4.0 ENVIRONMENTAL IMPACTS

4.1 GEOLOGY, MINERALS, AND GEOHAZARDS

4.1.1 Impact Criteria

The basis of the Project consists of extraction of mineral resources from the Madison Formation on approved federal leases in the Riley Ridge Unit, and would conform to all applicable Onshore Orders and BLM guidance for drilling, operating, reclamation, and closure of gas wells. Since extraction of oil and gas resources in appropriate federal lease-holdings is an objective identified in the PFO RMP for the RBPA, including the Riley Ridge Unit, no impacts are anticipated from the extraction of gases (BLM 2008b). Geohazard risks, however, may occur in the RBPA. These geohazards are not resource values, but could potentially result in impacts on the Project itself, as well as impacts to other resources in the RBPA.

Geohazard risks will be evaluated using the following criteria:

- Slope and land stability: Impacts from geohazard risk would be adverse if Project implementation results, directly or indirectly, in increased runoff and erosion and loss of slope integrity. Significant adverse impacts would occur if the Project leads directly or indirectly to mass movement (landslides), subsidence, flooding, or increased deposition.
- Produced water containment: Indirect adverse geohazard impacts could occur if water injected into the Nugget Formation was to lead to over-pressurization of the formation. Over-pressurized formations could lead indirectly to the lubrication of existing faults in an area with known faults and seismic risks. Adverse geohazard impacts would also result if over-pressuring of the Nugget Formation was to indirectly cause Nugget water to be released into higher quality aquifers or otherwise reach the surface. If the injectate reached a shallow aquifer it would contaminate the water and make it of no use unless treated.
- Seismic risk: Adverse impacts from geohazard risk could result if Project design features failed to protect vulnerable equipment and processes in the event of an earthquake for the RBPA. Design failure could result in failure and/or leaks in the wells, pipeline infrastructure, or M&HRF, and resulting failure to contain raw or processed sour gas.

4.1.2 No Action Alternative

Under No Action, the BLM would not authorize federal components of the Project, but non-federal connected actions, such as the construction and operation of the M&HRF and HLF may proceed without federal approvals. The No Action Alternative would, therefore, result in identical geological impacts from these non-federal components, when compared with other alternatives. Without federal action, any geohazard impacts resulting from non-federal actions associated with Cimarex gas development and processing would be speculative and outside of BLM authority to modify or change.

4.1.3 Alternative 1

4.1.3.1 Impacts of BLM Actions with Alternative 1

4.1.3.1.1 Slope and Land Stability

Of the geologic features described in Chapter 3, surface geology would be most impacted by Alternative 1, resulting in potential impacts to slope and land stability. The Wasatch Formation and the Quaternary alluvium at the surface are easily eroded by water because of their lithologic properties. The WSGS has mapped the western half of the RBPA, indicating several complex slope movements (WSGS 2008). These known movements are important indicators of where similar activities are likely to occur. Specifically, multiple slumps and debris-laden earth flows have been mapped on the northern slope of Riley Ridge, as shown in Map 3-2.

Other complex slope movements labeled as debris flows, alluvial fans, alluvial cones, and slump/flow complexes are mapped in the area where increased landslide indicators such as steeper slopes, proximity to a fault zone, and erosion from mountain streams occur. The majority of the complex slope movements are on slopes near South Piney Creek and Beaver Creek; however, some other debris flows occur in drainages throughout the western half of the RBPA (WSGS 2008). Section 4.2 provides additional information on soil types involved in landslide and slump hazards that would be affected by Alternative 1.

Table 4-1 provides information on the number of acres that Alternative 1 would affect within known soils that are susceptible to landslide or slumping. Only a small proportion of soils in the RBPA are rated for landslide or slumping hazard, so additional soils may be susceptible. BLM actions would result in 234.3 acres of short-term disturbance in hazard-prone soil types, and 5.9 acres of long-term disturbance.

Table 4-1. Alternative 1 Landslide or Slumping Hazard.

Landslide or Slump Hazard	Initial Disturbance in Susceptible Soils (acres)	Long-term Disturbance in Susceptible Soils (acres)	BLM Actions		Non-federal Actions	
			Short-term (acres)	Long-term (acres)	Short-term (acres)	Long-term (acres)
Soils with known Landslide Hazards	151.1	5.1	148.5	3.9	2.6	1.2
Soils with known Landslide and Slump Hazards	13.4	0.4	13.4	0.4	0.0	0.0
Soils with known Slump Hazards	72.4	1.6	72.4	1.6	0.0	0.0
Total Hazard-prone Soils Affected	**236.9**	**7.1**	**234.3**	**5.9**	**2.6**	**1.2**

Such slope movements are outside the ability for normal erosion control measures and BMPs to control and could result in short-term adverse impacts. Removing vegetation and/or soils during construction could lead to an increase in complex slope movements during the construction phase of the Project. Mass movements, including landslides, could be triggered in areas that become over-steepened by removal of slope-supporting material.

4.1.3.1.2 Seismic Risk

The RBPA is in a tectonically active area with complex faulting, and earthquakes of moderate magnitude are possible. Earthquakes are very difficult to predict with any accuracy, therefore their probability of occurrence is estimated based on past events.

Numerous statistical methods have been developed to evaluate the risks associated with probability of earthquake events within specific regions of the world. The USGS (2002) has developed models which may be used for assessing probability and return intervals of earthquake events within areas of the United States. The expected number of earthquakes may be converted into a probability of one or more earthquakes during a specified time period using the following formula:

$Pr[t] = 1\text{-}\exp(-t)$, where

$Pr[t]$ = probability of an event within a specified time period, such as per year, and

t = exposure time.

This equation is the Poisson distribution, which is used for predicting the probability of random isolated events. The Poisson probability with regards to earthquake probability is a time-independent distribution, meaning the earthquake could happen regardless of time. The Poisson model of earthquake occurrences is the standard equation for the Probabilistic Seismic Hazards Analysis (PSHA) model used by the USGS (2002). Results from the PHSA model for the RBPA (Figure 3-5) demonstrate an approximately 10 to 20% probability of a 6.5 magnitude earthquake occurring within a 50-year time period.

The RBPA is located in Zone 2 of the Uniform Builders Code (UBC). Zone 2 has a 10% probability to exceed an earthquake event with strong perceived shaking and light damage in 50 years (Case et al. 2002). It must be noted that the RBPA is very near the Zone 3 border, which has a 10% probability to exceed an earthquake event with very strong perceived shaking and moderate damage in 50 years. These statistical probabilities indicate that the chance of an earthquake of magnitude 6.5 or greater occurring at some point during the life of the Project (LOP) is possible at any time.

An earthquake with a magnitude of 6.5 would unlikely alter the current geological conditions of safe containment of the Nugget or Madison formations. The depth and character of the Nugget Formation has been shown to be very stable and to receive injected water safely. The depth and character of the Madison Formation reservoir has been proven to receive and confine injected gases. Since 2005, ExxonMobil has been injecting sour gas (H_2S) into the Madison Formation 42 miles south of the RBPA. As of September 2008, 23.6 bcf of gas has been successfully and safely injected into the Madison Formation (WOGCC 2009d). Please

refer to Map 3-3 for the location of these wells. Therefore, no significant adverse impacts would be anticipated from Alternative 1 related to the proposed geological containment of either produced water or re-injection of acid gases that originated in the Madison Formation.

BLM actions including wellheads, acid gas injection wells, and pipelines would all be susceptible to damage from seismic activity. These facilities have been designed to withstand seismic activity typical of the region. Successful design makes use of compliant materials and systems which can accommodate ground deformation. According to the Federal Emergency Management Agency (FEMA 2002), mitigation measures may be implemented which may reduce earthquake movement and acceleration damage to installed infrastructure. Acid gas pipelines and sour gas flowlines would be made with corrosion protection to maintain structural integrity of materials, increasing wall thicknesses to increase tensile strength.

4.1.3.2 Total Project Impacts with Alternative 1

4.1.3.2.1 Slope and Land Stability

Table 4-1 provides information on Alternative 1 interactions with known landslide and slumping hazard soils for Project components with non-federal jurisdiction, as well as total area of hazard-prone soils that would be affected with this alternative. Non-federal actions would affect 2.6 acres of hazard-prone soils during construction, and 1.2 acres would be affected in the long term. Overall, 236.9 acres of landslide or slumping soil types would be affected during construction, with 7.1 acres of long-term disturbance.

Implementation of slope stabilization design features, along with aggressive erosion control methods and BMPs during construction of the BLM Project components, would minimize impacts to the surface that could lead to slope movements. Site-specific geotechnical analysis has been conducted for the M&HRF and incorporated into the design of the M&HRF, leading to appropriate slope and foundation specifications (see Appendix G). This study indicates the soil conditions within the first 100 feet of the surface are represented by the soil test in the geotechnical analysis and recommend a Site Class C determination. Therefore, no adverse impacts would be anticipated from complex slope movement as a result of Alternative 1.

4.1.3.2.2 Produced Water Containment

The produced water would be handled under all alternatives as a non-federal action without federal jurisdiction. The target geological formation for produced water injection would be the Jurassic-aged Nugget Formation of sandstone and dune and interdunal formation with a saline aquifer that lies below the entire southwestern portion of Wyoming (Li and Zhan 2009; National Energy Technology Laboratory [NETL] 2009). The porous Nugget sandstones lie approximately 11,000 feet below the surface in the RBPA, and have an approximate thickness of 500 feet, an average porosity of 8.5%, and are highly permeable (WOGCC 2009e). Water would be injected and trapped within the sandstone through hydrodynamic trapping (Nelson et al. 2005). Water would be injected at pressures which are greater than the existing pore pressure of the formation, thereby allowing the injected water to displace the compressed native saline fluids. The formation also has a history of oil production in the Tip Top Field. Nugget oil production has been abandoned in the Tip Top since 1986 (WOGCC 2009c).

Injectate pressurizes the receiving formation. Potential hazards of injecting fluids into subsurface formations include the migration of injectate fluids beyond the planned zone or between formations through a system of communicating faults, and/or the lubrication and reactivation of the complex sets of faults.

In the case where nearby boreholes have poor integrity or if a communicating system of unsealed faults occurs nearby, these features could act as a conduit, allowing the injectate to escape to other formations or to the ground surface. Injection fluids or other production-induced changes also have the ability to alter local pore pressures and stresses on localized faults in rare cases. In these rare cases, active movement of a fault could disrupt the borehole and cause migration of the fluids outside the receiving formation.

Nearby well bore logs must be provided to WOGCC as part of any injection permit application, demonstrating borehole integrity, lack of active faulting, and lack of evidence for communication with other formations. Recent public documents accompanying an application with WOGCC for Aquifer Exemption and Water Disposal Approval provides bore logs and additional geochemical information regarding the ability of the Nugget Formation in the vicinity of the RBPA to contain injected water (WOGCC 2009e). This and other nearby well bore logs indicate that the Nugget Formation is contained by the Twin Creek Formation, which consists of 875 feet of carbonates (salts) with a few interbedded shales and siltstones with very low porosity. It is anticipated that the thickness and character of the salt formation would act as a seal in the event of any faulting. In addition, two other formations lie above the Twin Creek Formation that are equally impervious to the migration of water, making an effective ~~"c~~ap" over the Nugget Formation of approximately 1,100 feet. This cap layer of impervious and non-porous shales and siltstones is present below the RBPA and a large region of western Wyoming and would be likely to also successfully contain injection water into the Nugget for the Project.

Available pore volume in the Nugget sandstone has a mean of 14,100 bcf, indicating that large volumes of injectate, both gas and liquids, could be contained by the Nugget Formation without leakage (Li and Zhang 2009; NETL 2009). As of August 2008, 38 million barrels of water have been successfully injected into the Nugget Formation in four wells in the region (WOGCC 2009d). Although the WOGCC allows injection on Class II wells above the formation fracture gradient, the chances of overpressurizing the Nugget Formation are minimal due to the sound geological character of the formation.

4.1.3.2.3 Seismic Risk

The operation of the M&HRF and other non-federal Project components may contribute to risks from seismic activity. Without appropriate engineering design, earthquake events with a magnitude greater than 6.5 could cause failure of well casings, sour gas pipelines, injection well pressure controls, or rupture or leaks within the M&HRF. Robust engineering design is required to stabilize building and tank foundations, wellheads, drilling equipment, and pipeline joints to withstand the possible effects of the known magnitude and expected frequency of seismic activity normal for the RBPA. Measures included in the design of the Project facilities include horizontal strengthening or anchoring of structures to withstand lateral acceleration and the use of strengthened or non-brittle materials in the construction of the installations.

Design standards for all of the sour gas facilities, from the well casings to the processing vessels at the M&HRF, would meet or exceed design standards established under the UBC for seismic Zone 2. The risk of an earthquake with a large enough magnitude to severely damage infrastructure designed and constructed to seismic Zone 2 standards is unlikely based on the earthquake history and studies of tectonics in the area. A moderate geohazard risk would occur as a result of a major earthquake of magnitude greater than 6.5 or occurring during the LOP which exceeds the proposed seismic Zone 2 design standards of the Project. Such an earthquake event could damage Project infrastructure and result in leaks of sour gas. This risk is not considered significant due to the low probability of occurrence. In addition, the injection wells and the M&HRF would be regulated by the WOGCC and a WOGCC monitoring and emergency shutdown plan is associated with the Class II injection permit. Early detection and warning systems included as a design feature of the Project, and the required safety standards and the emergency management plans included in Alternative 1, are identified in Appendix E.

In summary, analysis of Alternative 1 shows that potential short-term and long-term adverse impacts may occur from implementation of the alternative due to increased slope instability and from introducing sour gas infrastructure in an area with the possibility of experiencing an earthquake of magnitude 6.5 or greater sometime within the LOP. Some of these adverse impacts would occur as a result of constructing and operating the M&HRF, a non-federal Project component over which BLM would have no jurisdiction. Some adverse impacts would result from BLM-managed drilling and operation of production and injections wells. There is a low probability of an earthquake occurrence and incorporation of geotechnical studies and robust design features would reduce these potential impacts to a level less than significant.

