan has been sufficient to merit a waiver of the mitigation fee for depletions of 100 acre-feet per year or less (USFWS 1995b). The proposed water sources and amounts necessary for construction and operations for Alternative 1R were provided by PCW (PCW 2010a,c) and are the basis of this analysis. It is anticipated that up to 10 percent (55 acre-feet total) over Years 2 and 3, including up to 40 acre-feet total for dust control may be used for the project. This would be the lowest amount of water use among the three alternatives that would utilize water resources from the Colorado River basin. This use would be considered a depletion under provisions of the endangered fish recovery program and would result in a *May Affect, Likely to Adversely Affect* determination through the program. The proposed water sources for this project have been identified and evaluated in the Biological Assessment (**Appendix L**).

4.15.2.2 BLM Sensitive Species

Thirty-one BLM sensitive species were evaluated for potential impacts under the five alternatives, including the No Action Alternative. Analysis for the three BLM sensitive bat species that potentially occur within the alternative boundary was included in the evaluation for bats in Section 4.14. Similarly, most of the BLM sensitive bird species likely to occur within the alternative boundary including the sagebrush obligate bird species, bald eagle, ferruginous hawk, burrowing owl, and loggerhead shrike were discussed in the bird evaluation in Section 4.14. The long-billed curlew, which was not observed during any of the biological surveys, has been recorded within the 1-mile buffer of the Application Area, but these records are not considered to be current observations. The long-billed curlew is a shorebird which is one of the bird groups analyzed in Section 4.14.

The following BLM sensitive species were evaluated in this section: pygmy rabbit; white-tailed prairie dog; Wyoming pocket gopher, Columbian sharp-tailed grouse, greater sage-grouse, mountain plover,

northern leopard frog, sensitive plants, Colorado River cutthroat trout, roundtail chub, bluehead sucker, and flannelmouth sucker.

The Great Basin spadefoot toad and boreal toad were not observed during any of the biological surveys and there are no records of the Great Basin spadefoot toad within the Application Area according to the WYNDD and the most recent record for the boreal toad in the area was 1947. Information is generally lacking for the Great Basin spadefoot toad and specific data for the boreal toad, therefore the general analysis conducted in Section 4.14 for reptiles and amphibians would be relevant to these species.

Pygmy Rabbit

The distribution of pygmy rabbits is poorly understood but they have been reported within the sagebrush vegetation community within southwestern Wyoming (WEST 2008i, unpublished). A predictive model prepared by WYNDD was utilized to assess the potential impacts for the pygmy rabbit (WYNDD 2009).

Potential impacts to pygmy rabbits include: 1) direct loss of habitat; 2) indirect loss of habitat, including displacement due to increased traffic on roads and human activity; and 3) inadvertent mortalities due to increased traffic on roads and human activity. Generally, pygmy rabbits are known to inhabit the big sagebrush (*Artemesia tridentata*) plant community in areas where big sagebrush grows in tall, dense stands. Recent data indicate that they also use low sagebrush plant community as well (WEST 2008i, unpublished). However, available habitat mapping does not provide a vegetation type that is distinctive for low sagebrush; thus to assess the direct habitat loss, only the Wyoming big sagebrush vegetation type was considered when estimating the total amount of initial and long-term disturbances. For the purpose of assessing direct impact to pygmy rabbit habitats, initial disturbances were treated the same as long-term disturbances due to the length of time it could take before sagebrush has re-established to pre-disturbance levels (20 to 30 years). Due to the limited and conflicting information available about the range of this species, it is difficult to assess the potential indirect impacts and habitat fragmentation. Indirect impacts were assessed through a qualitative approach; that is, indirect impacts were assumed to increase in proportion to the infrastructure present for each alternative. Direct loss from vehicular collision was evaluated based on the length of roads associated with each alternative. Since the predictive model shows the probability of occurrence for pygmy rabbits throughout the Application Area, the total miles of new road construction for each alternative was used for the assessment.

Alternative 1R has the lowest (6,294 acres) direct impact to areas identified as having some probability of pygmy rabbit occurrence. Most of the loss (4,797 acres) would occur within areas classified as having a low probability of occurrence according to the WYNDD predictive model (**Table 4.15-3**).

Table 4.15-3 Pygmy Rabbit Probability Model for Alternative 1R

	Low Probability of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)	Very High Probability of Occurrence (acres)
Potential Disturbance	4,797	1,598	527	2

Alternative 1R has the lowest (1,231 acres) loss of Wyoming big sagebrush, which is a habitat type preferred by pygmy rabbits. Indirect impacts from the presence of human activity under Alternative 1R would be similar to Alternatives 2 and 3 as each alternative is designed to construct up to 1,000 turbines and infrastructure associated with the project. Alternative 1R would construct the least amount of new roads (438 miles), which potentially would result in some fatalities of pygmy rabbits through vehicle collisions.

The boundary for the Alternative 1R area would include portions of the Upper Muddy Creek Watershed/Grizzly WHMA and Red Rim-Grizzly WHMA. Management objectives for these areas do not specifically address pygmy rabbits; thus the inclusion of the WHMA within Alternative 1R boundary would not result in any indirect impacts beyond what has been described.

White-tailed Prairie Dog

Potential impacts to white-tailed prairie dogs include: 1) direct loss of habitat; 2) indirect loss of habitat; and 3) increased traffic on roads and human activity potentially resulting in prairie dog fatalities. Analysis was completed using the results of surveys conducted within the original Application Area (WEST 2008e) and existing data for the area provided by the Wyoming Natural Diversity Database (WYNDD 2008) To assess potential direct impacts to white-tailed prairie dog habitat, the white-tailed prairie dog towns delineated through the surveys conducted in 2008 and WYNDD data were overlaid onto the potential disturbance zones for each alternative. Acres of direct disturbance were then calculated. Indirect impacts were assessed through a qualitative approach; that is, indirect impacts were assumed to increase in proportion to the infrastructure present for each alternative. The potential for white-tailed prairie dog fatalities from vehicle collisions was evaluated by calculating the number of miles of new road construction among alternatives.

Alternative 1R has the second lowest initial and long-term potential impact to white-tailed prairie dog habitat with 92 acres and 22 acres, respectively. Indirect impacts from the presence of human activity under Alternative 1R would be similar to Alternatives 2 and 3 as each alternative is designed to construct up to 1,000 turbines and infrastructure associated with the project. Alternative 1R would construct 8 miles of new roads within potential white-tailed prairie dog habitat, which potentially would result in some fatalities of white-tailed prairie dogs through vehicle collisions. This amount of road construction is the second highest among the action alternatives.

Wyoming Pocket Gopher

The potential impacts to Wyoming pocket gopher include: 1) direct loss of habitat; 2) indirect loss of habitat; and 3) increased traffic on roads and human activity resulting in Wyoming pocket gopher fatalities. The Wyoming pocket gopher is more of a habitat specialist occurring predominantly on flatter slopes where Gardner's saltbush and winterfat are present and big sagebrush is absent or subdominant (Griscom et al. 2010). Information regarding the Wyoming pocket gopher is limited and its distribution is poorly understood. However, suitable habitat is found throughout the Application Area. A predictive model prepared by the Wyoming Natural Diversity Database (WYNDD 2009) was utilized to identify habitat and assess the potential impacts for this species. For the purpose of assessing direct impacts, initial disturbances were treated the same as long-term disturbances due to the length of time it could take before Gardner's saltbush has re-established to pre-disturbance levels (20 to 30 years). Due to the limited and conflicting information available about the range of this species, it is difficult to assess the potential indirect impacts and habitat fragmentation. Indirect impacts were assessed through a qualitative approach; that is, indirect impacts were assumed to increase in proportion to the infrastructure present for each alternative. Fatalities from vehicular collision were evaluated based on the length of roads associated with each alternative. Since the predictive model shows the probability of occurrence for Wyoming pocket gopher throughout the Application Area, the total miles of new road construction for each alternative was used for the assessment.

Although pocket gopher activity is easy to identify in the field, it is difficult to know which species occupies a particular site without labor-intensive trapping. Two models exist that can aid in calculating the probability that Wyoming pocket gopher occupies a specific site. The first model is based on the average diameter of gopher tunnels within a specific area. Generally, tunnels less than 55 mm in diameter are probably occupied by the Wyoming pocket gopher, and those over 80 mm are probably occupied by the northern pocket gopher. The second model has higher predictive capability and is based on tunnel diameter, litter cover, and Gardner's saltbush cover (Griscom et al. 2010).

Alternative 1R has the lowest (6,922 acres) direct impact to areas identified as having some probability of Wyoming pocket gopher occurrence. Most of the loss (4,349) would occur in areas classified as having a high probability of occurrence according to the WYNDD predictive model (**Table 4.15-4**).

Table 4.15-4 Wyoming Pocket Gopher Probability Model for Alternative 1R

	Absent (acres)	Absent (Marginal) of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)
Potential Disturbance	0.34	73	2,500	4,349

Indirect impacts from the presence of human activity under Alternative 1R would be similar to Alternatives 2 and 3 as each alternative is designed to construct up to 1,000 turbines and infrastructure associated with the project. Alternative 1R would construct the least amount of new roads (438 miles) which potentially would result in some fatalities of Wyoming pocket gophers through vehicle collisions.

Columbian Sharp-tailed Grouse

No Columbian sharp-tailed grouse or leks were documented during avian or greater sage-grouse surveys conducted within the Application Area; however, WYNDD (2008) data documents an observation greater than 6 miles away from the boundary of the Application Area. This observation recorded 14 adults during a classification survey conducted in 2002 at documented lek sites. The 0.25-mile perimeter of this lek does not overlap with any alternative; therefore, this lek or associated nesting and brood-rearing habitat would not likely be affected by any action alternative. Therefore, it is anticipated that Alternative 1R would have no impact on Columbian sharp-tailed grouse.

Greater Sage-grouse

Because of their sensitivity and public and agency concern, potential impacts to greater sage-grouse are assessed in detail. Impacts of wind energy facilities to greater sage-grouse can be grouped into two main categories: direct and indirect. Direct impacts include mortality when greater sage-grouse collide with turbines, power lines or meteorological towers, or their supporting infrastructure, such as guy wires. Other direct impacts may include vehicle collisions and increased levels of poaching. Indirect impacts can include the following:

- The presence of wind energy structures may reduce the value and use of otherwise suitable greater sage-grouse habitats if greater sage-grouse avoid tall structures or increased human activity within the wind energy development.
- Wind energy facilities may fragment greater sage-grouse habitat if movement among blocks of grouse habitat is blocked by avoidance of habitats near wind energy facility structures such as wind turbines and power lines.
- Increased predation and harassment of greater sage-grouse that can occur when power lines provide additional perch locations for raptors and corvids or when turbine and power line access roads increase mammalian predator densities.
- Ground disturbance associated with access roads and other construction activities may lead to establishment of noxious weeds or enhanced rates of predation that degrade greater sage-grouse habitats or directly impact populations.
- Access roads associated with wind turbines and power lines may result in increased human use and disturbance of greater sage-grouse in areas previously inaccessible by vehicles, and may increase the chance for fires.

Because of a lack of research, it is not possible to predict the level of direct mortality potentially associated with each alternative. Healthy bird populations, including upland gamebirds, can generally withstand loss of individuals resulting from collision mortality without population level declines (Johnson and Erickson 2010). Although it is not possible to quantify impacts associated with each alternative, it can reasonably be assumed that those alternatives that have the largest number of turbines, affect the greatest amount of greater sage-grouse habitat or that have the greatest length of roads and above-ground power lines also would likely have the highest level of collision mortality and other direct impacts.

To provide a basis for the greater sage-grouse impact assessment, an extensive literature review was conducted on greater sage-grouse response to wind energy development and power lines. This literature review was not conducted specifically for the CCSM project, but borrowed extensively from recent literature reviews on greater sage-grouse and wind energy (Johnson and Holloran 2010) and effects of power lines on greater sage-grouse prepared for the Draft EIS for the Mountain States Transmission Intertie project in Montana and Idaho (Johnson 2009).

Based on an extensive literature review of greater sage-grouse response to wind energy facilities and power lines, observed or measured greater sage-grouse responses to wind energy structures and transmission lines vary greatly. Impacts range from no apparent or low impacts, to one study in California that concluded population impacts may occur out to 3 miles from transmission lines, and impacts to leks have been noted out to 5 miles from transmission lines. Because the sphere of potential influence is not known for wind energy structures and is not consistent among studies of power lines, several recommendations on appropriate buffers to protect greater sage-grouse have been provided. Braun (1998) reported that power lines may limit greater sage-grouse use within 0.6 mile of the line, while Connelly et al. (2000) recommended that power lines not be constructed within 2 miles of seasonal greater sage-grouse habitats. In the Idaho Greater sage-grouse Conservation Plan (2006), it was recommended that a 3-mile buffer be applied on each side of power lines to account for potential influences of avian predation.

Due to a lack of consistent data, there is no consensus on how far wind turbines and power lines may influence greater sage-grouse use of habitat. However, studies of oil and gas development indicate that impacts may occur as far as 4 miles from the disturbance (Naugle et al. 2009). Therefore, the buffer evaluated as being within the potential zone of influence of the wind energy facility structures was 4 miles. Because greater sage-grouse response to wind turbines and power lines may be different, we examined acres of affected habitat within 4 miles separately for wind turbines and power lines. For any area within the 4-mile buffer of both wind turbines and power lines, it was classified as a wind turbine buffer. The acreage of greater sage-grouse habitat affected only by power lines was classified as a power line buffer. It was assumed that greater sage-grouse habitats over 4 miles from the wind energy structures and transmission lines would not be affected. For comparing the various alternatives in terms of their indirect impact to greater sage-grouse habitat, potential impacts to greater sage-grouse habitats in relation to their distance from project infrastructure were categorized as very high (0 to 0.5 mile), high (0.5 to 1 mile), moderate (1 to 2 miles), moderate-low (2 to 3 miles), and low (3 to 4 miles). Although there is not sufficient data to determine exactly how far wind energy facility structures may influence greater sage-grouse habitats, use of the categories described above provide a sound framework for comparing greater sage-grouse impacts among the alternatives.