4.1.4 Alternative 2

4.1.4.1 Impacts of BLM Actions with Alternative 2

4.1.4.1.1 Slope and Land Stability

Since Alternative 2 evaluates a different location for pipeline and transmission line infrastructure, it has different outcomes for the potential for impacts from slope and land stability. Table 4-2 provides information on the number of acres that Alternative 2 would affect within known soils that are susceptible to landslide or slumping. BLM actions would result in 4.2 acres of short-term disturbance, out of a Project total of 84.1 acres of disturbance in hazard-prone soil types. BLM actions would result in 0.2 acre of long-term disturbance in such soils.

4.1.4.1.2 Seismic Risk

In addition to BLM actions, non-federal actions would result in 79.9 acres of short-term disturbance, out of a Project total of 84.1 acres of disturbance in hazard-prone soil types. These non-federal activities would also result in 3.0 acres of long-term disturbance in such soils.

Table 4-2. Alternative 2 Landslide or Slumping Hazard.

Landslide or Slump Hazard	Initial Disturbance in Susceptible Soils (acres)	Long-term Disturbance in Susceptible Soils (acres)	BLM Actions		Non-federal Actions	
			Short-term (acres)	Long-term (acres)	Short-term (acres)	Long-term (acres)
Soils with known Landslide Hazards	77.3	3.2	4.2	0.2	73.1	3.0
Soils with known Landslide and Slump Hazards	0.0	0.0	0.0	0.0	0.0	0.0
Soils with known Slump Hazards	6.8	0.0	0.0	0.0	6.8	0.0
Total Hazard-prone Soils Affected	**84.1**	**3.2**	**4.2**	**0.2**	**79.9**	**3.0**

Implementation of slope stabilization design features, and erosion control methods and BMPs during construction of the non-federal and BLM Project components would minimize impacts to the surface that could lead to slope movements. Site-specific geotechnical analysis has been conducted for the M&HRF and incorporated into the design of the M&HRF, leading to appropriate slope and foundation specifications to prevent adverse impacts with Alternative 2.

4.1.4.2 Total Project Impacts with Alternative 2

Overall, Alternative 2 would have the lowest impact to slope and land stability, largely due to its location in stable bottomland soils with low slopes.

4.1.4.2.1 Produced Water Containment

Non-federal actions would include a produced water injection well with Alternative 2. Geological and seismic conditions for Alternative 2 would be the same as for Alternative 1. All potential impacts that could arise relative to produced water containment, and seismic risk would be the same as for Alternative 1.

4.1.4.2.2 Seismic Risk

Geological and seismic conditions for Alternative 2 would be the same as for Alternative 1, as would the federal and non-federal design standards for construction in Seismic Zone 2 areas. Therefore, the impacts would be the same as Alternative 1.

4.1.5 Alternative 3

4.1.5.1 Impacts of BLM Actions with Alternative 3

4.1.5.1.1 Slope and Land Stability

As shown in Table 4-3, BLM actions would result in 90.8 acres of short-term disturbance in landslide or slump hazard soils with Alternative 3, out of 148.0 total acres of such construction disturbance in these hazard-prone soils. Long-term effects of BLM actions would affect 4.3 acres of these hazard-prone soils. Therefore, BLM actions under Alternative 3 would result in less risk for landslide or slumping hazard compared with Alternative 1.

Table 4-3. Alternative 3 Landslide or Slumping Hazard.

Landslide or Slump Hazard	Initial Disturbance in Susceptible Soils (acres)	Long-term Disturbance in Susceptible Soils (acres)	BLM Actions		Non-federal Actions	
			Short-term (acres)	Long-term (acres)	Short-term (acres)	Long-term (acres)
Soils with known Landslide Hazards	90.8	4.3	88.2	2.7	2.6	1.6
Soils with known Landslide and Slump Hazards	15.2	0.0	15.2	0.0	0.0	0.0
Soils with known Slump Hazards	42.0	0.0	42.0	0.0	0.0	0.0
Total Hazard-prone Soils Affected	**148.0**	**4.3**	**145.4**	**2.7**	**2.6**	**1.6**

4.1.5.1.2 Seismic Risk

Since this alternative includes BLM gas production and injection wells at the same locations as all other alternatives, the potential impacts that could arise relative to seismic risk would be the same as those described for Alternative 1 and among all alternatives.

4.1.5.2 Total Project Impacts with Alternative 3

4.1.5.2.1 Slope and Land Stability

Non-federal actions would result in potential impacts to 2.6 acres from construction disturbance and 1.6 acres of long-term disturbance in hazard-prone soils. Total Alternative 3 short-term disturbance in soils with known hazards for landslides and slumping would be 148.0 acres, with 4.3 acres of long-term disturbance in susceptible soils. This alternative would have the lowest total long-term effect within known landslide and slumping soil types, compared with other alternatives.

4.1.5.2.2 Produced Water Containment and Seismic Risk

Since this alternative also includes a gas processing facility at the same location and gas production and injection wells at the same locations as Alternative 1, and jurisdictions for the Project components would also be the same as with Alternative 1, all potential impacts that could arise relative to slope stability, produced water containment, and seismic risk are assumed to be the same for Alternative 3 as for Alternative 1.

4.1.6 Alternative 4

4.1.6.1 Impacts of BLM Actions with Alternative 4

4.1.6.1.1 Slope and Land Stability

Alternative 4 would include a 7-acre EGS south of the M&HRF. This facility would be located on a relatively level shelf on a steep (greater than 25%) hillside downslope from the M&HRF site and upslope from Spring Creek. A geotechnical study has been conducted on the

M&HRF site and enhanced design specifications have been developed to reduce any potential slope movement at the site.

Table 4-4 indicates that BLM actions in Alternative 4, such as construction of pipeline, fiber optic cable, and gas wells, would result in approximately 138.2 acres of short-term disturbance in soils with known landslide and slumping hazards, but less than 1% of long-term disturbance. This alternative would result in reduced impacts to slope and land stability, compared with Alternatives 1 and 3, but higher than Alternative 2.

Table 4-4. Alternative 4 Landslide or Slumping Hazard.

Landslide or Slump Hazard	Initial Disturbance in Susceptible Soils (acres)	Long-term Disturbance in Susceptible Soils (acres)	BLM Actions		Non-federal Actions	
			Short-term (acres)	Long-term (acres)	Short-term (acres)	Long-term (acres)
Soils with known Landslide Hazards	88.9	1.4	86.3	0.2	2.6	1.2
Soils with known Landslide and Slump Hazards	6.8	0.0	6.8	0.0	0.0	0.0
Soils with known Slump Hazards	45.1	0.0	45.1	0.0	0.0	0.0
Total Hazard-prone Soils Affected	140.8	1.4	138.2	0.2	2.6	1.2
Soils no Landslide or Slump Hazard	146.8	27.8	92.4	8.8	54.4	19.0

4.1.6.2 Total Project Impacts with Alternative 4

4.1.6.2.1 Slope and Land Stability

Non-federal actions would result in potential impacts to 2.6 acres from construction disturbance and 1.2 acres of long-term disturbance in hazard-prone soils. The overall effect of Alternative 4 would result in short-term effects to 140.8 acres of disturbance in soils with known hazards for landslides and slumping. Appropriate engineering design, erosion control, and BMPs would reduce the potential for introducing soil instability and movement.

4.1.6.2.2 Produced Water Containment and Seismic Risk

Since this alternative also includes a gas processing facility at the same location and gas production and injection wells at the same locations as Alternative 1, and jurisdictions for the Project components would also be the same as with Alternative 1, all potential impacts that could arise relative to slope stability, produced water containment, and seismic risk are assumed to be the same for Alternative 4 as for Alternative 1.

4.1.7 Cumulative Impacts

The CIAA for geological resources is the RBPA and the area within 1 mile of the boundary of the RBPA. Impacts to slope stability would be felt near future foreseeable development in the area; however, effects from produced water containment and seismic risk would potentially be felt at a greater distance.

Incremental and cumulative impacts to slope stability would occur from any future and foreseeable activities in soils with landslide or slumping hazards and slopes greater than 25%. Ongoing effects of drought, cattle grazing, as well as other projects such as the Big Piney-LaBarge Infill Project and the development of other surrounding oil and gas fields would have localized impacts in soil types with known landslide and slumping hazards unless additional design and construction BMPs are implemented and land movements are monitored and immediately corrected.

The Project alternatives would add slight incremental increases of 850 barrels per day of injectate to the current and future foreseeable water injection action. One outstanding Application for Aquifer Exemption and Approval of Disposal Well is pending at the time of this analysis. This is for a water disposal well targeting the Nugget Formation at a location approximately 10 miles from the proposed location of the Cimarex disposal well. In a future development scenario for the RBPA in which oil and gas development doubles over the LOP, multiple future applications for additional injection wells targeting the Madison and Nugget formations are likely due to the high levels of by-product water in most of the geological formations targeted for oil and gas development.

Incremental and cumulative impacts from geological injection of produced water to the Nugget Formation could lead to overpressuring the aquifer to the point where it approaches the formation fracture gradient. The available pore volume in the Nugget sandstone has a mean of 14,100 bcf, indicating that large volumes of injectate, both gas and liquids, could be contained by the Nugget Formation without leakage (Li and Zhang 2009; NETL 2009). As of August 2008, 38 million barrels of water have been successfully injected into the Nugget Formation in four wells in the region (WOGCC 2009d). Although the WOGCC allows injection on Class II wells above the formation fracture gradient, the chances of overpressurizing the Nugget Formation are minimal due to the sound geological character of the formation. Therefore, no adverse cumulative impact would be anticipated from proposed water injection in Alternative 1 or any other alternative considered.

The Project would not add any increased risk of over-pressurizing the Madison Formation, and in fact would decrease formation pressure by extracting methane and helium gas from the formation; therefore, no cumulative risk of increased seismic risk is anticipated from proposed acid gas injection back into the Madison Formation. .

4.1.8 Mitigation and Monitoring Opportunities

4.1.8.1 <u>Mitigation</u>

*4.1.8.1.1 BLM-Required Mitigation**

- An Erosion, Revegetation, and Restoration Plan shall be prepared to address all Project-related surface disturbance on BLM-administered land.

- The Operator/grant holder shall conduct operations and implement control measures to prevent sediment discharge from Project components occurring on federal land.
- Do not remove vegetation from areas with slopes of 25% or greater.
- Recontour and reclaim areas immediately following construction if not needed for production or other long-term operations.
- Design ROWs such that they follow slope contours and have adequate drainage plans.
- Take immediate steps to correct any detected erosion or slope movements.
- Implement BMPs listed in Appendix F when and where appropriate.
- Meter and report the volume of water injected into the Nugget Formation on a monthly basis.
- Cease injection operations if the well pressure approaches the formation fracture gradient.

*4.1.8.1.2 Other Mitigation Opportunities***

- Minimize the amount of earth-moving activity in areas with slopes greater than 15% or in areas with soil types with known landslide or slumping hazards.
- Conduct mechanical integrity tests on each plugged and abandoned well within 1 mile of the Class II wells to make sure they are sealed and cannot become conduits for water from the Nugget Formation.
- If the amount of seismic activity increases significantly, ensure that emergency shutdown procedures are in place to shut down all operations.

4.1.8.2 Monitoring

*4.1.8.2.1 BLM-Required Monitoring**

- Monitor slopes and look for signs of erosion, slumping, or slope movement.
- Monitor for run-on and runoff during construction and correct drainage issues.

*4.1.8.2.2 Other Monitoring Opportunities***

- Conduct mechanical integrity tests on each plugged and abandoned well within 1 mile of the Class II wells to make sure they are sealed and cannot become conduits for water from Nugget Formation.
- Conduct geotechnical studies and include design features that meet or exceed all recommendations for stabilizing slopes and establishing suitable foundations in soils with known landslide or slumping hazards.
- Work with the USGS and keep track of all seismic events in the area.
- If the amount of seismic activity increases significantly, ensure that emergency shutdown procedures are in place to shut down all operations.

* BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the proposed Project, as identified in Chapter 2.

** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal Project components.

4.2 SOILS

4.2.1 Impact Criteria

Potential adverse impacts to soils would include:

- increased wind and water erosion;
- loss of topsoil;
- decreased soil and vegetation productivity; and
- introduction and invasion of noxious weeds and undesirable plant species.

Removal of vegetation and the exposure of soils during construction of well pads, roads, and pipelines, along with the alteration and compaction of soils during construction, can increase runoff and wind and water erosion. Topsoil, in particular, is a valuable resource in semi-arid areas such as the RBPA, particularly during reclamation as well as for the following characteristics:

- topsoil development is slow;
- it provides a crucial plant-growth medium that is essential to establish successful revegetation;
- it is higher in organic matter, fertility, and biologic activity than subsoil materials;
- loss or dilution of the topsoil during construction by burial or mixing with subsoil horizons would reduce soil productivity and could hinder successful revegetation; and
- topsoil is generally much darker than subsoil materials and its reapplication during reclamation would help to minimize visual impacts by reducing contrasts on reclaimed sites.

Impacts from erosion would be greatest after initial soil disturbance and would decrease naturally in the short term due to natural stabilization through particle aggregation and armoring (i.e., formation of soil crusts and pavements). In general, most sediment in the RBPA is from exposed areas (i.e., stream channels and banks, badlands, and bare escarpment slopes). The primary factors affecting sediment delivery or movement includes slope gradient, soil particle size, roughness of soil, and vegetation cover.

The implementation of BLM-considered alternatives in the RBPA EA would cause significant impacts to soils if:

- disturbed areas are not adequately stabilized to reduce soil erosion and potential impacts to water quality; or

- there is increased erosion or reduced soil productivity to a level which prevents reestablishment of vegetative cover within five years; or
- disturbance occurs on soils with moderate to high potential for landslides or slumps.

Many soils within the RBPA have limiting features that make reclamation and revegetation difficult. These limiting features include salinity, sodium content, clayey and sandy textures, droughty conditions, alkalinity, low organic matter content, shallow depth to bedrock, stones and cobbles, and erosive forces (BLM 2008b). Degraded and eroded soils ultimately result in the reduction of soil fertility and stability needed for the successful re-establishment of native vegetation. Failure to mitigate impacts on disturbed soil surfaces increases the likelihood of non-native and invasive plant recruitment and downslope sedimentation into streams and other water bodies. The physical and chemical properties of the soil, along with topography and climate of the RBPA, determine the erodibility of the soil resource and the likelihood of successful reclamation.

Surface disturbances, including the removal of vegetation and topsoil and surface layer compaction, alter primary soil properties and may determine the resistance of soil to erosive forces. Potential impacts to the soil environment are a function of the total surface disturbance by construction activities, which varies for each alternative discussed herein (Table 4-5).

Table 4-5. Surface Disturbance Anticipated under Each Alternative on BLM and Non-federal Land.

Alternative	Total Initial Surface Disturbance (acres)	Total Residual Disturbance (acres)	BLM Actions		Non-federal Actions	
			Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)
No Action	>840.0	>104.0	0	0	>840.0	>104.0
1	872.3	54.6	811.3	31.6	61.0	23.0
2	984.5	59.7	195.6	12.0	789.0	47.7
3	692.3	48.7	631.3	25.7	61.0	23.0
4	570.8	42.4	492.4	12.2	78.4	30.2

Total surface disturbance from Alternative 1 is shown in Table 4-5, however not all areas of affected soil have been mapped. Soil Map Units were used wherever possible, in order to evaluate the consequences of disturbance on unique soil characteristics present, as shown in Tables 4-6, 4-7, 4-8, and 4-9.

4.2.2 No Action Alternative

Under the No Action Alternative, ROWs and APDs for the proposed Project would not be approved by BLM, and no impacts would occur to soil resources as a result of BLM actions. Regardless, non-federal connected Project actions may still occur, as described in Chapter 2. These private and state actions would result in temporary soil disturbance to greater than 840 acres in the RBPA, as indicated in Table 4-6. The effects would include loss of vegetative

cover and soil mixing and exposure to erosion. Long-term effects would occur to more than 104 acres, as indicated in Chapter 2, form installation of permanent facilities and impervious cover.

Many aspects of the environmental consequences of No Action cannot be determined since the exact location of several Project components is not known. However, for the purposes of this document it is assumed that the non-federal components would be essentially the same as the non-federal components in Alternative 2. Therefore, it is also assumed that the impacts resulting from the non-federal components would be essentially the same as described for Alternative 2. Other impacts to soil resources within the RBPA would continue at current rates, being affected primarily by ongoing oil and gas activity and livestock grazing which has already been authorized by the BLM.

4.2.3 Alternative 1

Table 4-6 displays the disturbance under Alternative 1 to various soil map units within the RBPA.

4.2.3.1 Impacts of BLM Actions with Alternative 1

Table 2-3 provides information on total disturbance from specific BLM and private/state actions under Alternative 1. Soils with elevated erosion, low reclamation potential, and adverse modifications to soil stability may limit the opportunities for the successful mitigation of adverse soil impacts, and the high variability in soil conditions may further reduce the likelihood of establishing vegetation following surface disturbances. Some of the soils that would experience surface disturbance possess comparatively high clay content, salinity, alkaline reactivity, SARs, and periods of water inundation. These factors limit reclamation opportunities, and increase erodibility and potential salt and sediment contributions to the Colorado River drainage. Alternative 1 would result in short-term adverse impacts to soils from BLM actions from increased potential for runoff with erosion and sedimentation in areas that include susceptible soils (Table 4-6).

Based on available data, it is projected that approximately 140 acres of disturbed soil under Alternative 1 are susceptible to elevated levels of runoff and erosion (Munn and Arneson 1998a, 1998b; Soil Survey Staff 1999; BLM 1984, 2008b). In addition, approximately 195 acres of affected lands under BLM actions have characteristics attributing to low reclamation potential. Soils within the RBPA may be located on moderately steep slopes in climatic regimes that maintain frigid or cryic temperature regimes, which may exacerbate their susceptibility to stability alterations and additional erosion. Under Alternative 1, construction would take place on approximately 162 acres of soil highly susceptible to landslides and 86 acres of soil highly susceptible to slumping.

Long-term disturbance from BLM actions would occur due to the continued presence of long-term facilities and unauthorized use of the transmission line ROW, resulting in approximately 31.6 acres of long-term impacts on soil during the LOP. Due to the small area of the RBPA that would be affected, and the requirement for immediate soil stabilization and interim reclamation, the short-term and long-term, direct and indirect impacts to soils from BLM actions would not be significant under Alternative 1.

Table 4-6. Disturbance of Soil Units and Soil Families Anticipated under Alternative 1.

Soil Map Unit	Estimated Total Initial Surface Disturbance (acres)	Total Residual Disturbance (acres)	BLM Actions		Non-federal Actions		Susceptibility		
			Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Erosion Hazard	Reclamation Potential	Landslide or Slump Hazard
1	60.0	1.4	60.0	1.4	0	0	severe	poor	landslide
2	2.1	0	2.1	0	0	0	slight to moderate	poor	
5	25.9	0.7	25.9	0.7	0	0	slight	poor to fair	
6	68.8	2.1	68.8	92.1	0	0	slight to moderate	poor	slump
8	10.9	0.7	8.4	0	2.5	0.7	slight to moderate	poor	
9	6.2	0.2	6.2	0.2	0	0	slight	good	
11	75.9	13.8	44.5	4.5	31.4	9.3	slight	poor to fair	
12	12.9	1.1	12.9	1.1	0	0	severe	poor	landslide
14	16.5	0	16.5	0	0	0	slight	good	
17	75.5	1.8	75.5	1.8	0	0	slight to severe	poor to fair	landslide
19	21.1	10.3	17.2	8.1	3.9	1.1	slight	poor to fair	
20	3.2	1.9	0	0	3.2	1.9	severe	poor	landslide
30	2.5	0	2.5	0	0	0	slight	good	slump
32	6.1	0	6.1	0	0	0	moderate	poor	
34	1.1	0	1.1	0	0	0	slight	poor to fair	slump
35	3.3	0.2	3.3	0.2	0	0	severe	poor	landslide, slump
77E	7.2	0.2	7.2	0.2	0	0	slight to moderate	poor	landslide, slump

Soil Map Unit	Estimated Total Initial Surface Disturbance (acres)	Total Residual Disturbance (acres)	BLM Actions		Non-federal Actions		Susceptibility		
			Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Erosion Hazard	Reclamation Potential	Landslide or Slump Hazard
77F	2.9	0	2.9	0	0	0	moderate	poor to fair	landslide, slump
LN11	24.8	0	24.8	0	0	0	N/A	N/A	N/A
LN12	5.3	0	5.3	0	0	0	N/A	N/A	N/A
SU02	35.2	0.9	35.2	0.9	0	0	N/A	N/A	N/A
SU05	157.8	4.0	157.8	4.0	0	0	N/A	N/A	N/A
SU06	231.2	16.4	221.2	6.4	10.0	10.0	N/A	N/A	N/A
SU17	6.0	0	6.0	0	0	0	N/A	N/A	N/A
Unknown	10.0	0	0	0	10.0	0	Unk	Unk	Unk
Total acres Mapped Soil Units*	**872.3**	**54.6**	**811.3**	**31.6**	**61.0**	**23.0**			

* A small proportion of the RBPA has not been mapped for soil.
Sources: Munn and Arneson 1998a, 1998b; Soil Survey Staff 1999; BLM 1984, 2008b.

4.2.3.2 Total Project Impacts with Alternative 1

In addition to the impacts resulting from BLM actions, an additional 61.0 acres of short-term surface disturbance, and 23.0 acres of long-term surface disturbance would occur to soil map units from connected actions, as shown in Table 4-6. Alternative 1 would result in an estimated total initial surface disturbance of approximately 872.3 acres from the construction of federal and non-federal Project components (Table 4-5). Total residual Project disturbance would occur within 54.6 acres.

Alternative 1 would result in short-term adverse impacts to soils under non-federal actions from increased potential for runoff with erosion and sedimentation in areas that include susceptible soils (Table 4-6). Approximately 3.8 acres of disturbed soil under Alternative 1 are susceptible to elevated levels of runoff and erosion. Approximately 32.2 acres of soil under non-federal action have characteristics attributing to low reclamation potential. In addition, soils within the RBPA may be located on moderately steep slopes in climatic regimes that maintain frigid or cryic temperature regimes, which may exacerbate their susceptibility to stability alterations and additional erosion. Under Alternative 1 non-federal actions, construction would take place on approximately 3.2 acres of soil highly susceptible to landslides. There is low susceptibility to slumping on these soils.

Long-term disturbance would occur due to the continued presence of non-federal long-term facilities and unauthorized use of the transmission line ROW. Due to the small area of the RBPA that would be affected, and the requirement for immediate soil stabilization and interim reclamation, the short-term and long-term, direct and indirect impacts to soils under non-federal action would not be significant under Alternative 1.

4.2.4 Alternative 2

Under this alternative, construction of electrical transmission and pipeline ROWs would occur primarily on private land (Table 4-7). Successful reclamation of short-term disturbance would reduce impacts for much of the total disturbed area; however, 59.7 acres of total residual disturbance would remain for the LOP for facilities, well pads, and access roads.

4.2.4.1 Impacts of BLM Actions with Alternative 2

Table 2-5 provides information on total disturbance from specific BLM and private/state actions under Alternative 2. Alternative 2 would result in short-term and long-term adverse impacts to soils from BLM actions from increased potential for runoff with erosion and sedimentation in areas that include susceptible soils (Table 4-7).

Based on available data, it is projected that approximately 8.0 acres of disturbed soil under Alternative 2 are susceptible to elevated levels of runoff and erosion (Munn and Arneson 1998a, 1998b; Soil Survey Staff 1999; BLM 1984, 2008b). In addition, approximately 36 acres of affected lands under BLM actions have characteristics attributing to low reclamation potential. Under Alternative 2, construction would take place on approximately 4.2 acres of soil highly susceptible to landslides and 6.7 acres highly susceptible to slumping, as shown in Table 4-7.

Table 4-7. Disturbance of Soil Units and Soil Families Anticipated under Alternative 2.

Soil Map Unit	Estimated Total Initial Surface Disturbance (acres)	Total Residual Disturbance (acres)	BLM Actions		Non-federal Actions		Susceptibility		
			Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Erosion Hazard	Reclamation Potential	Landslide or Slump Hazard
1	3.9	0	3.9	0	0	0	severe	poor	landslide
2	0	0	0	0	0	0	slight to moderate	poor	none
5	0	0	0	0	0	0	slight	poor to fair	none
6	3.1	0	3.1	0	0	0	slight to moderate	poor	slump
8	10.9	0.7	0	0	10.9	0.7	slight to moderate	poor	none
9	0	0	0	0	0	0	slight	good	none
11	81.4	14.0	12.1	3.6	69.3	10.4	slight	poor to fair	none
12	0.3	0.3	0.3	0.3	0	0	severe	poor	landslide
14	16.5	0	16.5	0	0	0	slight	good	none
17	70.5	2.1	0	0	70.5	2.1	slight to severe	poor to fair	landslide
19	21.1	9.2	17.2	8.1	3.9	1.1	slight	poor to fair	none
20	3.2	1.9	0	0	3.2	1.9	severe	poor	landslide
30	2.5	0	2.5	0	0	0	slight	good	slump
32	6.1	0	6.1	0	0	0	moderate	poor	none
34	1.1	0	1.1	0	0	0	slight	poor to fair	slump
35	0	0	0	0	0	0	severe	poor	landslide, slump
73	31.1	0.9	0	0	31.1	0.9	slight	good	none
74	56.4	1.6	0	0	56.4	1.6	slight	good	none

Soil Map Unit	Estimated Total Initial Surface Disturbance (acres)	Total Residual Disturbance (acres)	BLM Actions		Non-federal Actions		Susceptibility		
			Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Erosion Hazard	Reclamation Potential	Landslide or Slump Hazard
75	4.7	0.1	0	0	4.7	0.1	slight	poor	
77E	0	0	0	0	0	0	slight to moderate	poor	landslide, slump
77F	0	0	0	0	0	0	moderate	poor to fair	landslide, slump
LN11	24.8	0	24.8	0	0	0	N/A	N/A	N/A
LN12	5.3	0	5.3	0	0	0	N/A	N/A	N/A
SU01	413.0	14.6	0	0	413.0	14.6	N/A	N/A	N/A
SU02	30.0	0.5	17.7	0	12.3	0.5	N/A	N/A	N/A
SU05	53.6	0	53.6	0	0	0	N/A	N/A	N/A
SU06	129.3	13.8	25.5	0	103.8	13.8	N/A	N/A	N/A
SU17	6.0	0	6.0	0	0	0	N/A	N/A	N/A
Unknown	10.0	0	0	0	10.0	0	N/A	N/A	N/A
Total acres Mapped Soil Units*	**984.5**	**59.7**	**195.6**	**12.0**	**789.0**	**47.7**			

* A small proportion of the RBPA has not been mapped for soil units.
Sources: Munn and Arneson 1998a, 1998b; Soil Survey Staff 1999; BLM 1984, 2008b.

Long-term disturbance that would occur due to BLM actions authorizing the continued presence of long-term facilities would result in approximately 12.0 acres (<0.01% of the RBPA) of long-term impacts on soil during the LOP. Due to the small area of the RBPA that would be affected, and the requirement for immediate soil stabilization and interim reclamation, the short-term and long-term, direct and indirect impacts to soils from BLM actions would not be significant under Alternative 2..

4.2.4.2 Total Project Impacts with Alternative 2

In addition to the impacts resulting from BLM actions under Alternative 2, described above, connected non-federal actions would contribute an additional 789.0 acres of short-term surface disturbance in soil map units, as shown in Table 4-7. Alternative 2 would result in an estimated total initial surface disturbance of approximately 984.5 acres from the construction of federal and non-federal Project components (Table 4-5). Total residual Project disturbance would occur within of 59.7 acres.