Habitat mapping used for the impact analysis included maps of occupied greater sage-grouse habitat and greater sage-grouse core areas mapped by the WGFD. Greater sage-grouse core areas include areas with the highest densities of breeding greater sage-grouse in the state, as well as identified winter habitat and areas important for connectivity between populations. The core areas include roughly 25 percent of the state but contain 83.1 percent of the greater sage-grouse population in the state. Virtually the entire Application Area is classified as greater sage-grouse habitat, either core or non-core. Research in oil and gas has shown that lek size and persistence can be impacted by energy structures (Naugle et al. 2010). Assuming similar effects may be associated with wind turbines, the number of

greater sage-grouse leks present near each alternative based on mapped locations provided by the WGFD and surveys conducted by WEST (2009a, 2008c) also were evaluated.

Assumptions for the analysis included the following:

- Indirect impacts to greater sage-grouse are highest within 1 mile of project facilities, and generally do not extend beyond 4 miles from project facilities unless migratory populations are present. If present, indirect impacts may extend up to 11 miles from project facilities (Connelly 2000).
- For the purpose of assessing direct impact to greater sage-grouse habitats, initial disturbances were treated the same as long-term disturbances due to the length of time it could take before sagebrush has re-established to pre-disturbance levels on initially disturbed sites, which could be nearly as long as or as long as the life of the project (20 to 30 years);
- The proportion of the entire Application Area disturbed would be related to the potential for greater sage-grouse impacts;
- Direct impacts related to vehicle collisions, increased poaching and harassment were considered to be directly related to the length of new permanent roads;
- Direct impacts (e.g., collisions) as well as indirect impacts associated with new above-ground power lines would be related to the length of new above-ground power lines associated with each alternative; and
- Direct impacts (i.e., collision mortality) would be directly related to the number of wind turbines.

Alternative 1R entails constructing up to 1,000 wind turbines, of which as many as 923 would be in greater sage-grouse habitat (**Figure 4.15-1**). For the purposes of assessing impacts to greater sage-grouse habitat, initial disturbance was treated the same as long-term disturbance due to the length of time it could take before sagebrush becomes re-established to pre-disturbance levels (20 to 30 years). Due to the placement of the turbines outside of the core areas, there are no direct impacts to greater sage-grouse core areas associated with Alternative 1R. For non-core habitat, the lowest direct impacts are associated with Alternative 1R (8,431 acres; **Table 4.15-5**). Under Alternative 1R, direct disturbances (initial and long-term) would occur to 3.8 percent of the Alternative 1R area. Based on the miles of new road required to construct and maintain the project, Alternative 1R has the lowest potential for impact, with 438 miles of new roads and 126 miles of new above ground power lines within the alternative boundary. There are no greater sage-grouse leks within 4 miles of the proposed haul road/transmission lines for Alternative 1R.

Alternative 1R has the highest amount of greater sage-grouse core areas within 0.5 mile of project infrastructure (**Table 4.15-6**), which includes turbines and above-ground power lines (5,052 acres).

Table 4.15-5 Direct Disturbance Impacts (acres) to Greater Sage-grouse Core and Non-core Habitat by Alternative

Alternative	Disturbance Type	Core Area Habitat	Non-core Habitat	Total Greater Sage-grouse Habitat
1R	Initial and Long-term	0	8,431	8,431
2	Initial and Long-term	0	9,383	9,383
3	Initial and Long-term	0	8,846	8,846
4	Initial and Long-term	0	8,972	8,972

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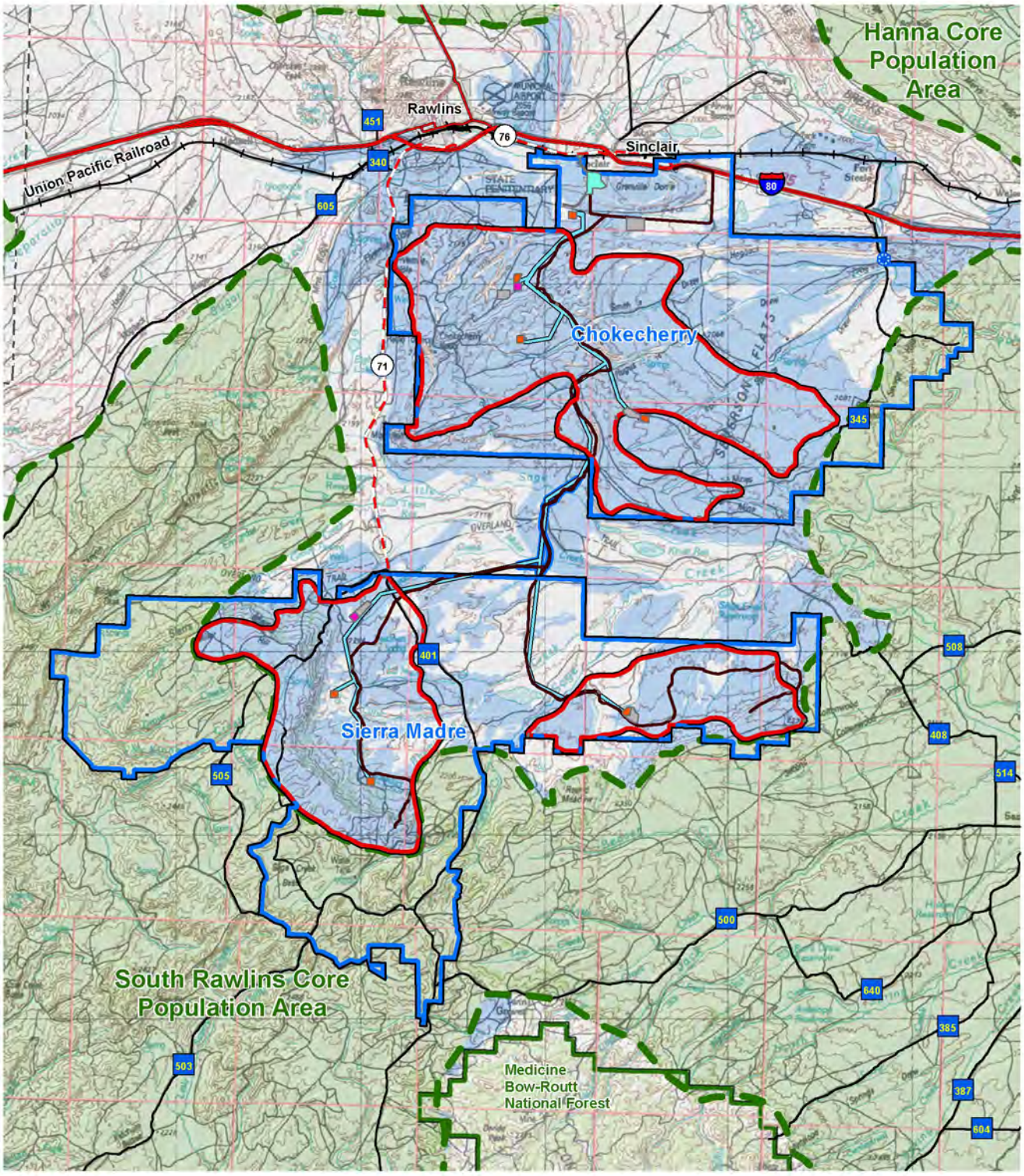

Legend

- Transmission Line
- Haul Road
- Likely Area of Turbine Construction
- Wyoming State Sage-grouse Core Population Area
- BLM Modeled Sage-grouse Nesting/ Brooding Habitat Outside Core Population Area
- Project Area

Project Facilities

- Water Extraction Site
- O&M Building
- Rail Distribution Facility
- Laydown Area (Construction Only)
- Substation
- National Forest

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.15-1

Location of Project Infrastructure associated with Alt. 1R in relation to Greater Sage-grouse Habitat

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

Table 4.15-6 Acres of Greater Sage-grouse Habitat and Numbers of Greater Sage-grouse Leks within Varying Distances (miles) of Wind Turbines by Alternative

Alternative	0 – 0.5	0.5 – 1	1 – 2	2 – 3	3 – 4	Total (0 – 4)
	Greater Sage-grouse Core Habitat					
1R	5,052	10,192	30,048	37,662	44,511	127,465
2	4,169	9,302	25,304	32,994	42,571	114,340
3	2,560	6,649	18,052	25,388	36,849	89,498
4	3,559	10,684	29,361	37,986	44,786	126,376
No Action	0	0	0	0	0	0
	Greater Sage-grouse Non-core Habitat					
1R	104,868	33,445	49,570	42,696	22,436	253,015
2	119,882	37,256	52,017	42,458	21,901	273,514
3	119,967	35,471	53,832	41,906	21,622	272,799
4	137,628	39,019	46,900	27,879	18,796	270,222
No Action	0	0	0	0	0	0
	Greater Sage-grouse Leks					
1R	13	6	6	4	8	37
2	3	14	4	5	8	34
3	4	13	2	2	6	27
4	10	8	4	5	7	34
No Action	0	0	0	0	0	0

However, this alternative also has the least amount of non-core habitat within 0.5 mile (104,868 acres). Within 4 miles of project infrastructure, Alternative 1R has 127,465 acres of core and 253,015 acres of non-core habitat, or 380,480 acres of greater sage-grouse habitat. Alternative 1R has 19 greater sage-grouse leks present within 1 mile of project infrastructure (**Tables 4.15-6** and **4.15-7**).

Because greater sage-grouse core habitat is considered the most important habitat in the Area, and because the number of leks is highly correlated with presence of core area habitat, we ranked the potential impact on greater sage-grouse for each of the four alternatives based on how many acres of greater sage-grouse core habitat was present within 1 mile of wind turbines and power lines combined, as we assumed that the highest potential for indirect impacts would occur within 1 mile of project facilities. Based on this ranking, Alternative 1R had the second highest potential impact, with 15,244 acres of core area present within 1 mile of project infrastructure (**Tables 4.15-6** and **4.15-7**). The long-term loss of substantial amounts of sagebrush in non-core areas, combined with expansive areas of potential indirect impacts to both core and non-core habitat during construction and operation of the facility, could result in habitat loss and disturbance levels exceeding all five significance criteria.

As described in **Appendix C**, **Table C-2**, PCW has committed to no development inside greater sage-grouse Core Areas. In addition, PCW must also follow all stipulations in Wyoming Governor's EO 2011-5 pertaining to development in non-core areas. PCW is currently conducting an extensive study of greater sage-grouse use of the Application Area through lek counts and radio-telemetry studies of both male and female greater sage-grouse to evaluate habitat use and demographic parameters in the Application Area. The results of this research will be used to locate infrastructure to avoid and minimize impacts to

Table 4.15-7 Acres of Greater Sage-grouse Habitat and Numbers of Greater Sage-grouse Leks within Varying Distances (miles) of Transmission Lines (exclusive of 4-mile wind turbine buffers) by Alternative

Alternative	0 – 0.5	0.5 – 1	1 – 2	2 – 3	3 – 4	Total (0 – 4)
	Greater Sage-grouse Core Habitat					
1R	0	0	0	0	0	0
2	0	0	752	1,943	3,427	6,122
3	0	0	317	1,908	3,492	5,717
4	0	0	0	1,375	5,171	6,546
No Action	0	0	0	0	0	0
	Greater Sage-grouse Non-core Habitat					
1R	0	0	0	0	1,565	1,565
2	0	0	0	0	4,254	4,254
3	0	0	0	0	4,254	4,254
4	0	0	0	0	4,254	4,254
No Action	0	0	0	0	0	0
	Greater Sage-grouse Leks					
1R	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
No Action	0	0	0	0	0	0

greater sage-grouse. In addition, results of this research will be used to develop mitigation measures to compensate for impacts. For example, results of the telemetry studies will be used to determine high use areas, and fences in these areas will either be removed or marked to make them more visible to greater sage-grouse. Other conservation measures proposed by PCW include placing bird diverters on met towers, placing escape ramps in water tanks, improving habitat (i.e., burned area rehabilitation, water improvement projects, agricultural field enhancements, removal of unnecessary roads, noxious weed control), suspension of hunting on TOTCO Ranch lands, and predator control (PCW 2012), These avoidance, minimization and mitigation measures, combined with timing restrictions to avoid or minimize impacts to breeding, nesting, and brood-rearing habitats during construction of the project, could result in impacts that do not exceed significance criteria. If long-term monitoring indicates impacts to greater sage-grouse that exceed significance criteria are occurring, further mitigation would be developed in consultation with the BLM, USFWS, and WGFD to offset identified impacts. This mitigation may include additional on-site as well as off-site measures.

The boundary for the Alternative 1R area would include 9,998 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 1,285 acres of the Red Rim-Grizzly WHMA. Based on PCW's ACM not to site facilities within greater sage-grouse core areas (**Appendix C**, **Table C-2**) and the conceptual layout, the potential initial (305 acres) and long-term (50 acres) disturbance within the Upper Muddy Creek

Watershed/Grizzly WHMA would equal 0.5 percent and 0.08 percent, respectively, of the entire WHMA. The initial (68 acres) and long-term (11 acres) disturbance within the Red Rim-Grizzly WHMA based on the conceptual layout would be 0.2 percent and 0.13 percent acres, respectively, of the Grizzly area of the WHMA. It is not likely that the inclusion of this area would result in any indirect impacts to the greater sage-grouse beyond what has been described above.

Mountain Plover

Potential impacts to mountain plover include disturbance during breeding periods, the loss of nesting and brood-rearing habitat, and mortality from turbines and vehicle collisions. According to the environmental constraints table (**Appendix C**, **Table C-1**) the following protective measures apply to mountain plovers located on BLM lands: 1) habitat will be avoided where practical; 2) all surface-disturbing activities will be restricted from April 10 to July 10; and 3) additional protection measures will be applied if the area is determined to be within occupied habitat. Because of a lack of research, it is not possible to predict the level of direct mortality potentially associated with each alternative. However, it can reasonably be assumed that those alternatives that have the greatest length of roads also would likely have the highest level of collision mortality and other direct impacts.

Habitat mapping for mountain plovers within a portion of the Application Area was conducted in 2008 (WEST 2008d). During these surveys 37 mountain plovers were identified within the Chokecherry area and a total of 7,056 acres suitable habitat for mountain plovers were identified within the Application Area. However, the surveys did not encompass the entire Application Area therefore the analysis for direct impacts to potential habitat was conducted utilizing the vegetation map presented in Section 4.11. Direct impacts were evaluated by overlaying the potential disturbance zone over the vegetation map to determine the number of acres impacted both initial and long-term for each alternative. The vegetation types considered potential habitat for mountain plovers are presented in **Table 4.15-8**.

Table 4.15-8 Vegetation Types Considered Potential Habitat for Mountain Plover

Grassland	Saltbush
Grassland/Bird's Foot Sagebrush	Saltbush/Goldenweed
Grassland/Mountain Big Sagebrush	Saltbush/Mountain Big Sagebrush/Spiny Horsebrush
Grassland/Saltbush	Saltbush/Spiny Horsebrush
Grassland/Wyoming Big Sagebrush	

Assumptions for the analysis included the following:

- For estimating impacts to mountain plover through loss of habitat, we assumed that the total acreage of initial and long-term impacts associated with each alternative are correlated with mountain plover impacts.
- Direct impacts related to vehicle collisions as well as indirect impacts associated with vehicle disturbance were considered to be directly related to the length of new permanent road.

To protect potential mountain plover habitat, prior to any surface disturbance, a presence/absence survey for active mountain plover nests will be conducted in all potential habitat within the area proposed for surface disturbance. Surveys are to be performed by a wildlife biologist familiar with mountain plover and their associated habitat. If evidence of mountain plovers is found during the preconstruction survey, then additional stipulations may apply (BLM 2009a).

Alternative 1R has the lowest initial and long-term direct impacts (1,386 acres and 281 acres, respectively) to mountain plover habitat. The environmental constraints discussed in Section 2.2, under mountain plover (avoidance, seasonal stipulations, and additional protective measures) and presented in **Appendix C**, **Table C-1** would be adhered to on BLM land. Because mountain plover habitat consists primarily of grass species, it is anticipated that the initial impacts would recover quickly, assuming adequate precipitation follows the disturbance.

Indirect impacts from the presence of human activity under Alternative 1R would be similar to Alternatives 2 and 3 as each alternative is designed to construct up to 1,000 turbines and infrastructure associated with the project. Alternative 1R would construct the least amount of new roads within mountain plover habitat (92 miles) which potentially would result in some fatalities of mountain plovers through vehicle collisions.

Populations of mountain plovers at the Foote Creek Rim wind-energy facility in Wyoming declined during construction but have slowly increased since, although not to the same level present prior to construction. It is not known if the initial decline or subsequent increase was due to presence of the wind energy facility or to regional changes in mountain plover populations, as similar declines at a reference area occurred during the study. Nevertheless, some mountain plovers have apparently become habituated to the turbines, as 11 of 28 nests found during surveys (39 percent) were located within 246 feet of turbines (Young et al. 2008). Similarly, TRC Corporation (2009) examined displacement of mountain plovers at the Judith Gap wind energy facility in Montana and found that it did not appear that construction and operation of the facility had any documented displacement impacts on the occurrence of mountain plovers. Based on results of these studies, the USFWS, in their decision not to propose mountain plover for listing under the ESA (USFWS 2011), concluded that wind energy facilities do not pose a significant threat to this species. However, more data are required before definitive conclusions can be made regarding impacts of wind energy development on mountain plover.

Northern Leopard Frog

There are three habitat types to consider for the northern leopard frog: breeding and tadpole habitat, adult upland habitat, and overwintering sites (Smith and Keinath 2004). Breeding and tadpole habitat in Wyoming generally consists of ponds that are less than 12 acres and have extensive cattail margins. The adult upland habitat is characterized as herbaceous grasslands (NatureServe 2010; Smith and Keinath 2004) and adults are known to move as far as 5.2 km from the breeding pond (Smith and Keinath 2004). Overwintering sites consist of under water in ponds, streams and rivers. Potential impacts to this species include: 1) direct habitat loss; 2) habitat alteration; and 3) inadvertent mortalities from vehicle collisions.

To assess potential direct impacts to breeding and upland habitats, ponds less than 12 acres that occur within grassland vegetation types were identified and a buffer of 3.2 miles was applied. Then the initial and long-term potential disturbance zone for each alternative was overlaid and the number of potentially affected acres calculated. Potential affects resulting from habitat alteration would be related to degradation of surface waters, which was analyzed in Section 4.13. Fatalities from vehicular collision were evaluated based on the length of roads associated with each alternative within the 3.2 miles buffer.

Assumptions for this analysis included the following:

- Northern leopard frog habitat consists of ponds less than 12 acres within grassland habitats;
- Habitats included in the analysis were the grassland vegetation types and wet meadow identified in the map prepared for the vegetation analysis; and
- Direct impacts related to vehicle collisions were considered to be directly related to the length of new roads.

Alternative 1R potentially would impact the greatest amount of ponds both initially (seven ponds) and long-term (four ponds) that are considered suitable habitat for northern leopard frogs. Alternative 1R has the lowest initial and long-term direct impacts (6,697 acres and 1,462 acres, respectively) on northern leopard frog upland habitat within 3.2 miles of a suitable pond. According to the analysis conducted for general amphibians in Section 4.14, potential impacts to the aquatic habitat would result from surface disturbance and possible contamination from construction equipment. Surface disturbance likely would result in increased erosion and runoff causing changes to the quantity and quality of the aquatic habitats. The percent of surface disturbance within a sub-watershed was used as the indicator for the resulting increase in erosion and runoff. Under Alternative 1R, surface disturbance within the sub-watersheds ranged from less than 0.1 to 4.8 percent during construction phase and less than 0.1 to 1.0 percent during operation. The application of BMPs and ACMs will minimize the potential impacts resulting from increased erosion and runoff. Potential contamination of the aquatic habitat from construction equipment is not anticipated based on the establishment of the project's SPCC Plan.

New road construction increases the potential for inadvertent mortality through vehicle collision and general disturbance resulting from increased human activity. This alternative would construct the least amount of new roads (420 miles) in upland habitat within 3.2 miles of a suitable pond. Alternative 1R would result in five perennial and 344 ephemeral road-stream crossings resulting in the fragmentation and potential for direct mortalities.

Sensitive Fish

The Colorado River cutthroat trout, roundtail chub, bluehead sucker, and flannelmouth sucker occur within the following sub-watershed basins that have some portion of their drainage within the boundary of Alternative 1R: Little Savery; Muddy Creek-Littlefield Creek; and, McKinney Creek (**Table 3.14-6**). Only a small portion of the Little Savery and Muddy Creek-Littlefield Creek sub-watershed drainages intersect with the Alternative 1R area and no infrastructure would be constructed or stream crossings would occur within these two sub-watersheds. Section 4.14.3.6 discusses potential impacts to fish under Alternative 1R within the McKinney Creek sub-watershed. These impacts would be applicable to the BLM sensitive fish species. Under Alternative 1R, McKinney Creek sub-watershed would have the greatest amount of initial (530 acres, or 1.7 percent of the sub-watershed) and long-term (86 acres, or 0.3 percent of the sub-watershed) surface disturbance among the alternatives (**Table 4.13-2**). Also under Alternative 1R, 10 ephemeral and no perennial road-stream crossings would occur within the McKinney Creek sub-watershed (**Table 4.13-2**). As discussed in Section 4.14.3.6 new roads and construction of other facilities have been demonstrated to increase sedimentation that can have a variety of ecological impacts to fish habitat such as a change in channel depth, pool-to-riffle ratio, percent fines in substrates, and cover availability (Angermeier et al. 2004). Based on the current conceptual layout for Alternative 1R, project development will generally be concentrated in higher-altitude upland areas away from streams and reservoirs with the exception of road-stream crossings. However, the 2008 Rawlins RMP (BLM 2008a) does require that any road crossing any waterbody that potentially supports fish for a portion of the year will be designed to simulate natural stream process, thus allowing fish passage potentially reducing the impacts.

Sensitive Plants

Based on the predictive model of the potential distribution of the six BLM sensitive plants (Fertig and Thurston 2003), two species, Cedar Rim thistle and Gibben's beardtongue, are not likely to be found in the Alternative 1R boundary, therefore impacts to these species are unlikely.

Persistent sepal yellowcress is most likely to be impacted based on both the predictive model and known occurrence. The model predicts areas of high (309 acres), medium (33 acres), and low (8 acres) probability of potential habitat in the Alternative 1R boundary that would be disturbed during project construction. High, medium, and low probability depends on the variables used in the model that are different for each species. The likelihood of impacting potential habitat (350 acres) is lowest under

Alternative 1R than any other alternative. Some of the area disturbed during construction would be only initial disturbance; the remainder would be long-term operational impacts. According to the model, 148 acres of high probability potential habitat, 11 acres of medium probability potential habitat, and 3 acres of low probability potential habitat would be disturbed long-term. Alternative 1R would result in the least amount of initial and long-term potential impacts to potential habitat for persistent sepal yellowcress.

According to the model, one other BLM sensitive plants could be impacted under Alternative 1R, Laramie false sagebrush. During construction, 73 acres of medium probability potential habitat for Laramie false sagebrush would be impacted. Of that temporary disturbance, 14 acres of medium probability potential habitat for Laramie false sagebrush would be impacted long term during operation of the project. Alternative 1R would result in the greatest amount of initial and long-term potential impacts to potential habitat for Laramie false sagebrush.

4.15.3 Impacts to Special Status Species from Alternative 2

Under Alternative 2, the types of impacts on special status species would be similar to Alternative 1R; however, the amount and location of habitat disturbance would differ. The location of infrastructure under Alternative 2 would be compressed into the northern portion of the Sierra Madre area and expanded to the east within the Chokecherry area. Potential impacts from the increase in surface disturbance and the shift in location unique to Alternative 2 are presented below.

4.15.3.1 Federally Listed Species

Wyoming Species

Black-footed Ferret

Potential impacts to black-footed ferret from this alternative include: 1) direct loss of habitat resulting from the construction of roads and turbine pads within portions of prairie dog towns present at the site; 2) indirect loss of habitat due to avoidance of human activity; 3) increased traffic on roads and human activity may result in prairie dog, and potentially black-footed ferrets fatalities; and 4) increased human activity may increase the presence of pets, which potentially could result in the introduction of canine distemper.

Alternative 2 would result in the least initial (75 acres) and long-term (17 acres) direct loss of white-tailed prairie dog habitat. An estimated 5 miles of new roads would be constructed under Alternative 2 within white-tailed prairie dog towns increasing the potential for wildlife-vehicle collisions. The amount of new roads would be the least among the alternatives.

Similar to Alternative 1R, Alternative 2 would construct up to 1,000 turbines and which would lead to an increase of human activity which could result in the presence of dogs on site with personnel associated with the project. The presence of dogs could lead to expose the area to canine distemper which is a fatal disease for black-footed ferret.

As with Alternative 1R, surveys for black-footed ferrets would be required before ground disturbing activities within white-tailed prairie dog colonies located in the Bolten Ranch Prairie Dog Complex. The remaining white-tailed prairie dog colonies within the project are in the “block clearance” area, where surveys for black-footed ferrets are not warranted.

Rare Plants

Based on the predictive model of the potential distribution of Ute ladies’-tresses and Colorado butterfly plant (Fertig and Thurston 2003), potential habitat for both of these species is not likely to be found in the Alternative 2 boundary, therefore impacts to either species is unlikely. Surveys will be required in

appropriate habitat prior to construction once final siting of project facilities is complete to ensure that impacts to these species do not occur.

Platte River System Species

Under Alternative 2, impacts associated with water depletions would be the same as discussed for Alternative 1R, although the amount of water used would be 51 acre-feet greater (total of 604 acre-feet) under Alternative 2. This is the greatest amount of water use among the alternatives.

Colorado River System Species

Under Alternative 2, impacts associated with water depletions would be the same as discussed for Alternative 1R, although the amount of water used would be 5 acre-feet greater (total of 60 acre-feet) under Alternative 2. This is the greatest amount of water use among the alternatives.

4.15.3.2 BLM Sensitive Species

Pygmy Rabbit

Potential impacts to pygmy rabbits include: 1) direct loss of habitat; 2) indirect loss of habitat, including displacement due to increased traffic on roads and human activity; and 3) inadvertent mortalities due to increased traffic on roads and human activity.

Alternative 2 would have the greatest (7,775 acres) direct impact to areas identified as having some probability of pygmy rabbit occurrence. Most of the loss (5,924 acres) would occur within areas classified as having a low probability of occurrence according to the WYNDD predictive model (**Table 4.15-9**).

Table 4.15-9 Pygmy Rabbit Probability Model for Alternative 2

	Low Probability of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)	Very High Probability of Occurrence (acres)
Potential Disturbance	5,924	1,378	473	0.05

The direct loss of Wyoming big sagebrush would be 1,831 acres under Alternative 2, which would be the greatest loss among alternatives. Indirect impacts from the presence of human activity under Alternative 2 would be similar to Alternatives 1R and 3 as each alternative is designed to construct up to 1,000 turbines and infrastructure associated with the project. Indirect impacts may result in reduced populations and species abundance. However, Alternative 2 would construct 483 miles of new roads which is the second highest amount among alternatives. The new road construction would potentially result in some fatalities of pygmy rabbits through vehicle collisions.

White-tailed Prairie Dog

Potential impacts to white-tailed prairie dogs include: 1) direct loss of habitat; 2) indirect loss of habitat; and 3) increased traffic on roads and human activity potentially resulting in prairie dog fatalities.

Alternative 2 would have a direct loss of 75 acres of initial disturbance and 17 acres of long-term disturbance of white-tailed prairie dog habitat. Indirect impacts from the presence of human activity under Alternative 2 would be similar to Alternatives 1R and 3 as each alternative is designed to construct up to 1,000 turbines and infrastructure associated with the project. Indirect impacts may result in reduced populations and species abundance. An estimated 5 miles of new roads would be constructed under Alternative 2 within white-tailed prairie dog, which would be the least among the alternatives. The new

road construction would potentially result in some fatalities of white-tailed prairie dogs through vehicle collisions and increased poaching.

Wyoming Pocket Gopher

The potential impacts to Wyoming pocket gopher include: 1) direct loss of habitat; 2) indirect loss of habitat; and 3) increased traffic on roads and human activity resulting in Wyoming pocket gopher fatalities.

Alternative 2 would have the greatest (7,774 acres) direct impact to areas identified as having some probability of Wyoming pocket gopher occurrence. Most of the loss (4,906 acres) would occur in areas classified as having a high probability of occurrence according to the WYNDD predictive model (**Table 4.15-10**).