Surface disturbance under Alternative 2 would occur in similar soil map units as Alternative 1; however, overall surface disturbance acreage for each soil map unit under Alternative 2 would be different (Table 4-7). It is projected that approximately 41 acres of disturbed soil under Alternative 2 are susceptible to elevated levels of runoff and erosion. In addition, approximately 127 acres of soil under non-federal action have characteristics attributing to low reclamation potential. Under Alternative 2, construction would take place on approximately 74 acres of soil highly susceptible to landslides. There is low susceptibility to slumping on these soils.

Long-term disturbance under non-federal action that would occur due to the continued presence of long-term facilities and unauthorized use of the transmission line ROW would result in approximately 47.7 acres (<0.01% of the RBPA) of long-term impacts on soil during the LOP. Due to the small area of the RBPA that would be affected, and the requirement for immediate soil stabilization and interim reclamation, the short-term and long-term, direct and indirect impacts to soils under non-federal action would not be significant under Alternative 2.

4.2.5 Alternative 3

Table 4-8 displays the disturbance under Alternative 3 to various soil map units within the RBPA.

4.2.5.1 Impacts of BLM Actions with Alternative 3

Table 2-6 provides information on total disturbance from specific BLM and private/state actions under Alternative 3. Alternative 3 would result in short-term and long-term adverse impacts to soils from BLM actions from increased potential for runoff with erosion and sedimentation in areas that include susceptible soils (Table 4-8).

Table 4-8. Disturbance of Soil Units and Soil Families Anticipated under Alternative 3.

Soil Map Unit	Estimated Total Initial Surface Disturbance (acres)	Total Residual Disturbance (acres)	BLM Actions		Non-federal Actions		Susceptibility		
			Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Erosion Hazard	Reclamation Potential	Landslide or Slump Hazard
1	38.2	0	38.2	0	0	0	severe	poor	landslide
2	1.9	0	1.9	0	0	0	slight to moderate	poor	
5	16.7	2.7	16.7	2.7	0	0	slight	poor to fair	
6	38.5	0.2	38.5	0.2	0	0	slight to moderate	poor	slump
8	10.9	0.7	8.4	0	2.5	0.7	slight to moderate	poor	
9	15.4	0	15.4	0	0	0	slight	good	
11	64.5	13.8	33.0	4.5	31.4	9.3	slight	poor to fair	
12	12.9	0.9	12.9	0.9	0	0	severe	poor	landslide
14	16.5	0	16.5	0	0	0	slight	good	
17	37.1	0.8	37.1	0.8	0	0	slight to severe	poor to fair	landslide
19	21.1	9.2	17.2	8.1	3.9	1.1	slight	poor to fair	
20	3.2	1.9	0	0	3.2	1.9	severe	poor	landslide
30	2.5	0	2.5	0	0	0	slight	good	slump
32	6.1	0	6.1	0	0	0	moderate	poor	
34	1.1	0	1.1	0	0	0	slight	poor to fair	slump
35	0.7	0	0.7	0	0	0	severe	poor	landslide, slump
77E	2.0	0	2.0	0	0	0	slight to moderate	poor	landslide, slump

Soil Map Unit	Estimated Total Initial Surface Disturbance (acres)	Total Residual Disturbance (acres)	BLM Actions		Non-federal Actions		Susceptibility		
			Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Erosion Hazard	Reclamation Potential	Landslide or Slump Hazard
77F	12.6	0	12.6	0	0	0	moderate	poor to fair	landslide, slump
LN11	24.8	0	24.8	0	0	0	N/A	N/A	N/A
LN12	5.3	0	5.3	0	0	0	N/A	N/A	N/A
SU02	30.8	0.9	30.8	0.9	0	0	N/A	N/A	N/A
SU05	127.4	1.5	127.4	1.5	0	0	N/A	N/A	N/A
SU06	186.3	16.1	176.3	6.1	10.0	10.0	N/A	N/A	N/A
SU17	6.0	0	6.0	0	0	0	N/A	N/A	N/A
Unknown	10.0	0	0	0	10.0	0	Unk	Unk	Unk
Total acres Mapped Soil Units*	**692.3**	**48.7**	**631.3**	**25.7**	**61.0**	**23.0**			

* A small proportion of the RBPA has not been mapped for soil units.
Sources: Munn and Arneson 1998a, 1998b; Soil Survey Staff 1999; BLM 1984, 2008b.

Surface disturbance from BLM actions under Alternative 3 would occur in many of the same soil map units as Alternative 1; however, overall surface disturbance acreage for each soil map unit under Alternative 3 would be different (Table 4-8). Based on analysis of the available soils data, approximately 92 acres of disturbed soil under Alternative 3 are susceptible to elevated levels of runoff and erosion. In addition, approximately 197 acres of lands disturbed from BLM actions would have characteristics attributing to low reclamation potential. Construction would take place on approximately 104 acres of soil highly susceptible to landslides and 57 acres highly susceptible to slumping.

Long-term disturbance would occur due to the continued presence of long-term facilities and unauthorized OHV use of some ROW areas, resulting in approximately 25.7 acres (<0.01% of the RBPA) of long-term impacts on soil from BLM actions over the LOP. Due to the small area of the RBPA that would be affected, and the requirement for immediate soil stabilization and interim reclamation, the short-term and long-term, direct and indirect impacts to soils on BLM-authorized Project components would not be significant under Alternative 3.

4.2.5.2 Total Project Impacts with Alternative 3

In addition to the impacts resulting from BLM actions described above, connected non-federal actions in Alternative 3 would result in an additional 61.0 acres of short-term surface disturbance in soil map units, and an additional 23.0 acres of long-term surface disturbance, as shown in Table 4-8. Alternative 3 would result in an estimated total initial surface disturbance of approximately 692.3 acres from the construction of federal and non-federal Project components (Table 4-5). Total residual Project disturbance would occur within 48.7 acres.

Non-federal connected actions under Alternative 3 would result in the same level of soil impacts compared with Alternative 1 (Table 4-5). It is projected that approximately 3.8 acres of disturbed soil under Alternative 3 are susceptible to elevated levels of runoff and erosion. In addition, approximately 32 acres of soil under non-federal action have characteristics attributing to low reclamation potential. Under Alternative 3, construction would take place on approximately 3.2 acres of soil highly susceptible to landslides. There is low susceptibility to slumping on these soils.

Long-term disturbance under non-federal action that would occur due to the continued presence of long-term facilities and unauthorized use of the transmission line ROW would result in approximately 23.0 acres (<0.01% of the RBPA) of long-term impacts on soil during the LOP. Due to the small area of the RBPA that would be affected, and the requirement for immediate soil stabilization and interim reclamation, the short-term and long-term, direct and indirect impacts to soils under non-federal action would not be significant under Alternative 3.

4.2.6 Alternative 4

Under Alternative 4, total soil disturbances would be reduced compared to other alternatives (Tables 4-5 and 4-9).

6810 **Table 4-9. Disturbance of Soil Units and Soil Families Anticipated under Alternative 4.**

Soil Map Unit	Estimated Total Initial Surface Disturbance (acres)	Total Residual Disturbance (acres)	BLM Actions		Non-federal Actions		Susceptibility		
			Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Erosion Hazard	Reclamation Potential	Landslide or Slump Hazard
1	37.9	0	37.9	0	0	0	severe	poor	landslide
2	2.1	0	2.1	0	0	0	slight to moderate	poor	
5	14.8	0	14.8	0	0	0	slight	poor to fair	
6	41.5	0.2	41.5	0.2	0	0	slight to moderate	poor	slump
8	16.1	4.3	0.1	0	16.0	4.3	slight to moderate	poor	
9	3.4	0	3.4	0	0	0	slight	good	
11	65.8	16.5	30.5	3.6	35.3	12.9	slight	poor to fair	
12	1.6	0.3	1.6	0.3	0	0	severe	poor	landslide
14	16.5	0	16.5	0	0	0	slight	good	
17	46.9	0	46.9	0	0	0	slight to severe	poor to fair	landslide
19	21.1	9.2	17.2	8.1	3.9	1.1	slight	poor to fair	
20	3.2	1.9	0	0	3.2	1.9	severe	poor	landslide
30	2.5	0	2.5	0	0	0	slight	good	slump
32	6.1	0	6.1	0	0	0	moderate	poor	
34	1.1	0	1.1	0	0	0	slight	poor to fair	slump
35	0.1	0	0.1	0	0	0	severe	poor	landslide, slump
77E	3.8	0	3.8	0	0	0	slight to moderate	poor	landslide, slump

Soil Map Unit	Estimated Total Initial Surface Disturbance (acres)	Total Residual Disturbance (acres)	BLM Actions		Non-federal Actions		Susceptibility		
			Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Initial Surface Disturbance (acres)	Residual Surface Disturbance (acres)	Erosion Hazard	Reclamation Potential	Landslide or Slump Hazard
77F	2.9	0	2.9	0	0	0	moderate	poor to fair	landslide, slump
LN11	24.8	0	24.8	0	0	0	N/A	N/A	N/A
LN12	5.3	0	5.3	0	0	0	N/A	N/A	N/A
SU02	21.6	0	21.6	0	0	0	N/A	N/A	N/A
SU05	96.5	0	96.5	0	0	0	N/A	N/A	N/A
SU06	119.2	10.0	109.2	0	10.0	10.0	N/A	N/A	N/A
SU17	6.0	0	6.0	0	0	0	N/A	N/A	N/A
Unknown	10.0	0	0	0	10.0	0	Unk	Unk	Unk
Total Acres Mapped Soil Units*	**570.8**	**42.4**	**492.4**	**12.2**	**78.4**	**30.2**			

* A small proportion of the RBPA has not been mapped for soil units.
Sources: Munn and Arneson 1998a, 1998b; Soil Survey Staff 1999; BLM 1984, 2008b.

4.2.6.1 Impacts of BLM Actions with Alternative 4

Surface disturbance from BLM actions under Alternative 4 would occur in similar soil map units as Alternative 1; however, overall surface disturbance acreage for each soil map unit under Alternative 4 would be substantially reduced (Table 4-9) due to the removal of the Cimarex 230-kV transmission line. Although the Cimarex electrical transmission line from the Chimney Butte Substation to the M&HRF would not be constructed under Alternative 4, the transmission line from the Substation to the HLF would be. Table 2-7 provides information on total disturbance from specific BLM and private/state actions under Alternative 4. Like the other alternative discussed, Alternative 4 would result in short-term and long-term adverse impacts to soils from BLM actions from increased potential for runoff with erosion and sedimentation in areas that include susceptible soils (Table 4-9).

It is projected that approximately 79 acres of disturbed soil under Alternative 4 are susceptible to elevated levels of runoff and erosion. In addition, approximately 178 acres of lands affected by BLM actions have characteristics attributing to low reclamation potential. Under Alternative 4, construction would take place on approximately 93 acres of soil highly susceptible to landslides and 52 acres highly susceptible to slumping.

Long-term disturbance of soils from BLM actions would occur due to the continued presence of long-term facilities, resulting in approximately 12.2 acres (<0.01% of the RBPA) of long-term impacts on soil during the LOP. Due to the small area of the RBPA that would be affected, and the requirement for immediate soil stabilization and interim reclamation, the short-term and long-term, direct and indirect impacts to soils from BLM actions would not be significant under Alternative 4.

4.2.6.2 Total Project Impacts with Alternative 4

With Alternative 4, the Operator would construct and operate an EGS on 7 acres of State of Wyoming land near the M&HRF, including ancillary pipelines and electrical transmission lines. Alternative 4 would result in an estimated total initial surface disturbance of approximately 570.8 acres from the construction of federal and non-federal Project components (Table 4-9). Total residual Project disturbance would occur within 42.4 acres.

Alternative 4 surface disturbance would occur in similar soil map units but would affect fewer acres overall. The addition of the EGS and electrical transmission lines (Table 4-9) in the Riley Ridge Unit would, however, add an additional 7.38 acres of short- and long-term disturbance. Approximately 7.2 acres of disturbed soil under Alternative 4 are susceptible to elevated levels of runoff and erosion. In addition, 41.0 acres of affected soil have characteristics attributing to low reclamation potential due to non-federal actions. Under Alternative 4, construction would take place on approximately 3.2 acres of soil highly susceptible to landslides. There is low susceptibility to slumping on these soils.

Long-term disturbance would occur due to the continued presence of non-federal long-term facilities, resulting in approximately 30.2 acres (<0.01% of the RBPA) of long-term impacts on soil during the LOP. Due to the small area of the RBPA that would be affected, and the requirement for immediate soil stabilization and interim reclamation, the short-term and long-

term, direct and indirect impacts to soils under non-federal action would not be significant under Alternative 4.

Alternative 4 surface disturbance would occur in similar soil map units but would affect more acres with the addition of the EGS and electrical transmission lines (Table 4-9). Approximately 7.0 acres of disturbed soil under Alternative 4 are susceptible to elevated levels of runoff and erosion. In addition, 47 acres of affected soil have characteristics attributing to low reclamation potential due to non-federal actions. Under Alternative 4, soils are developing on nearly level to moderately steep slopes (1% to 32%), with an average slope of 13%. Approximately 0.3% of the non-federal action would occur on steep slopes (greater than 25%), with construction taking place on approximately 2.6 acres of soil highly susceptible to landslides. There is low susceptibility to slumping on these soils.

Long-term disturbance would occur due to the continued presence of non-federal long-term facilities and unauthorized use of the transmission line ROW, resulting in approximately 32 acres (<0.01% of the RBPA) of long-term impacts on soil during the LOP. Due to the small area of the RBPA that would be affected, and the requirement for immediate soil stabilization and interim reclamation, the short-term and long-term, direct and indirect impacts to soils under non-federal action would not be significant under Alternative 4.

The electrical transmission line from the Chimney Butte Substation would not be constructed under Alternative 4, thereby reducing the total acreage of short-term soil disturbance from BLM actions. Since transmission lines are overhead and the pole structures do not require much long-term surface disturbance, the change results in higher overall long-term soil disturbance than Alternative 1 and the other alternatives, although no significant adverse impacts would result from this alternative.