Table 4.15-10 Wyoming Pocket Gopher Probability Model for Alternative 2

	Absent (acres)	Absent (Marginal) of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)
Potential Disturbance	0.9	63	2,804	4,906

Indirect impacts from the presence of human activity under Alternative 2 would be similar to Alternatives 1R and 3 as each alternative is designed to construct up to 1,000 turbines and infrastructure associated with the project. Indirect impacts may result in reduced populations and species abundance. However, Alternative 2 would construct 483 miles of new roads, which is the second highest amount among alternatives. The new road construction would potentially result in some fatalities of Wyoming pocket gophers through vehicle collisions.

Columbian Sharp-tailed Grouse

Similar to Alternative 1R, no Columbian sharp-tailed grouse leks have been documented within the Application Area or within a 1-mile buffer of the Application Area. Therefore, it is anticipated Alternative 2 would not have any impacts on Columbian sharp-tailed grouse.

Greater Sage-grouse

Impacts to greater sage-grouse under Alternative 2 include direct impacts through collisions with wind turbines and power lines, as well as direct loss of habitat due to ground disturbance activities, indirect loss of habitat due to displacement from wind energy facilities, power lines, and habitat fragmentation.

Alternative 2 involves constructing up to 1,000 wind turbines in the checkerboard portions of the ranch only, where as many as 894 would be located in greater sage-grouse habitat (**Figure 4.15-2**). Similar to Alternative 1R, there would be no direct impacts to greater sage-grouse core areas. Alternative 2 would result in direct impacts to 9,383 acres of non-core habitat (**Table 4.15-5**), which is the greatest acreage of any alternative. Under Alternative 2, direct disturbances (initial and long-term) would occur to 5.0 percent of the Application Area. Alternative 2 would entail construction of 483 miles of new road and 143 miles of new aboveground power line within the project boundary. No leks are present within one mile of either the haul road or transmission lines, although two leks are present between 1 to 2 miles of both the haul road and transmission lines.

Alternative 2 has 4,169 acres of greater sage-grouse core area within 0.5 mile of project infrastructure. This alternative also has 119,882 acres of non-core habitat within 0.5 mile. Within 4 miles of project

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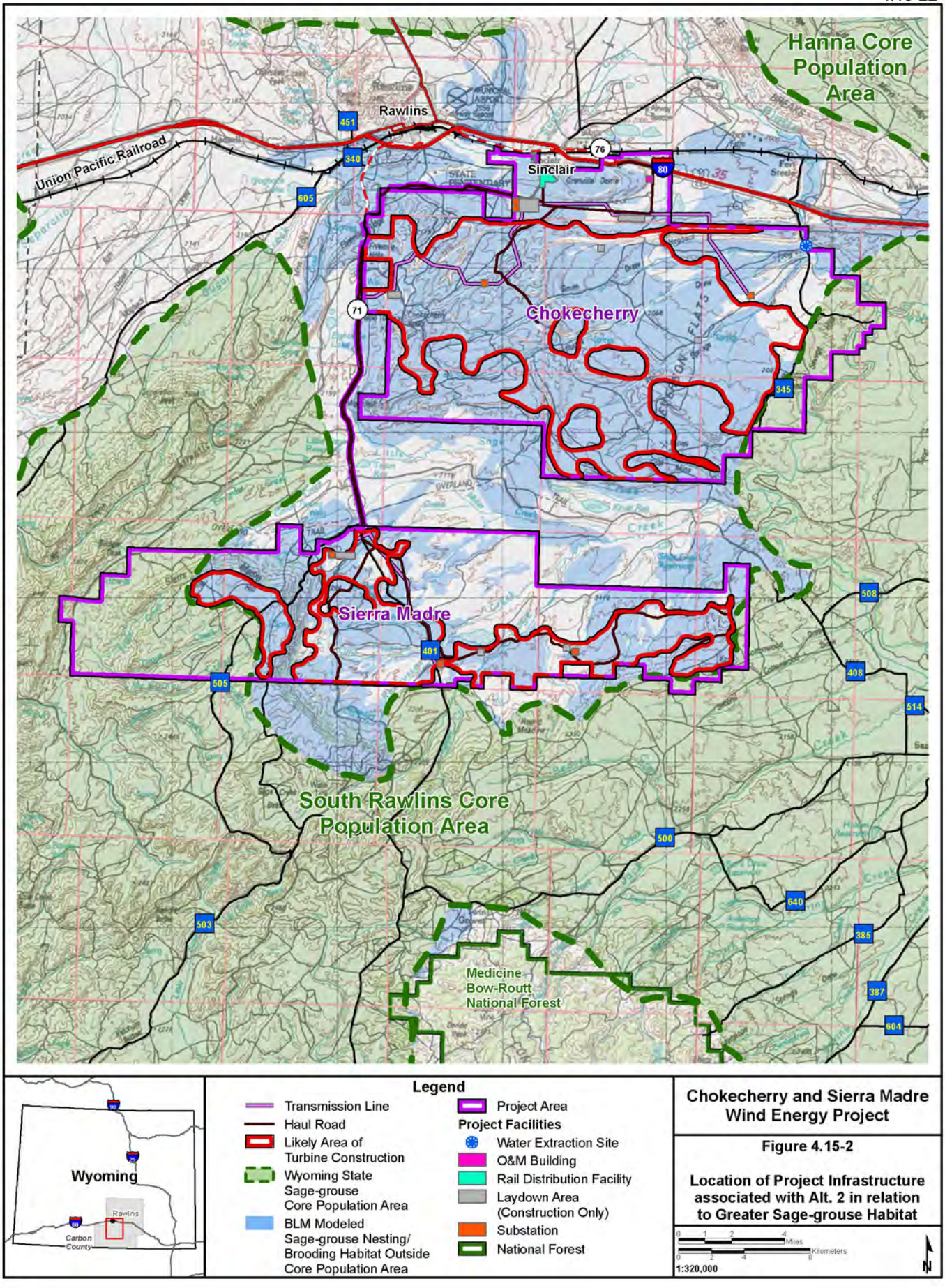

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.15-2

Location of Project Infrastructure associated with Alt. 2 in relation to Greater Sage-grouse Habitat

infrastructure, Alternative 2 has 114,340 acres of core and 273,514 acres of non-core habitat, or 387,854 acres of greater sage-grouse habitat (**Tables 4.15-6** and **4.15-7**).

Alternative 2 has 17 greater sage-grouse leks present within 1 mile of project infrastructure (**Table 4.15-6**). There also are 13,471 acres of core area present within 1 mile of project infrastructure (**Tables 4.15-6** and **4.15-7**). The long-term loss of substantial amounts of sagebrush in non-core areas, combined with expansive areas of potential indirect impacts in both core and non-core habitat during construction and operation of the facility, would result in habitat loss and disturbance levels exceeding all five significance criteria. However, the greater sage-grouse research and avoidance, minimization and mitigation measures developed by PCW to reduce impacts to greater sage-grouse could result in impacts that do not exceed significance criteria.

The boundary for the Alternative 2 area would include 7,440 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 12 acres of the Red Rim-Grizzly WHMA. Based on PCW's ACM not to site facilities within greater sage-grouse core areas (**Appendix C**, **Table C-2**) and the conceptual layout, the potential initial (166 acres) and long-term (26 acres) disturbance within the Upper Muddy Creek Watershed/Grizzly WHMA would equal 0.3 percent and 0.04 percent, respectively, of the entire WHMA. There would be no disturbance within the Red Rim-Grizzly WHMA under Alternative 2. It is not likely that the inclusion of this area would result in any indirect impacts to the greater sage grouse beyond what has been described above.

Mountain Plover

Potential impacts to mountain plover include direct loss of habitat, disturbance during the breeding period, the loss of nesting and brood-rearing habitat, and mortality from turbines and vehicle collisions.

Alternative 2 would result in the direct loss of approximately 1,765 acres for the initial disturbance and 301 acres for long-term disturbance of mountain plover habitat, which is greater than Alternative 1R. Similar to Alternative 1R, BLM environmental constraints discussed in Section 2.2 and presented in **Appendix C**, **Table C-1** under mountain plover would be adhered to on BLM lands. This alternative would construct the second lowest amount (104 miles) of new roads within mountain plover habitat, thus increasing the potential for wildlife-vehicle collisions.

Northern Leopard Frog

Potential impacts to northern leopard frog include direct loss of aquatic and upland habitat, potential degradation of aquatic habitats through erosion and runoff, and mortalities from wildlife-vehicle collisions.

Alternative 2 would potentially impact six ponds initially that are considered suitable habitat for northern leopard frogs and only one pond long-term, which is less than Alternative 1R. Alternative 2 would potentially result in the direct loss of approximately 7,519 acres of initial disturbance and 1,565 acres for long-term disturbance on northern leopard frog upland habitat within 3.2 miles of a suitable pond, which is the greatest amount of potential disturbance among the alternatives. According to the analysis general amphibians in Section 4.14, potential impacts to the aquatic habitat would result from surface disturbance and possible contamination from construction equipment. Under Alternative 2, surface disturbance within the sub-watersheds would range from less than 0.1 to 7.8 percent during construction phase and less than 0.1 to 1.1percent during operation, which is slightly higher than Alternative 1R. The application of BMPs and ACMs will minimize the potential impacts resulting from increased erosion and runoff. Potential contamination of the aquatic habitat from construction equipment is not anticipated based on the establishment of the project's SPCC Plan.

New road construction increases the potential for inadvertent mortality through vehicle collision and general disturbance resulting from increased human activity. This alternative would construct 464 miles of new roads in upland habitat within 3.2 miles of a suitable pond. Alternative 2 would result in 11 perennial and 520 ephemeral road-stream crossings, resulting in habitat fragmentation and the potential

for direct mortalities. Both the potential direct habitat loss and the amount of new road construction within the habitat would be the greatest amount among all alternatives.

Sensitive Fish

The boundary of Alternative 2 does not include any portion of the Little Savery or Muddy Creek-Littlefield Creek sub-watersheds. Under Alternative 2, McKinney Creek sub-watershed would have the second highest amount of initial (371 acres, or 1.2 percent of the sub-watershed) and long-term (61 acres, or 0.2 percent of the sub-watershed) surface disturbance among the alternatives (**Table 4.13-2**). Similar to Alternative 1R, 10 ephemeral and no perennial road-stream crossings would occur within the McKinney Creek sub-watershed (**Table 4.13-2**). As discussed in Section 4.14.3.6, new roads and construction of other facilities have been demonstrated to increase sedimentation that can have a variety of ecological impacts to fish habitat such as a change in channel depth, pool-to-riffle ratio, percent fines in substrates, and cover availability (Angermeier et al. 2004). Based on the current conceptual layout for Alternative 2, project development will generally be concentrated in higher-altitude upland areas away from streams and reservoirs with the exception of road-stream crossings. However, the 2008 Rawlins RMP (BLM 2008) does require that any road crossing any waterbody that potentially supports fish for a portion of the year will be designed to simulate natural stream process, thus allowing fish passage potentially reducing the impacts. Section 4.14.4.5 discusses the potential impacts from Alternative 2 to fish species within the McKinney sub-watershed.

Sensitive Plants

Based on the predictive model of the potential distribution of the six BLM sensitive plants (Fertig and Thurston 2003), two species, Cedar Rim thistle and Gibben's beardtongue, are not likely to be found in the Alternative 2 boundary, therefore impacts to these species are unlikely.

Persistent sepal yellowcress is most likely to be impacted based on both the predictive model and known occurrence. The likelihood of impacting potential habitat (612 acres) is higher than under Alternative 1R, but less than Alternatives 3 and 4. The model predicts areas of high (498 acres), medium (103 acres), and low (11 acres) probability of potential habitat in the study area that could be disturbed during project construction. Some of the area disturbed during construction would be initial disturbance; the remainder would be long-term operational impacts. According to the model, 170 acres of high probability potential habitat, 14 acres of medium probability potential habitat, and 3 acre of low probability potential habitat would be disturbed long-term.

According to the model, one other BLM sensitive plants could be impacted under Alternative 2, Laramie false sagebrush. During construction, 53 acres of medium probability potential habitat for Laramie false sagebrush would be impacted. Of that initial disturbance, 9 acres of medium probability potential habitat for Laramie false sagebrush would be impacted long term during operation of the project. As with persistent sepal yellowcress, the likelihood of impacting potential habitat is less than under Alternative 1R for Laramie false sagebrush.

4.15.4 Impacts to Special Status Species from Alternative 3

4.15.4.1 Federally Listed Species

Under Alternative 3 infrastructure would not occur within the Miller Hill or southern portion of Sierra Madre, but would increase construction in the eastern portion of the Sierra Madre area. Development in the Chokecherry area would be the same as Alternative 2. Potential impacts from the increase in surface disturbance and the shift in location unique to Alternative 3 are presented below.

Wyoming Species

Black-footed Ferret

Potential impacts to black-footed ferret from this alternative include: 1) direct loss of habitat resulting from the construction of roads and turbine pads within portions of prairie dog towns present at the site; 2) indirect loss of habitat due to avoidance of human activity; 3) increased traffic on roads and human activity may result in prairie dog, and potentially black-footed ferrets fatalities; and 4) increased human activity may increase the presence of human pets, which potentially could result in the introduction of canine distemper.

Alternative 3 would result in an initial direct loss of 97 acres and a long-term direct loss of 34 acres of white-tailed prairie dog habitat. The potential initial and long-term direct loss of habitat would be similar to Alternative 1R, more than Alternative 2, and less than Alternative 4. An estimated 6 miles of new roads would be constructed under Alternative 3 within white-tailed prairie dog towns increasing the potential for wildlife-vehicle collisions. The amount of new roads is slightly less than Alternative 1R and Alternative 4, but greater than Alternative 2. Similar to Alternative 1R, Alternative 3 would construct up to 1,000 turbines and which would lead to an increase of human activity which could result in the presence of dogs on site with personnel associated with the project. The presence of dogs could lead to expose the area to canine distemper which is a fatal disease for black-footed ferret.

As with all action alternatives, surveys for black-footed ferrets would be required before ground disturbing activities within white-tailed prairie dog colonies located in the Bolten Ranch Prairie Dog Complex. The remaining white-tailed prairie dog colonies within the project are in the “block clearance” area, where surveys for black-footed ferrets are not warranted.

Rare Plants

Based on the predictive model of the potential distribution of Ute ladies’-tresses and Colorado butterfly plant (Fertig and Thurston 2003), potential habitat for both of these species is not likely to be found in the Alternative 3 boundary, therefore impacts to either species is unlikely. Surveys will be required in appropriate habitat prior to construction once final siting of project facilities is complete to ensure that impacts to these species do not occur.

Platte River System Species

Under Alternative 3, impacts associated with water depletions would be the same as discussed for Alternative 1R, although the amount of water used would be 24 acre-feet greater (total of 577 acre-feet) under Alternative 3. This would be the second lowest, after Alternative 1R, amount of water use among the alternatives.

Colorado River System Species

Under Alternative 3, construction would not occur in the White-Yampa River Basin, thus no impacts associated with water depletions would occur.

4.15.4.2 BLM Sensitive Species

Pygmy Rabbit

Potential impacts to pygmy rabbits include: 1) direct loss of habitat; 2) indirect loss of habitat, including displacement due to increased traffic on roads and human activity; and 3) inadvertent mortalities due to increased traffic on roads and human activity.

Alternative 3 would potentially result in a direct loss of 7,359 acres identified as having some probability of pygmy rabbit occurrence. Most of the loss (5,404 acres) would occur within areas classified as having

a low probability of occurrence according to the WYNDD predictive model (**Table 4.15-11**). This amount of loss would be greater than Alternative 1R but less than Alternative 2 and 4.

The direct loss of Wyoming big sagebrush would be 1,444 acres under Alternative 3, which is greater than Alternative 1R and less than Alternative 2 but similar to Alternative 4. Indirect impacts from the presence of human activity under Alternative 3 would be similar to Alternatives 1R and 2 as each alternative is designed to construct up to 1,000 turbines and infrastructure associated with the project.

Table 4.15-11 Pygmy Rabbit Probability Model for Alternative 3

	Low Probability of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)	Very High Probability of Occurrence (acres)
Potential Disturbance	5,404	1,507	448	0.02

Indirect impacts may result in reduced populations and species abundance. However, Alternative 3 would construct 460 miles of new roads, which is the second lowest amount among alternatives. The new road construction would potentially result in some fatalities of pygmy rabbits through vehicle collisions.

White-tailed Prairie Dog

Potential impacts to white-tailed prairie dogs include: 1) direct loss of habitat; 2) indirect loss of habitat; and 3) increased traffic on roads and human activity potentially resulting in prairie dog fatalities.

Alternative 3 would have a direct loss of 97 of initial disturbance and 34 acres of long-term disturbance acres of white-tailed prairie dog habitat. Indirect impacts from the presence of human activity under Alternative 3 would be similar to Alternatives 1R and 2 as each alternative is designed to construct up to 1,000 turbines and infrastructure associated with the project. Indirect impacts may result in reduced populations and species abundance. However, Alternative 3 would construct 6 miles of new roads within potential white-tailed prairie dog habitat. The new road construction would potentially result in some fatalities of white-tailed prairie dogs through vehicle collisions. The loss of habitat from construction would be greater than Alternative 1R and 2, but the amount of new road construction within potential habitat would be slightly less than Alternative 1R and 4 but greater than Alternative 2.

Wyoming Pocket Gopher

The potential impacts to Wyoming pocket gopher include: 1) direct loss of habitat; 2) indirect loss of habitat; and 3) increased traffic on roads and human activity resulting in Wyoming pocket gopher fatalities.

Alternative 3 would potentially have a direct loss of 7,357 acres identified as having some probability of Wyoming pocket gopher occurrence. Most of the loss (4,255 acres) would occur in areas classified as having a high probability of occurrence according to the WYNDD predictive model (**Table 4.15-12**). This amount of loss would be greater than Alternative 1R but less than Alternatives 2 and 4.

Indirect impacts from the presence of human activity under Alternative 3 would be similar to Alternatives 1R and 2 as each alternative is designed to construct up to 1,000 turbines and infrastructure associated with the project. Indirect impacts may result in reduced populations and species abundance. However, Alternative 3 would construct 460 miles of new roads, which is the second lowest amount among alternatives. The new road construction would potentially result in some fatalities of Wyoming pocket gophers through vehicle collisions.

Columbian Sharp-tailed Grouse

Similar to Alternatives 1R and 2, no Columbian sharp-tailed grouse leks have been documented within the alternative boundaries or within a 1-mile buffer of the Application Area. Therefore, it is anticipated Alternative 3 would not have any impact on Columbian sharp-tailed grouse.

Table 4.15-12 Wyoming Pocket Gopher Probability Model for Alternative 3

	Absent (acres)	Absent (Marginal) of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)
Potential Disturbance	0.3	66	3,036	4,255

Greater Sage-grouse

Impacts to greater sage-grouse under Alternative 3 include direct impacts through collisions with wind turbines and power lines, as well as direct loss of habitat due to ground disturbance activities, indirect loss of habitat due to displacement from wind energy facilities, power lines, and habitat fragmentation.

Alternative 3 would entail constructing up to 1,000 wind turbines but excludes placement of project infrastructure in the Miller Hill and southern Sierra Madre area (**Figure 4.15-3**). Up to 888 turbines would be located in greater sage-grouse habitat. Similar to Alternatives 1R and 2, Alternative 3 would not result in any direct impacts to greater sage-grouse core breeding areas. However, direct impacts (8,846 acres) would occur in non-core habitat (**Table 4.15-5**). Under Alternative 3, direct disturbances (initial and long-term) would occur to 5.5 percent of the Application Area. Alternative 3 would entail construction of 460 miles of new road and 115 miles of new above-ground power line within the alternative boundary. No greater sage-grouse leks are present within 2 miles of the haul road, and no leks are present within 1 mile of the transmission lines. However, two leks occur between 1 and 2 miles from the transmission lines.

Alternative 3 has 2,560 acres of greater sage-grouse core habitat within 0.5 mile of project infrastructure. This alternative also has 119,967 acres of non-core habitat within 0.5 mile. Within 4 miles of project infrastructure, Alternative 3 has 89,498 acres of core and 272,799 acres of non-core habitat, or 362,297 acres of greater sage-grouse habitat (**Tables 4.15-6** and **4.15-7**).

Alternative 3 has 17 greater sage-grouse leks present within 1 mile of project infrastructure (**Table 4.15-6**). There also are 9,209 acres of core area present within 1 mile of project infrastructure (**Tables 4.15-6** and **4.15-7**). The long-term loss of substantial amounts of sagebrush in both core and non-core areas, combined with expansive areas of potential indirect impacts to both core and non-core habitats during construction and operation of the facility, would result in habitat loss and disturbance levels exceeding all five significance criteria. However, the greater sage-grouse research and avoidance, minimization and mitigation measures developed by PCW to reduce impacts to greater sage-grouse could result in impacts that do not exceed significance criteria.

Mountain Plover

Potential impacts to mountain plover include direct loss of habitat, disturbance during breeding periods, the loss of nesting and brood-rearing habitat, and mortality from turbines and vehicle collisions.

Alternative 3 would result in the direct loss of approximately 2,168 acres for the initial disturbance and 582 acres for long-term disturbance of mountain plover habitat, which is greater than Alternatives 1R and 2. Considering the environmental constraints associated with the BLM land, this loss of habitat would be similar to Alternative 1R. This alternative would construct 118 miles of new roads within mountain plover

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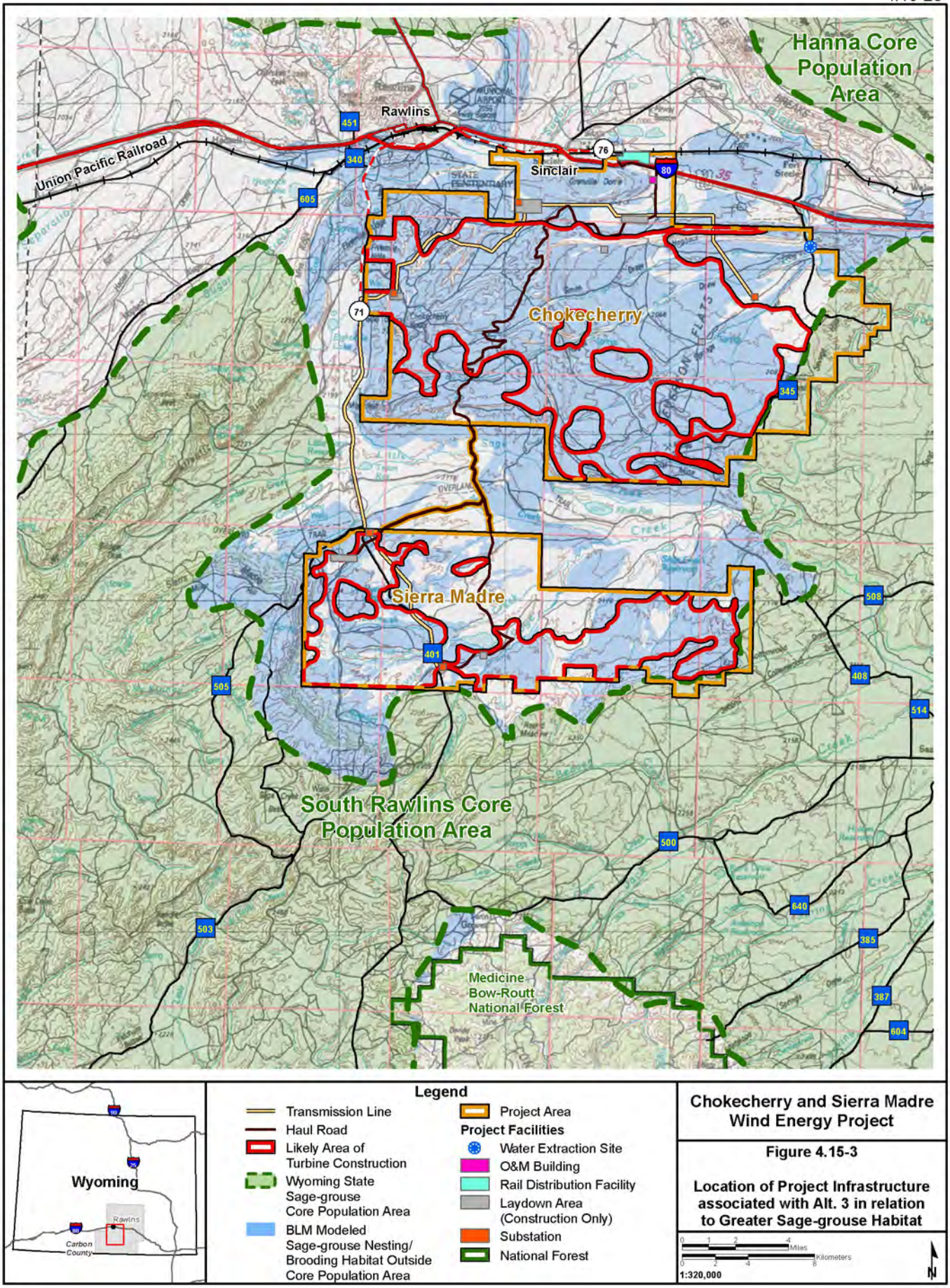

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.15-3

Location of Project Infrastructure associated with Alt. 3 in relation to Greater Sage-grouse Habitat

habitat, thus increasing the potential for wildlife-vehicle collisions. The amount of road construction is greater than Alternatives 1R and 2.

Northern Leopard Frog

Potential impacts to northern leopard frog include direct loss of aquatic and upland habitat, potential degradation of aquatic habitats through erosion and runoff, and mortalities from wildlife-vehicle collisions.

Alternative 3 would potentially impact three ponds initially considered suitable habitat for northern leopard frogs and only one pond long-term. Alternative 3 would potentially result in the direct loss of approximately 6,981 acres of initial disturbance and 1,408 acres for long-term disturbance on northern leopard frog upland habitat within 3.2 miles of a suitable pond. According to the analysis general amphibians in Section 4.14, potential impacts to the aquatic habitat would result from surface disturbance and possible contamination from construction equipment. Under Alternative 3, surface disturbance within the sub-watersheds would range from less than 0.1 to 7.1 percent during construction phase and less than 0.1 to 1.3 percent during operation, which is slightly higher than Alternative 1R, but less than Alternative 2. The application of BMPs and ACMs will minimize the potential impacts resulting from increased erosion and runoff. Potential contamination of the aquatic habitat from construction equipment is not anticipated based on the establishment of the project's SPCC Plan.

New road construction increases the potential for inadvertent mortality through vehicle collision and general disturbance resulting from increased human activity. This alternative would construct 431 miles of new roads in upland habitat within 3.2 miles of a suitable pond. Alternative 3 would result in 11 perennial and 483 ephemeral road-stream crossings, resulting in habitat fragmentation and the potential for direct mortalities. Although the number of suitable ponds affected and the potential long-term habitat loss was the least, the potential direct habitat loss and the amount of new road construction within potential habitat would be greater than Alternative 1R.

Sensitive Fish

The boundary of Alternative 3 does not include any portion of the Little Savery, Muddy Creek-Littlefield Creek, or McKinney Creek sub-watersheds within which BLM sensitive fish species are known to occur. General impacts to the fisheries under Alternative 3 were analyzed in Section 4.14.5.5.

Sensitive Plants

Based on the predictive model of the potential distribution of the six BLM sensitive plants (Fertig and Thurston 2003), two species, Cedar Rim thistle and Gibben's beardtongue, are not likely to be found in the Alternative 3 boundary, therefore impacts to these species are unlikely.

Persistent sepal yellowcress is most likely to be impacted based on both the predictive model and known occurrence. The likelihood of impacting potential habitat (703 acres) is higher than under Alternative 1R and 2, but less than Alternative 4. The model predicts areas of high (622 acres), medium (75 acres), and low (6 acres) probability of potential habitat in the study area that could be disturbed during project construction. Some of the area disturbed during construction would be initial disturbance; the remainder would be long-term operational impacts. According to the model, 304 acres of high probability potential habitat, 5 acres of medium probability potential habitat, and 1 acres of low probability potential habitat would be disturbed long-term.