4.2.7 Cumulative Impacts

The CIAA for soils is the RBPA boundary. In addition to the existing disturbance in the CIAA, and the incremental added short-term disturbance and loss of soil productivity due to the construction of the Project facilities, there would be foreseeable future impacts to soils for increased development over the LOP. These cumulative impacts on soils would be closely associated with changes in vegetation cover related to cumulative development of this and other ongoing oil and gas development and existing management practices (i.e., livestock grazing) in the RBPA; however, because there are no applications for current projects in the RBPA, the location and significance of the impacts could not be predicted. Assuming current general distribution patterns for development outlined in the Pinedale RMP (BLM 2008b), a conservative future development scenario would approximately double oil and gas infrastructure in the reasonably foreseeable future, including secondary development of access roads, power lines, and pipeline infrastructure.

With the application of stormwater pollution prevention plan measures, WDEQ BMPs, WYPDES standards, and other BMPs and COAs to current and reasonably foreseeable projects in the CIAA, and past implementation of reclamation measures and mitigations on previous projects in the CIAA, additional impacts beyond the long-term disturbance and loss

of soil productivity within the RBPA would be expected to be adverse but not reach a level of significance due to the overall size of the CIAA and current dispersed development.

4.2.8 Mitigation and Monitoring Opportunities

The overall management goal for the soil resource is to restore the character of the land to pre-disturbance conditions through the prevention and mitigation of adverse impacts on soil stability, productivity, and water infiltration (BLM 2008b). Projects would be examined on a site-specific basis, evaluating the potential for soil loss, and the compatibility of soil properties with project design. Stipulations and mitigating measures are provided on a case-by-case basis to ensure soils conservation and practical management. Management of the soil resource would be based on the following:

- Evaluation and interpretation of soils in relation to project design and development.
- Identification and inventory of soils for baseline data.
- Identification and implementation of methods to reduce accelerated erosion.

Actions taken to protect soils from erosive forces and further degradation ultimately conserve soil productivity and fertility, providing optimal conditions for plant growth to sustain wildlife habitat, air and water quality, and a viable agricultural economy (BLM 2008b; Urbigkit 2008). The purposes of these mitigation and monitoring guidelines are to reduce soil erosion, increase soil stability, increase water infiltration, and reduce runoff. To accomplish these goals, the BLM may modify the operations of all surface disturbances and inform the Operator of BMPs and COAs that must be met when using public lands. The Operator would collaborate with local, state, and federal agencies to ensure that all newly disturbed areas are successfully reclaimed and that the management actions are consistent with inherent soil resource capabilities. The Operator would conduct all surface activities in accordance with the BLM Gold Book (USDI and USDA 2007), the Pinedale RMP (BLM 2008b), the Storm Water Pollution Prevention Plan (SWPPP), WYPDES standards, and the WDEQ Storm Water Discharge Permit. Additional mitigation would be applied in all areas with soils that are classified as highly erodible, saline, fragile and other sensitive soils, determined by the BLM Authorizing Officer (AO).

Refer to Appendix 3 of the Pinedale RMP (BLM 2008b) for additional mitigation and BMPs that can be implemented to protect soils.

4.2.8.1 Mitigation

*4.2.8.1.1 BLM-Required Mitigation**

- Soil retention measures, such as silt fencing, contour furrows, or hydromulching, would be implemented at the time of disturbance.
- Topsoil depth would be determined by the BLM AO and all surface soil materials salvaged and respread during interim reclamation. During pipeline and fiber optic line construction, topsoil would be kept intact through scalping.
- Interim reclamation of disturbed areas would be initiated within one growing season to minimize long-term exposure to wind and water erosion, achieve natural erosion rates

and soil productivity to the extent practicable, and control for invasive noxious weeds and/or undesirable plant species. The prompt revegetation of disturbed areas using adapted species and BLM-approved seed mixtures, and the application of biodegradable mulch, netting, or soil stabilizers, would be advised.

- The Operator shall be required to development, submit, and implement a SWPPP prior to initiating construction operations on BLM-administered lands.

*4.2.8.1.2 Other Mitigation Opportunities***

- Deep ripping and/or adding mulches would alleviate soil compaction and create micro-topography, reduce water and wind erosion, increase potential of rooting depth, and enhance seedling growth.
- The addition of soil conditioners and fertilizers would ameliorate poor topsoil quality.
- Once NRCS order three soil surveys become available for the RBPA, newly available data would be incorporated into an addendum for this report and used to classify soils by erodibility, alkalinity, salinity, fragility, or sensitivity to construction activity.
- If erosion is noticed in ROWs by unauthorized OHV use, then additional measures would be put into place to control erosion and initiate revegetation.
- Use mat pads on those soils identified as having low reclamation potential.

4.2.8.2 <u>Monitoring</u>

*4.2.8.2.1 BLM-Required Monitoring**

- When soil erosion in upland soils is accelerated beyond natural levels, visual observations and surveyed erosion pins would be used to determine annual soil loss while land use operations are active and during annual site surveys.
- If the water table shrinks beyond average precipitation fluctuations and soil erosion on stream banks and floodplains is increasing, visual observations and surveyed erosion pins would be used to determine the affected area while land use operations are active and during annual site surveys.
- When soil compaction restricts water infiltration and plant growth, visual inspection and use of a penetrometer would be used to determine the depth and exceedance of compaction one to two times annually.
- Critical erosion condition areas would be identified in soil surveys during the site-specific project analysis for the purpose of avoidance and special management.

*4.2.8.2.2 Other Monitoring Opportunities***

- Pre-disturbance and post-disturbance vegetation monitoring would be used, in addition to site-specific soil surveys, to determine baseline site conditions, establish ecological site descriptions, monitor invasive or undesirable plant species, and monitor reclamation success.
- Monitoring of the effectiveness of erosion control measures and BMPs during M&HRF construction is recommended.

- If slumping or slope instability is recognized during construction activities, appropriate measures would be taken to control and/or prevent soil mass movements.

* BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the proposed Project, as identified in Chapter 2.

** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal Project components.

4.3 PALEONTOLOGICAL RESOURCES

4.3.1 Impact Criteria

The PFO RMP ROD has developed management objectives designed to protect significant fossils and known paleontological resources from damage or destruction and facilitate suitable scientific, educational, and recreational uses of fossils (BLM 2008b). A significant impact would occur if a paleontological site is encountered during construction operations and important fossils, which could substantially add to the scientific understanding of paleontological resources, are destroyed. According to the RMP, paleontological sites would be protected by using surface and subsurface protection stipulations and discretionary management authority.

Direct adverse impacts on paleontological resources would occur from the potential destruction of non-renewable paleontological resources and the loss of information associated with these resources. In general, the potential for direct impacts on paleontological resources increases with and is proportionate to ground-disturbing activities located in paleontologically sensitive geologic units and therefore correlates directly with the amount (acreage and depth) of bedrock disturbance. If potentially fossiliferous bedrock or surficial sediments are mechanically disturbed, the disturbance could result in the destruction of paleontological resources and subsequent loss of information (adverse impact).

Long-term indirect adverse impacts would include the unlawful or unauthorized collection of fossil remains, which may increase due to the development of new roads and trails in areas that were previously less accessible and with increased human activity associated with operating new facilities.

The types of impacts are common to all alternatives. However, the degree of impact varies between alternatives because the severity of the impact is directly correlative with the amount of disturbance in areas containing highly sensitive geologic units (PFYC Class 5). In all areas in the RBPA underlain by the La Barge and Chappo members of the Wasatch Formation (PFYC Class 5), there is the potential for adverse impacts to subsurface (buried) paleontological resources during ground disturbance. This is further evidenced by the seven recorded localities within the RBPA.

Direct adverse impacts on paleontological resources resulting from surface and subsurface bedrock disturbance are possible in all alternatives during installation of fiber optic cables, well pads, pipelines, and transmission line poles and construction of the EGS, M&HRF, HLF, and AAM&WS. Shallow disturbance may also be associated with the installation and

tensioning of the transmission lines and associated two-track roads. No direct impacts to paleontological resources are expected from the use of the existing access roads.

After construction is complete, unauthorized access by the public using the two-track road created to facilitate installation of the transmission lines would result in an increased potential for illegal collection and vandalism of exposed paleontological resources in areas that were previously less accessible.

Direct and indirect adverse impacts to potentially fossiliferous geological sediments can typically be reduced to below a level of significance through the implementation of paleontological mitigation; however, because mitigation may only be required on BLM-administered land within the RBPA, disturbance of fossiliferous geologic units located on non-federal lands may result in unmitigated adverse impacts.

The estimated acres of disturbance under each alternative are summarized by geologic unit and land ownership in Table 4-10, by geologic unit and infrastructure type in Table 4-11, and by jurisdiction in Table 4-12. All disturbance estimates are based on the best available conceptual design information provided by Project proponents.

Table 4-10. Summary of Surface Disturbance Acreage for Each Alternative by Geologic Unit and Land Owner.[1]

Geologic Unit	PFYC	Alternative 1			Alternative 2			Alternative 3			Alternative 4		
		BLM	Other	Total	BLM	Other	Total	BLM	Other	Total	BLM	Other	Total
Alluvium and colluvium (Qa)	Class 2	26	38	64	22	365	387	32	31	63	23	24	47
Gravel, pediment, and fan deposits (Qt)	Class 2	248	117	365	31	327	358	193	92	285	132	78	210
Wasatch Formation, Diamictite and Sandstone (Twd)	Class 3	61	61	122	13	112	125	44	56	100	40	64	104
Wasatch Formation, La Barge and Chappo Members (Twlc)	Class 5	238	73	311	70	35	105	179	55	234	157	43	200
BLM disturbance and % of total disturbance		**573 (66%)**	**289 (34%)**	**862**	**136 (14%)**	**839 (86%)**	**945**	**448 (66%)**	**235 (34%)**	**682**	**351 (63%)**	**20 (37%)**	**561**

[1]Geologic abbreviations and acreage obtained from Love and Christiansen 1985, Green and Drouillard 1994.

Table 4-11. Summary of Surface Disturbance Acreage for Each Alternative by Infrastructure Type and Geologic Unit.

	Alternative 1				Alternative 2				Alternative 3				Alternative 4			
	Class 2		Class 3	Class 5	Class 2		Class 3	Class 5	Class 2		Class 3	Class 5	Class 2		Class 3	Class 5
	Qa	Qt	Twd	Twlc	Qa	Qt	Twd	Twlc	Qa	Qt	Twd	Twlc	Qa	Qt	Twd	Twlc
Wood H-frame (2-pole) and 3-pole structures	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A	N/A	N/A	N/A
Steel monopole structures	<1	<1	<1	<1	N/A	N/A	N/A	N/A	<1	<1	<1	<1	0	0	<1	0
Pulling and tensioning sites and long-term two-track road associated with transmission line	1	52	19	13	11	11	2	1	1	7	1	1	0	0	0	0
In-ROW temporary transmission line construction disturbance (not including disturbance associated with pulling sites and two-track road)	18	128	23	101	168	186	34	11	22	164	32	103	0	25	10	2
Cimarex gas and helium pipelines and fiber optic line	14	138	33	125	177	113	35	21	9	64	13	58	14	139	33	116
Williams pipeline	31	21	0	72	31	21	0	72	31	21	0	72	31	21	0	72
Gas and water injection flow lines	0	5	12	0	0	5	17	0	0	0	7	0	0	0	7	0
Three well pads (gas and acid injection, gas, and water)	0	5	6	0	0	5	5	0	0	5	5	0	0	5	5	0
EGS, M&HRF, HLF, and AAM&WS and electrical and communication conduit	0	16	29	0	0	17	32	0	0	24	42	0	0	22	49	10

Table 4-12. Summary of Impacts by Jurisdiction – Paleontological Resources.

Project Component	No Action Alt.			Alternative 1			Alternative 2			Alternative 3			Alternative 4		
	PFYC Classes														
	2	**3b**	**5**	**2**	**3b**	**5**	**2**	**3b**	**5**	**2**	**3b**	**5**	**2**	**3b**	**5**
BLM Actions															
AAM&WS and electrical and communication conduit	No BLM Action			0	4	0	0	4	0	3	4	0	0	4	0
3 gas production wells and acid gas injection well pad				0	5	0	0	5	0	0	5	0	0	5	0
1 gas production well pad (10-14 location)				5	0	0	5	0	0	5	0	0	5	0	0
Helium pipeline & fiber optic line*				121	17	67	No BLM Action			43	0	10	123	17	67
Cimarex gas pipeline*				31	17	58	3	0	13	28	14	48	31	17	58
Electrical transmission line*				198	35	114	20	0	3	195	33	104	24	0	3
Williams gas pipeline*				52	0	72	52	0	72	52	0	72	52	0	72
Utility corridor (buried electrical and fiber optic lines, gas flowlines and/or sour gas injection line)				5	10	0	5	10	0	5	10	0	5	10	0
Total Acres Affected by BLM Actions	**0**			**412**	**88**	**311**	**85**	**19**	**88**	**331**	**66**	**234**	**240**	**53**	**200**
Non-federal Actions															
Produced water line and injection well pad	0	7	0	Same as No Action.			Same as No Action.			Same as No Action.			Same as No Action.		
EGS	Not applicable			Not applicable			Not applicable			Not applicable			0	7	0
M&HRF	7	27	0	Same as No Action.			Same as No Action.			Same as No Action.			Same as No Action.		
HLF	10	0	0	Same as No Action.			Same as No Action.			Same as No Action.			Same as No Action.		
Helium pipeline & fiber optic line*				BLM Actions			211	20	5	BLM Actions			BLM Actions		
Cimarex gas pipeline							75	17	3						
Electrical transmission line							356	36	9				0	10	0
Williams gas pipeline*	Not applicable						BLM Actions						BLM Actions		
Total Acres Affected	**17**	**34**	**0**	**429**	**122**	**311**	**745**	**125**	**105**	**348**	**100**	**234**	**257**	**104**	**200**

*May also cross private and state lands

4.3.1 No Action Alternative

Under the No Action Alternative, ROWs and APDs for the proposed Project would not be approved by BLM, and no impacts would occur to paleontological resources as a result of BLM actions. Non-federal connected actions would occur, as described in Chapter 2. These private and state actions would result in temporary disturbance to greater than 840 acres in the RBPA.