According to the model, one other BLM sensitive plants could be impacted under Alternative 3, Laramie false sagebrush. During construction, 62 acres of medium probability potential habitat for Laramie false sagebrush would be impacted. Of that initial disturbance, 11 acres of medium probability potential habitat for Laramie false sagebrush would be impacted long term during operation of the project. The likelihood of impacting potential habitat is less than under Alternative 1R for Laramie false sagebrush, but greater than Alternative 2.

4.15.5 Impacts to Special Status Species from Alternative 4

4.15.5.1 Federally Listed Species

The location of infrastructure under Alternative 4 would occur only on private lands, which would result in infrastructure to be constructed throughout most of the Application Area. Potential impacts from the increase in surface disturbance and the expansion throughout the area unique to Alternative 4 are presented below.

Wyoming Species

Black-footed Ferret

Potential impacts to black-footed ferret from this alternative include: 1) direct loss of habitat resulting from the construction of roads and turbine pads within portions of prairie dog towns present at the site; 2) indirect loss of habitat due to avoidance of human activity; 3) increased traffic on roads and human activity may result in prairie dog, and potentially black-footed ferrets fatalities; and 4) increased human activity may increase the presence of human pets, which potentially could result in the introduction of canine distemper.

Alternative 4 would result in an initial direct loss of 224 acres and a long-term direct loss of 59 acres of white-tailed prairie dog habitat. An estimated 15 miles of new roads would be constructed under Alternative 4 within white-tailed prairie dog towns, which would increase the potential for fatalities through vehicle collisions. This alternative would have the highest direct impact to black-footed ferret habitat and greatest amount of road construction.

Alternative 4 would construct up to 846 turbines, which is less than the Alternatives 1R, 2, and 3. It is anticipated that the reduced turbines would result in less human activity on the site. Even with the possible reduction in human activity, personnel could result in the presence of dogs on site potentially exposing the area to canine distemper which is a fatal disease for black-footed ferret.

Surveys for black-footed ferrets would be required before ground disturbing activities within white-tailed prairie dog colonies located in the Bolten Ranch Prairie Dog Complex. The remaining white-tailed prairie dog colonies within the project are in the “block clearance” area, where surveys for black-footed ferrets are not warranted.

Rare Plants

Based on the predictive model of the potential distribution of Ute ladies’-tresses and Colorado butterfly plant (Fertig and Thurston 2003), potential habitat for these two species is not likely to be found in the Alternative 4 boundary, therefore impacts to either species is unlikely. Surveys will be required in appropriate habitat prior to construction once final siting of project facilities is complete to ensure that impacts to these species do not occur.

Platte River System Species

Under Alternative 4, impacts associated with water depletions would be the same as discussed for Alternative 1R, although the amount of water used would be 49 acre-feet greater (total of 602 acre-feet) under Alternative 4. This amount of water use would be the second highest among the alternatives.

Colorado River System Species

Under Alternative 4, impacts associated with water depletions would be the same as discussed for Alternative 1R, although the amount of water used would be 7 acre-feet greater (total of 60 acre-feet) under Alternative 4. This amount of water use would be the second highest among the alternatives.

4.15.5.2 BLM Sensitive Species

Pygmy Rabbit

Potential impacts to pygmy rabbits include: 1) direct loss of habitat; 2) indirect loss of habitat, including displacement due to increased traffic on roads and human activity; and 3) inadvertent mortalities due to increased traffic on roads and human activity.

Alternative 4 would potentially result in a direct loss of 7,448 acres identified as having some probability of pygmy rabbit occurrence. Most of the loss (5,576 acres) would occur within areas classified as having a low probability of occurrence according to the WYNDD predictive model (**Table 4.15-13**). This loss would be greater than Alternatives 1 and 3, but less than Alternative 2.

Table 4.15-13 Pygmy Rabbit Probability Model for Alternative 4

	Low Probability of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)	Very High Probability of Occurrence (acres)
Potential Disturbance	5,576	1,454	417	0.6

The direct loss of Wyoming big sagebrush would be 1,450 acres under Alternative 4, which is similar to Alternative 3. Alternative 4 would construct 488 miles of new roads, which is the greatest among alternatives. The new road construction would potentially result in some fatalities of pygmy rabbits through vehicle collisions.

Alternative 4 is designed for up to 846 turbines unlike the other action alternatives which may have as many as 1,000 turbines. Therefore, potentially there would be less human activity and indirect disturbance on the site than the other alternatives. However, the reduction in indirect impacts from the decrease in turbines would likely be offset by the increase in road construction.

Prior to construction activities in suitable pygmy rabbit habitat, presence/absence surveys would be conducted following appropriate protocols. Areas within 0.5 mile of proposed disturbance that show characteristics of pygmy rabbit habitat will be surveyed in accordance with the Interagency Pygmy Rabbit Working Group Survey Protocols (Ulmschneider et al. 2004). If the surveys conclude that the pygmy rabbits occur the “Habitat Preservation and Restoration” conservation measures would apply (Keinath and McGee 2004).

White-tailed Prairie Dog

Potential impacts to white-tailed prairie dogs include: 1) direct loss of habitat; 2) indirect loss of habitat; and 3) increased traffic on roads and human activity potentially resulting in prairie dog fatalities.

Alternative 4 would have an initial direct loss of 224 acres and a long-term direct loss of 59 acres of white-tailed prairie dog habitat. Alternative 4 would construct an estimated 15 miles of new roads within potential habitat. Both the loss of habitat (initial and long-term) and the new road construction would be the greatest under Alternative 4. The new road construction would potentially result in some fatalities of white-tailed prairie dogs through vehicle collisions and increased shooting.

Alternative 4 is slated for up to 846 turbines and all infrastructure associated with the project will lead to less human activity on the site than the other alternatives. However, the reduction in indirect impacts from the decrease in turbines would likely be offset by the increase in road construction.

Wyoming Pocket Gopher

The potential impacts to Wyoming pocket gopher include: 1) direct loss of habitat; 2) indirect loss of habitat; and 3) increased traffic on roads and human activity resulting in Wyoming pocket gopher fatalities.

Alternative 4 would potentially have an initial direct loss of 7,448 acres identified as having some probability of Wyoming pocket gopher occurrence. Most of the loss (4,501 acres) would occur in areas classified as having a high probability of occurrence according to the WYNDD predictive model (**Table 4.15-14**). This loss would be greater than Alternatives 1 and 3, but less than Alternative 2.

Table 4.15-14 Wyoming Pocket Gopher Probability Model for Alternative 4

	Absent (acres)	Absent (Marginal) of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)
Potential Disturbance	0.2	49	2,896	4,501

Alternative 4 would construct 488 miles of new roads, which is the greatest among alternatives. New road construction would potentially result in some fatalities of Wyoming pocket gophers through vehicle collisions

Alternative 4 would construct up to 846 turbines and all infrastructure associated with the project will lead to less human activity on the site than the other alternatives. However, the reduction in indirect impacts from the decrease in turbines would likely be offset by the increase in road construction.

Columbian Sharp-tailed Grouse

Similar to Alternatives 1R, 2, and 3, no Columbian sharp-tailed grouse leks have been documented within the alternative boundaries or within a 1-mile buffer of the Application Area. Therefore, it is anticipated Alternative 4 would not have any impacts on Columbian sharp-tailed grouse.

Greater Sage-grouse

Impacts to greater sage-grouse under Alternative 4 include direct impacts through collisions with wind turbines and power lines, as well as direct loss of habitat due to ground disturbance activities, indirect loss of habitat due to displacement from wind energy facilities, power lines, and habitat fragmentation.

Alternative 4 would entail constructing up to 846 wind turbines only on private lands where as many as 835 turbines would be located in greater sage-grouse habitat (**Figure 4.15-4**). Similar to Alternatives 1R, 2, and 3, no impacts to greater sage-grouse core breeding areas would occur as a result of this Alternative. This alternative has the second highest direct impact to greater sage-grouse habitat, with 8,972 acres of non-core habitat being impacted (**Table 4.15-5**). Under Alternative 4, direct disturbances (initial and long-term) would occur to 4.1 percent of the Application Area. Alternative 4 also would have the highest potential for direct impacts associated with new road construction, as 488 miles of new road and 100 miles of new above-ground power line would be required to construct and operate the project within the project boundary. No greater sage-grouse leks are present within 2 miles of the haul road, and no leks are present within 1 mile of the transmission lines. However, two leks occur between 1 and 2 miles from the transmission lines.

Alternative 4 also has the second lowest amount of acres of greater sage-grouse core area (3,559 acres) but has the highest acreage of non-core habitat (137,628 acres) within 0.5 mile of project infrastructure. Within 4 miles of project infrastructure, Alternative 4 has the second highest amount of core

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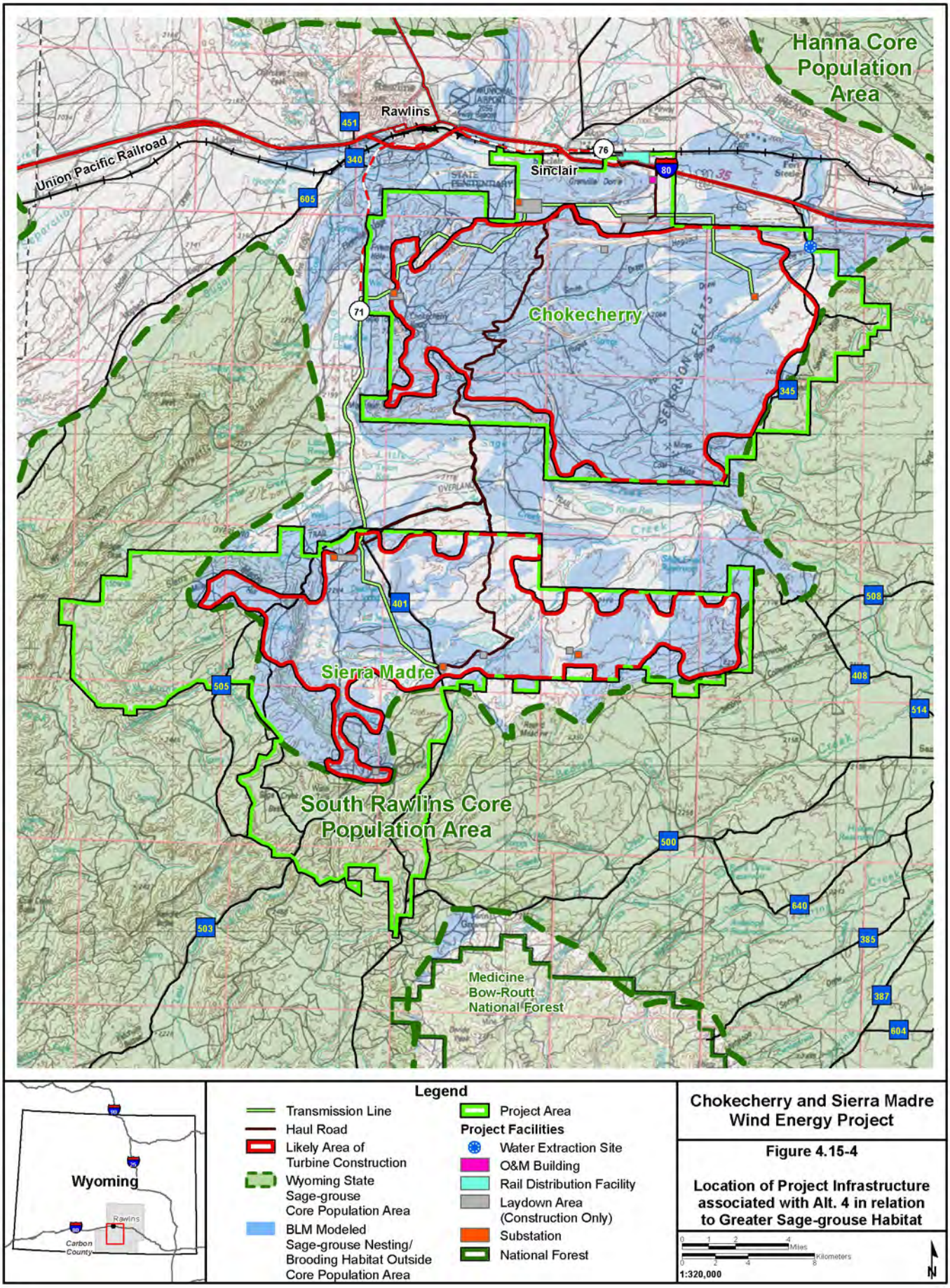

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Figure 4.15-4

Location of Project Infrastructure associated with Alt. 4 in relation to Greater Sage-grouse Habitat

(126,376 acres) and the third highest amount of non-core habitat (270,222 acres) for a combined total of 396,598 acres of greater sage-grouse habitat (**Tables 4.15-6** and **4.15-7**).

Alternative 4 has 18 greater sage-grouse leks present within 1 mile of project infrastructure (**Table 4.15-6**). This alternative also has the second highest amount (14,243 acres) of core area present within 1 mile of project infrastructure (**Tables 4.15-6** and **4.15-7**). The long-term loss of substantial amounts of sagebrush in non-core areas, combined with expansive areas of potential indirect impacts to both core and non-core habitat during construction and operation of the facility, would result in habitat loss and disturbance levels exceeding all five significance criteria. However, the greater sage-grouse research and avoidance, minimization and mitigation measures developed by PCW to reduce impacts to greater sage-grouse could result in impacts that do not exceed significance criteria.

The boundary for the Alternative 4 area is the same as Alternative 1R and would include 9,998 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 1,285 acres of the Red Rim-Grizzly WHMA. However, development would only occur on private land within the WHMAs. No development would occur within the Red Rim-Grizzly WHMA. Based on PCW's ACM not to site facilities within greater sage-grouse core areas (**Appendix C**, **Table C-2**) and the conceptual layout, the potential initial (56 acres) and long-term (12 acres) disturbance within the Upper Muddy Creek Watershed/Grizzly WHMA would equal 0.09 percent and 0.02 percent, respectively, of the entire WHMA. It is not likely that the inclusion of this area would result in any indirect impacts to the greater sage grouse beyond what has been described above.

Mountain Plover

Potential impacts to mountain plover include direct loss of habitat, disturbance during breeding periods, the loss of nesting and brood-rearing habitat, and mortality from turbines and vehicle collisions.

Alternative 4 would have the greatest initial and long-term direct loss (2,312 acres and 611, respectively) of mountain plover habitat compared to the other alternatives. Considering the environmental constraints associated with the BLM land, under Alternative 4 the potential direct loss of habitat in relation to suitable habitat within the Application Area would be greater than any other alternative. Alternative 4 would construct the greatest amount (132 miles) of new roads within mountain plover habitat, thus increasing the potential for wildlife-vehicle collisions.

Northern Leopard Frog

Potential impacts to northern leopard frog include direct loss of aquatic and upland habitat, potential degradation of aquatic habitats through erosion and runoff, and mortalities from wildlife-vehicle collisions.

Alternative 4 would potentially impact six ponds initially considered suitable habitat for northern leopard frogs and three ponds long term. Alternative 4 would result in 7,038 acres of potential direct loss initially and 1,438 acres potential direct loss long-term. According to the analysis general amphibians in Section 4.14, potential impacts to the aquatic habitat would result from surface disturbance and possible contamination from construction equipment. Under Alternative 4, surface disturbance within the sub-watersheds would range from less than 0.1 to 6.2 percent during construction phase and less than 0.1 to 1.2 percent during operation, which is slightly higher than Alternative 1R. The application of BMPs and ACMs will minimize the potential impacts resulting from increased erosion and runoff. Potential contamination of the aquatic habitat from construction equipment is not anticipated based on the establishment of the project's SPCC Plan.

New road construction increases the potential for inadvertent mortality through vehicle collision and general disturbance resulting from increased human activity. This alternative would construct 457 miles of new roads in upland habitat within 3.2 miles of a suitable pond. Alternative 4 would result in 14 perennial and 582 ephemeral road-stream crossings, resulting in habitat fragmentation and the potential for direct mortalities. The number of suitable ponds affected by this impact was the second

lowest, while the potential direct habitat loss and the amount of new road construction within the habitat was the second highest after Alternative 2.

Sensitive Fish

Alternative 4 has the same boundary as Alternative 1R; however, under current conceptual layout less surface area and road crossings would occur within the McKinney sub-watershed than Alternative 1R. No surface disturbance or stream crossings are anticipated in Little Savery or Muddy Creek-Littlefield Creek sub-watersheds. Alternative 4 would result in less potential initial (248 acres) and long-term (43 acres) surface disturbance within the McKinney Creek sub-watershed than Alternative 1R and 2 (**Table 4.13-2**). Also under Alternative 4, only six ephemeral and no perennial road-stream crossings would occur within the McKinney Creek sub-watershed (**Table 4.13-2**). As discussed in Section 4.14.3.6, new roads and construction of other facilities have been demonstrated to increase sedimentation that can have a variety of ecological impacts to fish habitat such as a change in channel depth, pool-to-riffle ratio, percent fines in substrates, and cover availability (Angermeier et al. 2004). Based on the current conceptual layout for Alternative 4, project development would generally be concentrated in higher-altitude upland areas away from streams and reservoirs with the exception of road-stream crossings. However, the 2008 Rawlins RMP (BLM 2008a) does require that any road crossing any waterbody that potentially supports fish for a portion of the year will be designed to simulate natural stream process, thus allowing fish passage potentially reducing the impacts. Section 4.14.6.5 further discusses the potential impacts from Alternative 4 to fisheries within the McKinney sub-watershed.

Sensitive Plants

Based on the predictive model of the potential distribution of the six BLM sensitive plants (Fertig and Thurston 2003), two species, Cedar Rim thistle and Gibben's beardtongue, are not likely to be found in the Alternative 4 boundary, therefore impacts to these species are unlikely.

Persistent sepal yellowcress is most likely to be impacted based on both the predictive model and known occurrence. The likelihood of impacting potential habitat (821 acres) is highest under Alternative 4 than any other alternative. The model predicts areas of high (740 acres), medium (75 acres), and low (6 acres) probability of potential habitat in the study area that could be disturbed during project construction. Some of the area disturbed during construction would be initial disturbance; the remainder would be long-term operational impacts. According to the model, 304 acres of high probability potential habitat, 5 acres of medium probability potential habitat, and 1 acres of low probability potential habitat would be disturbed long-term.

According to the model, one other BLM sensitive plants could be impacted under Alternative 4, Laramie false sagebrush. During construction, 53 acres of medium probability potential habitat for Laramie false sagebrush would be impacted. Of that temporary disturbance, 10 acres of medium probability potential habitat for Laramie false sagebrush would be impacted long term during operation of the project. The likelihood of impacting potential Laramie false sagebrush habitat is similar to Alternative 2, but less than Alternatives 1R and 2.

4.15.6 Mitigation and Mitigation Effectiveness

As discussed in Section 4.14.7, a draft wildlife monitoring and protection plan has been developed for the project (**Appendix J**). This plan also would specifically address special status species. The monitoring and plan would provide information that could be used to avoid, minimize and design methods to mitigate impacts to special status species throughout the life of the project. The wildlife monitoring and mitigation plan will provide protocols to monitor special status species responses, habitats, and behavioral shifts, etc. due to the project as well as provide protocols that result in data that can be used to evaluate the effectiveness of management actions designed to avoid, minimize and mitigate identified significant impacts. Mitigation measure GEN-1, from the Draft EIS, is now part of the alternatives

analysis in the Final EIS as it was included as an ACM by the applicant in the January 2012 revised POD (PCW 2012a).

Additional mitigation measures to reduce impacts to special status species are discussed below.

SSS-1: Prior to construction activities in suitable pygmy rabbit habitat, presence/absence surveys will be conducted following appropriate protocols. Areas within 0.25 mile of proposed disturbance that show characteristics of pygmy rabbit habitat will be surveyed in accordance with the Interagency Pygmy Rabbit Working Group Survey Protocols (Ulmschneider et al. 2004). If the surveys conclude that the pygmy rabbits occur the "Habitat Preservation and Restoration" conservation measures will apply (Keinath and McGee 2004).

SSS-2: Prior to construction activities in suitable Wyoming pocket gopher habitat, presence/absence surveys will be conducted following appropriate protocols. If active Wyoming pocket gopher mounds are identified by the presence/absence survey, the proposed surface disturbing activities will avoid the active pocket gopher mounds by 75 m (BLM 2009f). However, if the proponent does not wish to avoid the active pocket gopher mounds by 75 m, classification surveys (via live capture) must be completed to identify the pocket gopher to the species level responsible for the mounds. If the results conclude that the Wyoming pocket gopher is responsible for the mounds the "Occupied Wyoming Pocket Gopher Habitat Protection Measures" will apply (BLM 2009f). If the results conclude that the associated species is a Northern pocket gopher, then the proposed surface disturbance may proceed without mitigation. If the classification survey fails to conclusively identify the associated pocket gopher to the species level, then it will be assumed that the species is a Wyoming pocket gopher and the "Occupied Wyoming Pocket Gopher Habitat Protection Measures" will apply (BLM 2009f).

Effectiveness: Implementation of SSS-1 and SSS-2 would be effective in reducing impacts to pygmy rabbits and Wyoming pocket gophers by limiting surface disturbance activities in suitable habitat and by implementing specific protection measures to protect individuals in occupied habitat.

SSS-3: To protect potential mountain plover habitat, prior to any surface disturbance, a presence/absence survey for active mountain plover nests will be conducted in all potential habitat within the area proposed for surface disturbance. Surveys are to be performed by a wildlife biologist familiar with mountain plover and their associated habitat. If evidence of mountain plovers is found during the preconstruction survey, then additional stipulations may apply (BLM 2009a).

Effectiveness: Implementation of SSS-3 would be effective in reducing impacts to breeding mountain plovers by limiting surface disturbance activities in suitable habitat and by implementing specific measures to protect individuals and their nests (e.g., timing restrictions, protection buffers).

4.15.7 Residual Impacts

Residual impacts to special status species would generally be the same as discussed in Section 4.14.

4.15.8 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable impacts to special status species would generally be the same as discussed in Section 4.14 for wildlife and fisheries. Native vegetation and wildlife habitat would be removed in order to accommodate the proposed facilities resulting in an irretrievable commitment of resources for the life of the project. Black-footed ferrets are federally endangered and any loss to a population within the project area, if present, and its primary food source (white-tailed prairie dogs) would be irretrievable. Water depletions from the North Platte River and Colorado River basins would result in irretrievable commitment of resources.

4.15.9 Relationship between Local Short-term Uses and Long-term Productivity

If black-footed ferrets are within the affected areas the loss of habitat and prey base could decrease an already small population of black-footed ferret within the Alternatives.

Construction and operation of any of the alternatives would likely impact the long-term productivity of greater sage-grouse habitat.

4.16 Impacts from Noise and to Human Health

The analysis of noise impacts involves the anticipated noise levels at noise sensitive receptors in and near the Alternative boundaries. These noise sensitive receptors include historic trails and residences. The analysis area for noise impacts includes the Alternative boundaries with a 1,600-foot buffer. Impacts are analyzed primarily on the basis of dB(A) sound levels within the analysis area, specifically analyzing the distance between noise sensitive receptors and the turbines.

Scoping meetings took place August and September 2008 in Saratoga, Rawlins, and Baggs, Wyoming, to gather public input regarding the proposed project. Public comments concerning potential project related noise impacts ranged from noise effects along historic trails to impacts to hunting and impacts to primary access roads and dwellings within and near the Alternative boundaries. Management objectives, goals, and actions concerning noise are outlined in **Table 4.16-1**.

Table 4.16-1 Relevant Management Considerations for Noise

2008 Rawlins RMP and ROD – Noise
Management Objectives • There are no applicable national, BLM, state, or county regulatory guidelines for this resource. The Rawlins RMP (BLM 2008a) does not establish objectives for management of noise.
Management Goals • The 2008 Rawlins RMP, state statutes, and local plans do not specifically state any pertinent management goals concerning noise. The 2008 Rawlins RMP refers to noise almost exclusively in the context of OHV use.
Management Actions • Sound emitted by Wind Energy Centers shall not exceed 50 dB(A), as measured at the closest neighboring inhabited dwelling. Manufacturer data must be submitted to demonstrate compliance with this requirement. The level, however, may be exceeded during short-term events such as utility outages and/or severe wind storms.

Source : Carbon County 2011.

Table 4.16-2 describes the guidance used for construction and operation noise impacts.

Assumptions for analysis are as follows:

- Turbines will be placed no closer than 2,750 feet to noise sensitive areas (NSAs);
- Turbines will be designed to limit low frequency noise;
- Projections of existing and project-related vehicle traffic will be available through the transportation section of the NEPA document. Traffic related noise can be extrapolated in proportion to projected changes in traffic volume; and
- Noise is primarily going to be generated from within the alternative boundaries.

Table 4.16-2 Guidance for Noise Impacts

Distance from Noise Receptors at Which Noise Impacts Occur	Regulation/Guidance/Significance Criteria
1,600 feet for noise emanating from construction related activities	USEPA guidance stipulates the threshold for residential noise impacts resulting from construction activities is reached at 55 dB(A) at 1,600 feet (USEPA 1974).
1,400 feet for noise emanating from a wind turbine during operations[1,2]	At this distance, noise from a 2MW turbine is approximately 35 dB(A) which is equal to the ambient noise level in a rural setting. A noise sensitive receptor at or within 1,400 feet would begin to notice noise from a turbine above existing ambient levels (British Wind Energy Association [BWEA] 2000; Vestas 2008).

[1] The applicant has committed to setting back wind turbines no less than 2,750 feet from residences.

[2] Although county regulations specify sound emitted by Wind Energy Centers shall not exceed 50 dB(A) at an inhabited dwelling, a more conservative estimate of 35 dB(A) has been used for regulatory guidance.

4.16.1 Impacts from Noise and to Human Health from the No Action Alternative

There would be no impacts from noise and to human health under this alternative. Potential noise impacts from construction activities, wind turbines, power lines, and substations would not be realized. Noise in the analysis area would continue to consist of existing ambient noise. Existing ambient noise consists largely of wind, wildlife, noise from the city of Rawlins, rail traffic, and local and highway traffic. Potential adverse human health effects such as wind turbine syndrome, shadow flicker, and the 'looming effect' also would not be realized.

4.16.2 Impacts from Noise and to Human Health from Alternative 1R, Applicant Proposed Alternative

Impacts under the construction phase of Alternative 1R include temporary short-term noise from heavy construction machinery and construction activities, as well as light vehicle construction traffic. Average noise levels for typical construction equipment range from 74 dB(A) for a roller, to 85 dB(A) for a bulldozer, to 88 dB(A) for a crane (Harris, Miller, Miller, and Hanson, Inc. [HMMH] 1995). In general, the dominant noise source from most construction equipment is the diesel engine, which is continuously operating around a fixed location or with limited movement. This is particularly true if the diesel engine is poorly muffled. In a few cases, noise generated by pile driving would dominate. Other sources of continuous noise would include field compressors, bulldozers, and backhoes.

Noise levels for typical construction equipment that would likely be used at a wind turbine project site are in the 80 to 90 dB(A) range at a distance of 50 feet, as shown in **Table 4.16-3**. For a general assessment of construction impacts, it can be assumed that only two of the noisiest pieces of equipment would operate simultaneously. Assuming geometric spreading only (i.e., a decrease of about 6 dB[A] per doubling of distance from a point source) and an 8-hour work day, on the basis of the noise levels presented in **Table 4.16-3**, it is estimated that with the two noisiest pieces of equipment operating simultaneously at peak load, noise levels would exceed the USEPA guideline for residential Ldn noise (55 dB[A]) for a distance of about 1,600 feet (USEPA 1974). The actual projected workday will be longer than 8-hours. It is anticipated that a project workday during construction will consist of one 10-hour shift six days a week. This distance, 1,600 feet, would decrease if reasonable factors for noise attenuation (e.g., air absorption and ground effects due to terrain and vegetation) and operating loads were considered. Residences within 1,600 feet of peak construction would experience noise levels that exceed the USEPA guidelines, resulting in significant impacts. There are two

Table 4.16-3 Noise Levels at Various Distances from Typical Construction Equipment

	Noise Level[1] at Distances (dB[A])					
Construction Equipment	**50 feet**	**100 feet**	**200 feet**	**400 feet**	**800 feet**	**1,600 feet**
Bulldozer	85	79	73	67	61	55
Concrete Mixer	85	79	73	67	61	55
Concrete Pump	82	76	70	64	58	52
Crane, Derrick	88	82	76	70	64	58
Crane, Mobile	83	77	71	65	59	53
Front-end Loader	85	79	73	67	61	55
Generator	81	75	69	63	57	51
Grader	85	79	73	67	61	55
Shovel	82	76	70	64	58	52
Truck	88	82	76	70	64	58

[1] The equivalent steady-state sound level that contains the same varying sound level during a 1-hour period.