Since No Action uses mostly private land for pipelines and transmission lines, it would be very similar to Alternatives 2. Most impacts would occur on land underlain by geological units with moderate or low paleontological sensitivity (PFYC Class 2 or Class 3). Therefore, even though the non-BLM-administered land would not necessarily be afforded protective measures, the impacts to paleontological resources are expected to be low.

4.3.2 Alternative 1

4.3.2.1 Impacts of BLM Actions with Alternative 1

BLM actions in Alternative 1 are underlain by approximately 412 acres of Class 2 geologic units, 88 acres of the Class 3 geologic unit, and 311 acres of the Class 5 geologic unit. Federal land occupies approximately 61 acres of the Class 3 geologic unit and 238 acres of the Class 5 geologic unit associated with BLM actions of Alternative 1. The State of Wyoming or private parties own the remaining 100 acres of Class 3 and Class 5 geologic units.

The BLM PFO record searches revealed that seven previously recorded fossil localities occur within 1 mile of Alternative 1 but outside of the Project APE. During the field survey for this EA, two fossil localities were newly discovered and documented on state land but were not collected. Locality 081110-GEK-01 occurs immediately adjacent to the proposed transmission line, and locality 081111-GEK-01 was documented from within the APE of the gas pipeline and helium pipeline/fiber optic line. To avoid significant impacts, these localities should be avoided by construction activities or mitigated prior to construction. No significant surface fossils were located on BLM-administered land during the field survey of Alternative 1; therefore, immediate surface clearance would be recommended for all infrastructure associated with the portions of this alternative located on BLM-administered land.

BLM actions under Alternative 1 could result in adverse impacts to undiscovered paleontological resources. The presence of the fossil localities noted above, combined with the known sensitivity of the Wasatch Formation, indicate that Alternative 1 has the potential to adversely impact fossil remains along the approximately 311 acres underlain by the most sensitive fossil class, PFYC Class 5 geologic unit. Because much of the surface within this alternative is vegetated, surface and shallow subsurface disturbance is unlikely to significantly impact paleontological resources in the vegetated portions of the route because the surface is composed of highly weathered bedrock and soils that do not contain in-situ fossils. Surface and shallow subsurface disturbance along the sparsely vegetated portions of Alternative 1 does have the potential to adversely impact fossil remains. However, since BLM management provides for monitoring and mitigation during the construction phase on BLM-administered land, the impacts would not be significant on BLM land. Impacts could also be reduced to below the level of significance on non-BLM land by additional construction mitigation and monitoring.

4.3.2.2 Total Project Impacts with Alternative 1

Alternative 1 is underlain by approximately 429 acres of Class 2 geologic units, 122 acres of the Class 3 geologic unit, and 311 acres of the Class 5 geologic unit. Federal land occupies approximately 61 acres of the Class 3 geologic unit and 238 acres of the Class 5 geologic unit. The State of Wyoming or private parties own the remaining 134 acres of Class 3 and Class 5 geologic units.

There are no acres of the PFYC Class 5 geologic unit and only 34 acres of the PFYC Class 3 geologic unit underlying the non-BLM actions. Therefore, nearly all acres of paleontologically sensitive geologic units underlie the BLM jurisdictional components of Alternative 1.

4.3.3 Alternative 2

4.3.3.1 Impacts of BLM Actions with Alternative 2

BLM actions in Alternative 2 are underlain by approximately 85 acres of Class 2 geologic units, 19 acres of the Class 3 geologic unit, and 88 acres of the Class 5 geologic unit. Under BLM actions in Alternative 2, federal land occupies approximately 13 acres of the Class 3 geologic unit and 70 acres of the Class 5 geologic unit. The remaining 24 acres of Class 3 and Class 5 geologic units are under ownership of the State of Wyoming or private parties.

One previously documented vertebrate locality (University of Wyoming [UW] 60018/UCMP V99087) occurs on BLM land within or immediately adjacent to the Cimarex gas pipeline APE and three localities occur within a 1-mile radius of Alternative 2 BLM actions. These four localities also occur within 1 mile of BLM actions in Alternatives 1, 3, and 4. The presence of these localities, combined with the known sensitivity of the Wasatch Formation, indicates that BLM actions in Alternative 2 have the potential to adversely impact fossil remains along the approximately 88 acres underlain by the most sensitive geologic unit (PFYC Class 5). Implementing this alternative could result in adverse impacts. However, since BLM management provides for monitoring and mitigation during the construction phase, the impacts on BLM-administered land would not be significant. Impacts could also be reduced to below the level of significance on non-BLM land by additional mitigation and monitoring.

4.3.3.2 Total Project Impacts with Alternative 2

The Alternative 2 APE is underlain by approximately 745 acres of Class 2 geologic units, 125 acres of the Class 3 geologic unit, and 105 acres of the Class 5 geologic unit. Federal land occupies approximately 13 acres of the Class 3 geologic unit and 70 acres of the Class 5 geologic unit. The State of Wyoming or private parties own the remaining 147 acres of Class 3 and Class 5 geologic units.

Since Alternative 2 uses mostly private land for pipelines and transmission lines, BLM actions would result in reduced adverse impacts to BLM-managed paleontological resources compared with Alternative 1. Most impacts would occur on private land underlain by geological units with moderate or low paleontological sensitivity (PFYC Class 2 or Class 3). Therefore, even though the non-BLM-administered land would not necessarily be afforded protective measures, the impacts to paleontological resources would be expected to be low.

4.3.4 Alternative 3

4.3.4.1 Impacts of BLM Actions with Alternative 3

BLM actions in Alternative 3 are underlain by approximately 331 acres of Class 2 geologic units, 66 acres of the Class 3 geologic unit, and 234 acres of the Class 5 geologic unit. Under Alternative 3 BLM actions, federal land occupies approximately 44 acres of the Class 3 geologic unit and 179 acres of the Class 5 geologic unit. The State of Wyoming or private parties own the remaining 77 acres of Class 3 and Class 5 geologic units.

Previously and newly recorded fossil localities within 1 mile of Alternative 3 include all of the localities identified in the APE of Alternative 1, including the new fossil locality, 081111-GEK-01, which occurs within the Alternative 3 APE of the proposed gas pipeline and helium pipeline/fiber optic line and the proposed transmission line. An additional survey would have to be conducted on a small section of Class 5 formations underlying the re-routed segment of the transmission line. The types of direct and indirect disturbance in Alternative 3 are identical to Alternative 1 except that the a portion of the natural gas and helium pipelines and fiber optic cable would be co-located in a shared trench, thereby reducing the total acreage of disturbance. As with other alternatives, implementing this alternative could result in adverse impacts. However, since BLM management provides for monitoring and mitigation during the construction phase, the impacts on BLM-administered land would not be significant.

4.3.4.2 Total Project Impacts with Alternative 3

The entire APE of Alternative 3 is underlain by approximately 348 acres of Class 2 geologic units, 100 acres of the Class 3 geologic unit, and 234 acres of the Class 5 geologic unit. Federal land occupies approximately 44 acres of the Class 3 geologic unit and 179 acres of the Class 5 geologic unit. The State of Wyoming or private parties own the remaining 111 acres of Class 3 and Class 5 geologic units.

Overall, Alternative 3 would impact approximately 77 acres less of the Class 5 geologic unit than Alternative 1 would, but approximately 129 acres more would be impacted than in Alternative 2. Therefore, the likelihood of adverse impacts to highly paleontologically sensitive geologic units (PFYC Class 5) under Alternative 3 would be lower than Alternative 1 but higher than Alternative 2 for combined federal and non-federal Project components.

4.3.5 Alternative 4

4.3.5.1 Impacts of BLM Actions with Alternative 4

Alternative 4 BLM actions are underlain by approximately 240 acres of Class 2 geologic units, 53 acres of the Class 3 geologic unit, and 200 acres of the Class 5 geologic unit. The BLM is the surface owner for approximately 40 acres of the Class 3 geologic unit and 157 acres of the Class 5 geologic unit. The State of Wyoming or private parties own the remaining 56 acres of Class 3 and Class 5 geologic units.

The types and amounts of direct and indirect disturbance in Alternative 4 are similar to Alternative 1 except that an EGS and associated infrastructure would replace the main transmission line proposed in Alternative 1, thereby reducing the total acreage of disturbance. Previously and newly recorded fossil localities within the APE or within 1 mile of Alternative

4 are the same as described above in Alternatives 1 and 3, except that the one new fossil locality (081110-GEK-01) mentioned in Alternative 1 and located on state land, adjacent to the main transmission line in Alternatives 1 and 3, is not in or immediately adjacent to the APE in Alternative 4.

The presence of these localities, combined with the known sensitivity of the Wasatch Formation, indicates that BLM actions in Alternative 4 have the potential to adversely impact fossil remains along the approximately 200 acres underlain by the most sensitive geologic unit (PFYC Class 5). Implementing this alternative could result in adverse impacts. However, since BLM management provides for monitoring and mitigation during the construction phase, the impacts on BLM-administered land would not be significant. Impacts could also be reduced to below the level of significance on non-BLM land by additional mitigation and monitoring.

4.3.5.2 Total Project Impacts with Alternative 4

The Alternative 4 APE is underlain by approximately 257 acres of Class 2 geologic units, 104 acres of the Class 3 geologic unit, and 200 acres of the Class 5 geologic unit within the RBPA. The BLM is the surface owner for approximately 40 acres of the Class 3 geologic unit and 155 acres of the Class 5 geologic unit. The State of Wyoming or private parties own the remaining 109 acres of Class 3 and Class 5 geologic units.

Approximately 34 fewer acres of the Class 5 geologic unit would be impacted than under Alternative 3, but approximately 95 acres more would be impacted than in Alternative 2. Therefore, the likelihood of adverse impacts to highly sensitive geologic units (PFYC Class 5 under Alternative 4 would be lower than Alternatives 1 and 3 but higher than Alternative 2.

4.3.6 Cumulative Impacts

Cumulative impacts were assessed within 1 mile of each alternative‘s components. Component impact types are expected to be similar between all alternatives. However, the acreage of highly paleontologically sensitive geologic units and the number of existing localities within the APE varies per alternative. In addition to Project-specific alternatives, cumulative impacts from the doubling of other private oil and gas drilling and production projects may also occur to paleontological resources in the RBPA in the foreseeable future. Where those private projects occur on fee or state land, protection of paleontological resources and the information they contain may be lost. Increased cumulative impacts on paleontological resources from implementation of the Project would be expected to be incrementally small under some of the action alternatives due to the predominance of federal management with more stringent mitigation guidelines and would be limited to direct and indirect impacts within the RBPA. PFYC Class 3 and Class 5 have the greatest potential to contain paleontological resources. Alternative 1 would disturb 433 acres of Classes 3 and 5, Alternative 2 would disturb 230 acres, Alternative 3 would disturb 334 acres, and Alternative 4 would disturb 304 acres. These cumulative impacts for each alternative would not be significant compared to the total paleontological resource availability of 20,327 acres of PFYC Class 3 and Class 5 on federal-managed land in the RBPA.

4.3.7 Mitigation and Monitoring Opportunities

The mitigation and monitoring measures outlined below would reduce adverse impacts to below the level of significance either through avoidance of resources or through fossil recovery, preservation, and permanent storage.

4.3.7.1 Mitigation Opportunities

*4.3.7.1.1 BLM-Required Mitigation **

- Should any subsurface bones or other potential fossils be discovered by construction personnel on BLM-administered land anywhere within the RBPA, the BLM must be notified immediately, as stated in Appendix 3 of the Pinedale RMP (BLM 2008b), and work in the area of the discovery shall cease until the BLM or a qualified and BLM-permitted paleontologist can assess the discovery, determine its significance, and make additional recommendations.
- A field survey is required for lands affected by BLM actions, if they are underlain by Class 5 geologic units. All significant surficial fossils should be collected and housed in a BLM-approved repository. Further mitigation recommendations would be made based on the survey results.
- BLM has identified information of a previously recorded fossil locality (UW 60018/UCMP V99087, mentioned above in Section 4.3.4) located on BLM-administered land in Section 14, T29N, R113W. Additional information should be obtained to accurately relocate this fossil locality.
- If the site is determined to be significant and is within the APE of the Cimarex gas pipeline, appropriate mitigation such as surface collection of significant fossils (with associated construction monitoring) or site avoidance is required prior to and/or during construction activities around the site

*4.3.7.1.2 Other Mitigation Opportunities***

- If any subsurface bones or other potential fossils are unearthed during construction on non-federal land anywhere within the RBPA, it is recommended that the Environmental Inspector (EI) be contacted immediately. The EI should then contact the Project Paleontologist and Cimarex representative, who will then contact the appropriate land management agency or land owner. It is also recommended that work in the area of the discovery cease until the Project paleontologist can assess the discovery, determine its significance, and make additional recommendations.
- It is recommended, based on site significance and the State of Wyoming Board of Land Commissioners‘ rule to protect and preserve paleontological resources on state land (Office of State Lands and Investment [OSLI] 2009), that fossil localities 081110-GEK-01 (Section 16, T29N, R112W) and 081111-GEK-01 (Section 16, T29N, R113W) located along the transmission line (Alternatives 1 and 3) and the Cimarex pipeline (Alternatives 1, 3, and 4), respectively, be avoided. If avoidance is not feasible, the surface fossils should be collected prior to construction and the site should be monitored during construction by a qualified and state-permitted paleontologist. The BLM has detailed location data for these localities.

- A field survey is recommended for infrastructure locations should the BLM selected alternative include unsurveyed ROW areas underlain by Class 5 geologic. All significant surficial fossils should be collected and housed in a BLM-approved repository. Further mitigation recommendations would be made based on the survey results.

4.3.7.2 Monitoring Opportunities

*4.3.7.2.1 BLM-Required Monitoring Opportunities**

- Reinforced steel monopoles would be used on BLM-administered land in Alternatives 1 and 3. Ground disturbance associated with the construction of steel monopoles is expected to occur over a greater area and be deeper than that for the wooden H-frames; therefore, paleontological monitoring is required on BLM-administered lands for construction activities associated with the steel monopole installation where underlain by Class 5 geologic units.
- For Alternatives 1, 2, 3, and 4, monitoring is required on BLM-administered lands for the construction of the portions of the Cimarex and Williams pipelines and the helium pipeline/fiber optic line underlain by Class 5 geologic units.
- In Alternatives 1, 2, and 3, monitoring is required on BLM-administered lands for in-line pulling and tensioning sites and two-track road areas underlain by the Class 5 geologic unit where subsurface disturbance is anticipated.

*4.3.7.2.2 Other Monitoring Opportunities***

- Reinforced steel monopoles would be used on private and state land in Alternatives 1, 3, and 4. Because ground disturbance associated with the construction of steel monopoles is expected to occur over a greater area and be deeper than that for the wooden H-frames, paleontological monitoring is recommended on private and state lands for construction activities associated with the steel monopole installation where underlain by Class 5 geologic units.
- For Alternatives 1, 2, 3, and 4, monitoring is recommended on private and state lands for the construction of the portions of the Cimarex and Williams pipelines and the helium pipeline/fiber optic line underlain by Class 5 geologic units.
- For Alternatives 1, 2, and 3, monitoring is recommended on private and state lands for in-line pulling and tensioning sites and two-track road areas underlain by the Class 5 geologic unit where subsurface disturbance is anticipated.

* BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the proposed Project, as identified in Chapter 2.

** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal Project components

4.4 GROUNDWATER AND SURFACE WATER RESOURCES

4.4.1 Impact Criteria

Resource indicators used to assess potential impacts to the affected water resources environment would address changes to both the water quality and physical hydrology (quantity and timing) of the resources. Potential direct and indirect impacts to surface water and groundwater resources within or near the RBPA may be short term or long term. Short-term direct and indirect impacts to water resources would be associated with drilling and construction activities and would decrease as well encasement, and land reclamation and other mitigation procedures are implemented.

Long-term impacts may result indirectly from effects associated with the operation of production and injection wells, or the added runoff and potential contamination of surface water due to the introduction of new facilities, impervious surface cover, or continuous or unreclaimed soil disturbance.

The WDEQ is responsible for the protection of the water quality of all waters for the state of Wyoming. This responsibility includes, but is not limited to, the quality of surface water, groundwater, and produced water from oil and gas, mining, and other private, public, or commercial ventures. The WDEQ is responsible for site characterization, cleanup, permitting, and compliance of surface water and groundwater under the authority of the Clean Water Act, NPDES, or WYPDES, and the Resource Conservation and Recovery Act and CERCLA for polluted sites.

Criteria for evaluating potential significance of direct or indirect impacts to groundwater include the following:

- exceedance of water quality standards established for the classified use of aquifers as a direct or indirect result of Project activities; and
- changes in the groundwater elevation in area wells or reduction of discharge at springs and seeps that could be directly attributed to upgradient Project activities.

Potential short-term water quality impacts to groundwater from BLM actions could include contamination of shallow groundwater resources if reserve pits leak or contaminants are otherwise spilled during development.

Depending on the quality of the water, the introduction of water from sources outside of the RBPA for dust control, drilling mud, or equipment maintenance could result in adverse reactions in shallow or deep aquifers, producing long-term impacts to groundwater. Reactions could include the oxygenation or precipitation of metals or the release of nutrients such as phosphorus from the soil matrix into the aquifer system.

Depending on the quality of each water source, there could be the potential of physical and chemical reactions between introduced water from construction activities within the RBPA and the native groundwater. Given the low volume of introduced water anticipated, no adverse impacts would result.

Long-term groundwater quality within the RBPA could be affected if any of the Project components are built at locations where local soils and/or geology contain contaminants that could leach into groundwater from land surface releases of water. The groundwater impact would depend on the contaminant concentration, the ability of underlying soil and aquifer materials to absorb contaminants, and the hydraulic connection with underlying aquifers. Changes in groundwater quality could potentially impact surface water quality at any point where groundwater may discharge to streams.

Criteria for evaluating potential significance of direct or indirect impacts to surface water include the following:

- exceedances of water quality standards established for the surface water body as a result of Project activities;
- changes in physical hydrology or channel morphology of streams as a result of Project activities; and
- changes in riparian condition, erosion, and/or drainage patterns as a result of Project activities, such that they result in exceedances of water quality standards.

Surface-disturbing activities can affect surface water quality through increased sedimentation and runoff. Soil disturbance and the removal of vegetative cover increases the potential for soil erosion, which in turn increases sediment loading during runoff-producing storm events. Salts, metals, and organic substances contained in or adsorbed onto sediments can be transported into the surface waters along with the sediment and further degrade water quality. Soil erosion can also affect drainage patterns and channel morphology.

Accidental spills of hazardous materials can also impact surface water quality. Increased surface runoff and erosion would occur primarily in the short term and would decline in time due to natural stabilization through disturbed surface revegetation, soil structure development, and armoring.

Adverse impacts to water resources as a result of erosion and sedimentation typically can be reduced to below a level of significance through the implementation of mitigation measures initiated through the execution of an effective SWPPP and successful timely reclamation of disturbed sites as outlined in the SWPPP.

4.4.2 No Action Alternative

Under the No Action Alternative, the proposed federal components of the Project would not be developed, but non-federal connected actions may proceed without federal approvals. Non-federal activities must adhere to the provisions of the Clean Water Act under the supervision of and permits from the WDEQ.

The No Action Alternative would include drilling and completion of natural gas production wells into the Madison Formation and a single H_2S/CO_2 injection well that would also be completed into the Madison Formation. The location of these wells is assumed to be on state land with No Action. Groundwater impacts could occur through potential cross contamination of aquifers by drilling through the Wasatch and Fort Union formations on the way to the

Madison Formation. Potential for contamination of groundwater resources could also occur through cross contamination during the re-injection of H_2S.

During well development, production water would be pumped from the Madison Formation, a deep, confined aquifer. Extraction of production water from the Madison Formation would produce a low-pressure sink near the production well. This low-pressure sink would have no adverse impact on existing groundwater in the Madison Formation since there are no wells in the area that are producing water from this zone for any beneficial use.

Other non-federal Project components could also affect groundwater resources with No Action. Approximately 25 gpm of by-product water (850 bpd) would likely be transported via pipeline to an injection well on state land and pumped into the Nugget Formation, a deep confined aquifer. The average TDS concentration is estimated to be greater than 11,000 mg/L (Mason and Miller 2005). TDS concentrations in water within the Nugget Formation can range from 3,000 to 35,000 mg/L. The direct results of these activities would be to increase the hydrostatic head immediately surrounding the injection well over the LOP. When recharge stops, groundwater elevations in the vicinity of the well would decrease as water levels equilibrate. However, the increased hydraulic gradient would have no adverse impact because the Nugget Formation is known to be well confined by the Cretaceous aquitard, consisting of the Bare River, Mowry, Frontier, and Baxter Shale formations; the volume of proposed injectate over the LOP is considered to be low. The saline water of the Nugget Formation does not have any beneficial use.

Groundwater quality could change as a result of injection of produced waters through the Nugget injection well under certain scenarios. If the quality of the injected water produced in the Madison Formation and the antecedent groundwater in the Nugget Formation were to result in geochemical precipitation of minerals within the aquifer or dissolving aquifer sandstone matrix, it could increase the dissolved solids content of the groundwater (Domenico and Schwartz 1998). Antecedent groundwater in the Nugget Formation may have solute concentrations or densities much different than the adjacent aquifers (Manahan 1990); however, the solute concentrations and geochemical compatibility of the two aquifers would be reviewed and approved by WDEQ prior to completion of the injection well. Should the proposed injectate be determined to be incompatible with the water of the Nugget Formation, the injection permit would be denied by WDEQ. Therefore, no adverse geochemical impacts are anticipated from the implementation of an approved injection well.

No shallow groundwater depletions or withdrawals are anticipated associated with non-federal actions during construction since all construction water needs are proposed to be met through surface water supplies. The possibility exists that groundwater control activities such as construction dewatering could be required at some sites. Such an activity could temporarily reduce groundwater levels and availability in the shallow alluvial aquifer in the immediate area.

Potential short-term water quality impacts to groundwater from construction and Project activities could include contamination of shallow groundwater resources if contaminants are spilled during development. These impacts would be limited to the very shallow aquifer

system as confining aquitards would provide barriers to rapid transport and dispersion of the contaminant into the deeper aquifers.

A septic system for the disposal of the plant's sanitary wastes would be installed at the M&HRF site, if approved by Sublette County and WDEQ. This septic system would treat the sanitary waste and infiltrate the effluent into the shallow soil horizon. If shallow groundwater resources are present at the site, or if the system is improperly designed or maintained, effluent water could impact the shallow groundwater. However, the nearest shallow groundwater is expected around 41 feet in depth. No shallow groundwater wells exist in the vicinity of the M&HRF, and any domestic groundwater well proposed by Cimarex would be located far enough away from the septic system to prevent any cross contamination.

Since the No Action Alternative would require the crossing of creeks and streams on private lands by pipelines and a transmission line, surface water impacts are anticipated but cannot be quantified because the exact locations are not known. Consequently, impacts are anticipated to be similar to those described for Alternative 2.

4.4.3 Alternative 1

Alternative 1 consists of BLM actions and non-federal actions that would result in short-term and long-term effects on groundwater and surface water.

4.4.3.1 Groundwater

4.4.3.1.1 Impacts of BLM Actions with Alternative 1

BLM actions with Alternative 1, and all other action alternatives, includes drilling four natural gas production wells and a single H_2S/CO_2 injection well on federal land in a manner similar to that described for the No Action Alternative (Section 4.4.2.1).

Potential cross contamination of aquifers would be managed through standard operating procedures and well casing at depths that intercept shallow aquifers, as specified in BLM Onshore Order 6 and other BLM guidelines (BLM 1991). Project design features for BLM-authorized wells include well casing and completion processes to protect shallow aquifers from potential cross contamination, including planned impervious concrete casing of the well to a depth of 2,600 feet in order to prevent cross contamination of aquifers communicating with the surface, and intermediate casing to a depth of 12,000 feet.

Cimarex estimates that the four federal natural gas production wells would produce a total of approximately 25 gpm of by-product water (850 bpd). Extraction of water from the Madison Formation along with the gas for the Project would also have no adverse effect on groundwater since this is a highly saline aquifer without beneficial use as a water source.

Proposed temporary containment of fluids and cuttings would be in an earthen reserve pit lined with 20-milliliter geomembrane to prevent leaking. Following completion of each well, the associated reserve pit contents would be solidified onsite and backfilled to the original grade of the location. As with the No Action Alternative, production water would be pumped from the Madison Formation, a deep, confined aquifer. Extraction of production water from the Madison Formation would produce a low-pressure sink near the production well. This low-pressure sink would have no adverse impact on existing groundwater in the Madison

Formation since there are no wells in the area that are producing water from this zone for any beneficial use.

No groundwater withdrawals have been identified for drilling of BLM wells under Alternative 1 and all other action alternatives, since all construction water needs are proposed to be met through surface water supplies. However, the possibility exists that groundwater control activities such as construction dewatering could be required at some sites. Such an activity could temporarily reduce groundwater levels and availability in the shallow alluvial aquifer in the immediate area.

As indicated in Section 4.1.3.1.2, BLM actions including wellheads, acid gas injection wells, and pipelines would all be susceptible to damage from seismic activity. These facilities have been designed to withstand seismic activity typical of Zone 2 of the UBC. Project design for well casings makes use of compliant materials and systems which can accommodate ground deformation. Acid gas pipelines and sour gas flowlines would be made with corrosion protection to maintain structural integrity of materials, increasing wall thicknesses to increase tensile strength. In the rare event of an earthquake exceeding 4.6 on the Richter Scale, the integrity of the well casing could be compromised, resulting in cross contamination of shallow aquifers, if not detected and repaired promptly. Any effects to groundwater would be very short-term since the BLM injection and production wells would be equipped with continuous leak detection, and rapid process shut-down in the event of an earthquake. Well integrity would be tested prior to injection start-up, thereby eliminating the possibility of significant cross contamination of shallow aquifers with by-product water.

Based on these design and operations considerations, BLM actions for Alternative 1 and all other action alternatives would not have adverse impacts on groundwater resources.

4.4.3.1.2 Total Project Impacts with Alternative 1

In addition to the impacts from BLM actions discussed in Section 4.4.3.1.1, several non-federal Project components could also affect groundwater resources. As part of Alternative 1, approximately 25 gpm of by-product water (850 bpd) would be transported via pipeline to an injection well on state land, to be pumped into the Nugget Formation which is a deep confined aquifer. The average TDS concentration is estimated to be greater than 11,000 mg/L (Mason and Miller 2005). TDS concentrations in water within the Nugget Formation can range from 3,000 to 35,000 mg/L. The direct results of these activities would be to increase the hydrostatic head immediately surrounding the injection well over the LOP. When recharge stops, groundwater elevations in the vicinity of the well would decrease as water levels equilibrate. However, the increased hydraulic gradient would have no adverse impact because the Nugget Formation is known to be well confined with a thick cap formation, and the volume of proposed injectate over the LOP is considered to be low. The saline water of the Nugget Formation does not have any beneficial use.

Groundwater quality could change as a result of injection of produced waters through the Nugget injection well under certain scenarios. If the quality of the injected water produced in the Madison Formation and the antecedent groundwater in the Nugget Formation were to result in geochemical precipitation of minerals within the aquifer or dissolving aquifer sandstone matrix, it could increase the dissolved solids content of the groundwater (Domenico

and Schwartz 1998). Antecedent groundwater in the Nugget Formation may have solute concentrations or densities much different than the adjacent aquifers (Manahan 1990); however, the solute concentrations and geochemical compatibility of the two aquifers would be reviewed and approved by WDEQ prior to completion of the injection well. Should the proposed injectate be determined to be incompatible with the water of the Nugget Formation, the injection permit would be denied by WDEQ. Therefore, no adverse geochemical impacts would occur from the implementation of an approved injection well.