Source: HMMH (1995).

residences which would be located within 1,600 feet of construction activity. The construction activity impacting these residences would consist of improving access roads and would occur during years 3 and 4 of construction. The two residences would be located within 635 feet of construction activity, therefore, since they would be within 1,600 feet of construction activities, noise impacts would result that exceed USEPA guidelines. The haul road is located 1.4 miles from the nearest residence, 2.9 miles from the Teton Reservoir Recreation Site, and 3.5 miles from the Wyoming State Penitentiary in Rawlins, resulting in negligible impacts. The Overland Trail would be transected by both the haul road and a power line, resulting in short-term noise impacts during construction of these project components. This portion of the Overland Trail where transected by the haul road and power line is not a contributing segment. The impacts to the two affected residences and the Overland Trail would be short-term and temporary in nature.

Blasting is an additional construction activity that would result in noise impacts that are short-term and temporary. Any blasting activity would require at least 2 business days notice to landowners. All blasting activities also would take place during daylight hours unless previously arranged with and approved by appropriate government agencies.

On-road vehicular traffic includes hauling of materials in and out of the construction site, movement of heavy equipment, and commuter and visitor traffic. The associated noise levels would increase and decrease rapidly. The number of truck trips associated with construction would vary, depending on the construction stage. Potential noise impacts would be greatest at the highest number of peak-hour trips and total heavy-duty truck trips. Local area traffic would consist of mostly light-duty vehicles with lower-level noise sources. Other vehicular traffic, such as transport of heavy equipment, delivery of general construction materials, and water truck for fugitive dust control, is anticipated; the noise contribution from these sources, however, likely would be short-lived. The relatively high level of ambient noise emanating from within and near the northern portion of the analysis area, such as wind, local traffic, the town of Rawlins, I-80, and the UPRR, results in a low impact to the few noise sensitive receptors, such as local residences, that are clustered in the northern part of the analysis area. Impacts

may be more pronounced in the southern portion of the analysis area, where there are more residences and ambient noise is much more rural in nature, although the number of residences is still very small.

Impacts under the operations phase of Alternative 1R include wind turbine noise, noise from project maintenance vehicles, power line, and substation noise. During operation, major noise sources would be mechanical and aerodynamic noise from wind turbines; transformer and switchgear noise from substations; corona noise from power lines; and vehicular traffic noise. These noise sources are described below.

Wind turbines produce two categories of noise: mechanical and aerodynamic. Recent improvements in the mechanical design of large wind turbines have resulted in significantly reduced mechanical noise (Rogers and Manwell 2002). As a result, aerodynamic noise is the dominant source from modern wind turbines. Aerodynamic noise from wind turbines originates mainly from the flow of air over and past the blades; therefore, the noise generally increases with tip speed. The aerodynamic noise has a broadband character, often described as a “swishing” or “whooshing” sound, and is typically the dominant part of wind turbine noise today. The noise caused by this process is unavoidable. Inflow turbulent noise caused by the interaction of blades with atmospheric turbulence is a major contributor to broadband noise, but it has not yet been fully quantified (Rogers and Manwell 2002).

The effects of noise produced by wind energy centers on big game and hunting are largely unknown. Studies have shown that big game species tend to avoid human disturbance. However, some species, during the operation phase when construction noise and human presence are both diminished, may readjust and reoccupy a disturbed area. It is possible that hunting opportunities may be reduced due to the displacement of some species, but this will likely be caused less by noise generated from wind turbines than the overall loss of habitat. Please see Section 4.14 for a more detailed discussion on impacts to wildlife by the proposed project.

To determine the potential noise impacts at nearby residences from wind turbine operations, sound level would need to be estimated. The sound power level from a single wind turbine is approximately 98 to 100 dB(A) for the rated power of 2 MW (Vestas 2008). Considering geometric spreading only, this results in a sound pressure level of 45 dB(A) at a distance of 385 feet from the turbine, which is about the same level as conversational speech at a 3-foot distance. At a receptor 1,400 feet away, the equivalent sound pressure level would be approximately 35 dB(A). This level is typical of background levels of a rural environment. Under this alternative, there would not be any residences within 1,400 feet of a wind turbine. The nearest turbine to a residence would be greater than 0.5 mile away, well past the 1,400 foot threshold for noise impacts and thus resulting in negligible impacts. The Overland Trail, which is the nearest historic trail to the analysis area, is over 0.25 mile away from the nearest turbine at 1,417 feet, resulting in negligible impacts.

Potential power line noise during the operation phase can result from corona discharge, which is the electrical breakdown of air into charged particles. While hardly audible at the edge of the ROW in dry weather, in humid wet conditions water drops collecting on the lines provide favorable conditions for corona discharges. During a rainfall event, noise from corona discharge emanating from a 230-kV line would be at 39 dB(A), at approximately 50 feet from the center of the tower. This would equal the noise being generated in a library (BPA 1996). In general, because of the arid climate in the analysis area and existing ambient noise, such as wind and wildlife, the impact of corona noise is expected to be negligible.

A noise source during the operation phase also can be the transformers at substations. A transformer produces a constant low-frequency humming noise primarily because of the vibration of its core. The average A-weighted core sound level at a distance of 492 feet from a transformer would be about 43 and 46 dB(A) for 100 and 200 million volt-amperes (corresponding to about 80 and 160 MW), respectively (Wood 1992). These noise levels at a distance of 1,640 feet would be 33 and 36 dB(A), which are typical of background levels in a rural environment, resulting in a negligible impact. The nearest location of a substation to residences and the Overland Trail is greater than 1 mile away.

Noise from traffic during the operations phase would range from light- to medium-duty vehicles, and is expected to be negligible. Heavy maintenance activities would contribute to a noticeably increased noise level, but heavy maintenance would be intermittent, typically every six months to a year, and short-term in nature. Overall, the noise levels of continuous site operation would be lower than the noise levels associated with short-term construction activities, and in conjunction with the existing ambient noise, would result in a negligible impact to noise sensitive receptors in the analysis area.

In general, noise impacts from decommissioning activities would be similar to but less than those associated with construction activities because the activity type and level would be similar but shorter in duration. As in the construction period, most of the decommissioning activities would occur during the day, when noise is tolerated better than at night because of the masking effect of background noise. Nighttime noise levels would drop to the background levels of a rural environment because decommissioning activities would cease at night. Like construction activities, decommissioning activities would last for a short period compared with wind turbine operation, and, accordingly, the potential impacts would be temporary and intermittent in nature.

Concerns have been raised that the noise and vibrations emitted from wind turbines can create adverse health effects, such as migraines, motion sickness, vertigo, visual, and gastrointestinal sensitivity (Wind Turbine Syndrome 2009). This is referred to as wind turbine syndrome. These potential effects may be greatest on permanent residents, not transient users such as hunters and other recreationists. Published reports provide input both for and against the potential adverse health effects caused by the relationship between wind turbine sound/vibration and human receptors. Published reports regarding wind turbine syndrome also did not highlight hazardous materials associated with wind energy development as a factor in the syndrome. The applicant has agreed to set-back turbines no less than 2,750 feet, over 0.5 mile from the nearest residences to minimize adverse effects. The nearest population center, the Wyoming State Penitentiary within Rawlins city limits, is over 1.3 miles away from the nearest turbine. Additionally, shadow flicker and the visual ‘looming effect’ are additional potential concerns for adverse health effects. Shadow flicker occurs when the operating turbine blades cast a shadow through a confined area on a property due to the angle of the sun behind the turbine, and has been suggested to initiate epilepsy and cause annoyance resulting in physical and mental health impacts. A study that evaluated the effects of shadow flicker concluded that the nearest affected receptors should be no closer than 10 rotor diameters from the WTGs (ARM Group Inc. 2009) to the northeast or northwest of the turbines. There would be no turbines located within 3,940 feet of any key observation point evaluated for Alternative 1R. The ‘looming effect’ causes a psychological reaction from feeling “enclosed” by a tall structure, and could be a negative impact on the quality of life and well-being of viewers. Studies suggest that the looming effect is dissipated at a distance greater than an estimated 1,640 foot distance between the WTG and the viewer (Oregon Health Authority 2012). Potential impacts from shadow flicker and the ‘looming effect’ are analyzed more in-depth in Section 4.12.

4.16.3 Impacts from Noise and to Human Health from Alternative 2, Checkerboard Only

The impacts from noise under this alternative would be similar to Alternative 1R. Under this alternative, there would not be any residences within 1,400 feet of a wind turbine. The nearest turbine and substation to a residence and the Wyoming State Penitentiary within Rawlins city limits would both be over 1 mile away, well past the 1,400 foot threshold for noise and associated health impacts. The nearest substation to the Overland Trail would be located over a mile away. The haul road is located approximately 1 mile from the nearest residence, resulting in negligible impacts. The haul road is located 1,445 feet from the Wyoming State Penitentiary in Rawlins and 905 feet from the Teton Reservoir Recreation Site. These sensitive receptors are both within 1,600 feet of construction activity resulting in construction noise levels that would exceed USEPA guidelines. Impacts from construction noise would be short-term and temporary in nature. Noise generated from haul road operations traffic to the Wyoming State Penitentiary would be added to the background noise generated from I-80, the UPRR, and the city of Rawlins resulting in negligible long-term impacts. Impacts from noise generated from haul road operations traffic to the Teton Reservoir Recreation Site would be lessened by the background noise

generated from adjacent WY 71, but would still serve to decrease the recreational character of the area. Impacts from construction, turbine, and substation noise to the Overland Trail would be the same as described in Alternative 1R. As in Alternative 1R, the portion of the Overland Trail where transected by the haul road and power line is not a contributing segment.

Potential human health effects from wind turbine syndrome, shadow flicker, and the 'looming effect' would be the same as described in Alternative 1R. The applicant has agreed to set-back turbines no less than 2,750 feet, over 0.5 mile from the nearest residences to minimize adverse effects.

4.16.4 Impacts from Noise and to Human Health from Alternative 3, No Miller Hill or South Sierra Madre

The impacts from noise under this alternative would be similar, but slightly less than Alternative 1R. There would be no residences impacted from noise generated by construction activities under this alternative, as opposed to Alternative 1R. Additionally, there would not be any residences within 1,400 feet of a wind turbine; the nearest turbine to a residence and the Wyoming State Penitentiary within Rawlins city limits would be over 1 mile away, well past the 1,400 foot threshold for noise and associated health impacts. The nearest substation to a residence would be over 5 miles away. The haul road is located approximately 1.4 miles from the nearest residence, 2.2 miles from the Teton Reservoir Recreation Site and 4.2 miles from the Wyoming State Penitentiary, resulting in negligible impacts. Impacts from construction and turbine noise to the Overland Trail would be the same as described for Alternative 1R. The nearest substation to the Overland Trail would be located approximately 0.5 mile away. The portion of the Overland Trail where transected by the power line is not a contributing segment; however, the portion of the Overland Trail where transected by the haul road has been designated as a contributing segment. Visitors to this portion of the Overland Trail would experience intermittent noise from project related traffic.

Potential human health effects from wind turbine syndrome, shadow flicker, and the 'looming effect' would be the same as described in Alternative 1R. The applicant has agreed to set-back turbines no less than 2,750 feet, over 0.5 mile from the nearest residences to minimize adverse effects.

4.16.5 Impacts from Noise and to Human Health from Alternative 4, Private Lands Only

The impacts from noise under this alternative would be similar, but slightly less than Alternative 1R. There would be no residences impacted from noise generated by construction activities under this alternative, as opposed to Alternative 1R. Additionally, there would not be any residences within 1,400 feet of a wind turbine. The nearest turbine and substation to a residence and the Wyoming State Penitentiary within Rawlins city limits would both be over 1 mile away, well past the 1,400 foot threshold for noise and associated health impacts. This alternative also would entail the construction of 154 less turbines than Alternative 1R, resulting in the least long-term impacts of any alternative. The haul road is located approximately 3 miles from the nearest residence, 2.2 miles from the Teton Reservoir Recreation Site and 4.2 miles from the Wyoming State Penitentiary, resulting in negligible impacts. Impacts from construction, turbine, and substation noise to the Overland Trail would be the same as described in Alternative 2. Potential impacts to the Overland Trail from the haul road and power line are the same as in Alternative 3.

Potential human health effects from wind turbine syndrome, shadow flicker, and the 'looming effect' would be the same as described in Alternative 1R. The applicant has agreed to set-back turbines no less than 2,750 feet, over 0.5 mile from the nearest residences to minimize adverse effects.

4.16.6 Mitigation and Mitigation Effectiveness

In order to mitigate for the two residences within 1,600 feet of access road construction, the following mitigation has been proposed:

N-1: USEPA guidance stipulates the threshold for residential noise impacts resulting from construction activities, including blasting, is reached at 55 dB(A) at 1,600 feet (USEPA 1974). When a residence is within 1,600 feet of construction activities, construction activities exceeding 55 dB(A) would only be allowed to occur between the hours of 7 a.m. and 10 p.m., and on weekdays.

N-2: Whenever feasible, multiple construction activities (e.g., blasting and earthmoving) should be scheduled to occur concurrently to minimize the length of time residences within 1,600 feet may be affected.

Effectiveness: It is anticipated that the mitigation measures presented will effectively reduce potential short-term temporary construction noise impacts to the two residences within 1,600 feet of access road construction.

4.16.7 Residual Impacts

Despite the mitigation measures presented, in some instances noise sensitive receptors within the alternative boundaries will still be impacted by short-term temporary construction noise.

4.16.8 Irreversible and Irretrievable Commitment of Resources

Elevated noise levels would occur in and near the alternative boundaries during construction and at a lower level during the operational life of the project which would be an irretrievable loss. However, project-related noise is reversible and would cease after project decommissioning.

4.16.9 Relationship between Local Short-term Uses and Long-term Productivity

Not applicable to this resource.