Project design features include injection well casing and completion processes to a depth of approximately 12,000 feet. This protection would exceed the depth of the Wasatch Aquifer, the target formation for water wells in the RBPA, as identified in Section 3.5.3.3. This measure would therefore protect the shallower aquifers from potential cross contamination. The well casings would be designed to meet or exceed standards for Seismic Zone 2, thereby ensuring integrity of the casings during earthquakes characteristic of the area. In the event of an earthquake exceeding 4.6 on the Richter Scale, the integrity of the well casing could be compromised, resulting in cross contamination of shallow aquifers, if not detected and repaired promptly. With the implementation of procedures for continuous leak detection, and for rapid process shut-down in the event of an earthquake, followed by testing of well integrity before injection start-up, there would be little opportunity for cross contamination of shallow aquifers with by-product water.

Alternative 1 is not anticipated to result in any significant adverse impacts to groundwater resources.

4.4.3.2 Surface Water

4.4.3.2.1 Impacts of BLM Actions with Alternative 1

Impacts to surface water resources from Alternative 1 would be proportional to unmitigated effects of short-term or long-term surface disturbance from construction and development activities or long-term operations, as identified in Table 4-5, since increased disturbance would result in a proportionally increased potential for runoff and erosion. BLM actions under Alternative 1 would result in approximately 783.68 acres of initial surface disturbance and 31.65 acres of long-term disturbance.

Construction activities that remove vegetative cover would increase the potential for erosion and transport of sediment, salts, and pollutants. This could cause impacts to water quality that would vary depending on the volume of earthwork, soil type, proximity to a water body, condition of surrounding vegetation, and mitigation measures implemented. Effects could include increased turbidity, decreased habitat viability, reduction in spawning success (depending on timing and volume), and/or increased salinity and/or pollutant levels. Recovery would be dependent on soil, volume, type and content, revegetation success, and human response to the erosive event.

Construction activity in some areas would be completed in proximity to streams, and some activities would include work within the riparian area of the stream. The natural gas and helium pipelines would require crossing 15 ephemeral creek channels and one crossing of both Spring Creek and Beaver Creek. Under this alternative, the crossing of Beaver Creek

would be accomplished by boring under the creek, while the crossings of all the other creeks would be trenched. Boring under Beaver Creek would reduce the direct input of sediment to the creek; however, the pads that must be built adjacent to the crossing sites for the boring equipment would provide the potential for increased sediment delivery to the creek through stormwater runoff. Areas where trenches have been cut across creek channels may be susceptible to accelerated erosion if not properly compacted and reclaimed. Additionally, approaches to creek channels may have slopes shallowed during the construction processes to allow access of construction equipment. Shallower slopes will have a positive impact of being easier to control erosion and reclaim. Project work within close proximity to the surface waters would have the greatest potential to contribute fine sediment to these waters. Project work that is a greater distance from surface water would not be considered as great a threat to water quality as Project work next to a drainage way, although potential sediment delivery to surface waters still exists from these construction sites. Impacts relative to sediment delivery are likely to continue until the disturbed sites are revegetated.

Potential short-term adverse impacts to water quality could also result from any isolated unanticipated failures during the construction or operation of the BLM-related components such as the wells and flowlines, and linear components (helium and natural gas pipeline, fiber optic line, transmission line). Short-term impacts could include delivery of a pollutant, such as fine sediment or a non-persistent oil or hazardous substance, to a water body. Most likely, the pollutant would be delivered in a volume that would be of insufficient quantity to overload the resource, or the substance would be diluted below a value that would be harmful to the water quality or aquatic organisms.

Other potential short-term effects could include the use of surface water for pipeline tests. Water used for hydrostatic testing of the pipelines could result in a net loss of water from the source of the testing water and a net gain where the water is discharged. If the discharge drainage was the source water, it would result in a change in flow between the input point and the discharge point. If the discharge point and source are from different drainages, it would result in lower flows in the source drainage and increased flows in the receiving drainage, potentially affecting aquatic life. Water used for hydrostatic testing of the pipelines would be discharged in compliance with WDEQ‘s General Permit for Temporary Discharge (Authorization for Temporary Discharges Under the Wyoming Pollutant Discharge Elimination System). If criteria established by the permit are not followed, pollutants could be introduced to receiving drainages from chemicals or debris in the pipeline. Additionally, if permit criteria are not followed, erosion of receiving channels could result.

Cimarex has four existing temporary water haul permits issued by the WSEO (Table 4-13). These water rights are limited in scope and may not provide enough water to meet all of Cimarex‘s needs. To make up for deficiencies, additional water would potentially be purchased from Dan Budd through an agreement that would allow Cimarex to pull surface water from a location in the SW¼ SW¼ of Section 15, T29N, R114W that is owned by Mr. Budd. If necessary, Cimarex would acquire additional water rights to pull water from the Green River. Water would be transferred from the surface water source to trucks via a portable pump in a manner that minimizes risk of damaging stream channels or reservoir perimeters and any adjacent riparian areas. Tanks used to haul any water would either be

dedicated only to hauling water, or the tanks would be cleaned prior to use to ensure that the water is not exposed to any potential contaminants.

Table 4-13. Cimarex Water Rights for Haul Water.

Permit #	Location (T/R/S)	Name	Priority Date	Amount (cfs)	Source
P33986D	29N/113W/14	Cimarex No. 1 Haul Water	8/21/2008	0.44	South Piney Creek
P33992D	29N/113W/17	Cimarex No. 2 Haul Water	8/25/2008	0.44	Beaver Creek
P34001D	29N/113W/11	Cimarex No. 3 Haul Water	9/8/2008	0.44	Middle Piney Creek
P34002D	29N/113W/28	Cimarex No. 4 Haul Water	9/11/2008	0.44	Green River

cfs = cubic feet per second
T/R/S = Township/Range/Section

It is estimated in Chapter 2 that three of the production wells and the H_2S/CO_2 injection well would each require 15,000 barrels of water to drill. The fourth production well and the water injection well should each require about 10,000 barrels of water to drill, for a total of approximately 80,000 barrels of water. This water use would occur over a four-year period. While in use, this water would be stored in and circulated through an earthen reserve pit with an impermeable synthetic liner that would prevent seepage into the soil and possibly into any aquifers. Following successful completion of each well, the water would be disposed of, and the reserve pit would be closed using a method approved by the WOGCC.

Surface water acquired from the same sources discussed above would be used to test the gas and helium pipelines for leaks. With WDEQ and private landowner access and approvals, the pipelines would be filled with water and pressurized to ensure integrity of the facilities. Once this is completed, the water would be discharged in a manner and location approved by the WDEQ and the landowner. Under the Proposed Action, 6,500 barrels of water would be required to test the gas line, and 3,200 barrels would be required to test the helium line. Additionally, water used for hydrostatic testing of the pipelines developed for the proposed Project would need to be discharged. The water would be pulled from a WSEO-approved source and discharged in compliance with the WDEQ‘s General Permit for Temporary Discharge. If any chemicals or debris are left in the gas or helium pipelines after manufacture and installation, they would be flushed out during the hydrostatic testing process. If the testing water is not properly managed, these contaminants could be introduced to the receiving waters. Fuels, oils, solvents, and drilling fluids would be present on site during construction. Any leak or spill has the potential to move downgradient toward the surface water resources.

BLM actions in Alternative 1 would produce the greatest short-term effect on surface water from runoff from temporary surface disturbance, compared with other alternatives. Runoff effects and other interactions between adjacent sites may create effects that are greater than a proportional relationship. In addition, adverse impacts would occur from trenching pipelines across Spring Creek and installing temporary boring pads in proximity to Beaver Creek. However, with the implementation of mitigation measures and BMPs, these impacts would not be significant. The potential for long-term adverse impacts to surface water from BLM actions under Alternative 1, either from chronic runoff from 31.65 acres of new facilities or

any isolated discharges, are not anticipated, and no significant long-term impacts to surface water resources are expected.

4.4.3.2.2 Total Project Impacts with Alternative 1

Under Alternative 1, the Project would have short-term effects to surface water from construction activities that would occur throughout the RBPA, including the removal of existing vegetation and exposure of soil to storm event runoff, snowmelt runoff, and wind erosion processes. In addition to the effects of BLM actions, non-federal actions such as construction and operation of the M&HRF and HLF, and construction of the staging and equipment yard, the drilling and operation of the water production well, flowline, and buried utilities would also affect surface water resources.

Non-federal activities under Alternative 1 would result in 75.9 acres of temporary surface disturbance and 33.0 acres of long-term surface disturbance, resulting in minor effects to surface water from runoff. Other potential short-term adverse impacts to water quality would occur in the event of isolated unanticipated failures during the construction or operation of the Project. The SWPPP would be designed to minimize the potential for such events.

Alternative 1 would not discharge produced water to the surface and no WYPDES permit would be required for that portion of the Project. However, potential stormwater discharges would occur as a result of the construction activities. Therefore, Cimarex would apply for and comply with coverage under WDEQ permit WYR10-0000, General Permit to Discharge Storm Water Associated with Large Construction Activity Under the Wyoming Pollutant Discharge Elimination System.

Illicit use of backcountry areas where there are no designated toilet facilities could occur during construction. Such actions could result in increased coliform levels within the surface waters around the RBPA. Cimarex would ensure that adequate portable toilets are provided, so impacts resulting from human sources of coliform under this and all alternatives would be minimal, as a result.

Limited consumptive use of surface water would occur during the construction and operation of the Project as described above. Impacts associated with the short-term use of the water would be limited to the diversion of water from one beneficial use of the water to another as defined by the WSEO. Water use would be determined by WDEQ regulations and would include not degrading water quality through either diversion or discharge. Water diverted from in-stream flow would not be available for any beneficial uses that the stream currently supports, including irrigation, aquatic life (see Section 4.6), stock and wildlife watering, and riparian vegetation.

Long-term surface water quality effects may result from indirect effects of changing surface hydrology by increasing impermeable surface areas, diverting or changing surface flows, or adding non-point pollutants to watersheds from vehicles or industrial processes.

The M&HRF plant would be operated 24 hours per day, 365 days per year, and maintained by an on-site crew of approximately 15 to 20 personnel. Demands for restroom facilities during construction of the Proposed Action would be met through the use of portable vault toilets at

the construction site. Disposal of the waste and maintenance of the portable toilets would be handled by the contractor who supplies the toilets. A septic system would be constructed at the M&HRF site for daily wastewater disposal associated with on-site personnel. The WDEQ and Sublette County would be responsible for the permitting and approval of the design of the septic-drain field system for the M&HRF. Septic systems are known to be safe and sanitary methods of handling domestic effluent, and with WDEQ and Sublette County oversight, no impacts are anticipated.

Water for domestic purposes would be transported to the M&HRF by truck during construction. Eventually, a domestic well would be developed for use by on-site personnel. The well would be developed and permitted in accordance with the WSEO rules and regulations. The domestic well would be developed in the shallowest aquifer that can produce adequate volumes of potable water. It is estimated that 20 to 30 persons would work at the site per day during normal operations. The American Water Works Association estimates that each worker would use approximately 50 gallons of water per day. This would equate to approximately 500,000 gallons of water per year for domestic purposes. Water may be applied to roads to reduce dust generated by traffic on unpaved roads. The water used for this purpose would be acquired from the water haul permits referenced above.

Alternative 1, as proposed, would meet all WDEQ water quality permit standards, BLM-required BMPs, and other design features to reduce the possible occurrence of surface discharge events. Therefore, long-term adverse impacts to surface water from either chronic or catastrophic discharges are not anticipated.

4.4.4 Alternative 2

4.4.4.1 Groundwater Impacts

4.4.4.1.1 Impacts of BLM Actions with Alternative 2

All BLM actions potentially affecting groundwater resources are the same as those described in Alternative 1.

4.4.4.1.2 Total Project Impacts with Alternative 2

All BLM actions potentially affecting groundwater resources are the same as those described in Alternative 1.

4.4.4.2 Surface Water Impacts

4.4.4.2.1 Impacts of BLM Actions with Alternative 2

Impacts to surface water resources from Alternative 2 would be proportional to unmitigated effects of short-term or long-term surface disturbance from construction and development activities or long-term operations, as identified in Table 4-5, since increased disturbance would result in a proportionally increased potential for runoff and erosion. BLM actions under Alternative 2 would result in approximately 169.2 acres of initial surface disturbance and 12.0 acres of long-term disturbance, resulting in the lowest potential short-term impact from uncontrolled runoff associated with BLM actions when compared with other alternatives.

4.4.4.2.2 Total Project Impacts with Alternative 2

Alternative 2 uses private ROW for the pipelines and transmission lines. Therefore, non-federal actions would result in 832.4 acres of short-term surface disturbance and 59.3 acres of long-term surface disturbance, adversely affecting the watershed and surface waters of the South Fork of Piney Creek and Middle Fork of Piney Creek. This would result in the largest total temporary surface disturbance and total Project impacts to surface water resources.

Additionally, Alternative 2 would have 5 pipeline and transmission crossings of perennial creeks and 30 crossings of ephemeral creeks, all of which would be accomplished by trenching, unless otherwise specified by landowners. Trenching of perennial streams may add additional adverse impacts. Areas where trenches have been cut across creek channels may be susceptible to accelerated erosion if not properly compacted and reclaimed.

Water quality may be affected by the greater surface disturbance in floodplains and wetland soils, and trenching the pipeline crossing of South Fork of Piney Creek and Middle Fork of Piney Creek. This would increase the potential for pollutants such as sediment to enter the creek. Both trenching and boring of stream crossings may result in unintentional sediment introduction to the creek. Trenching would alleviate the need to construct pads for the boring equipment adjacent to the crossing sites, as proposed in Alternative 1 for the crossing of Beaver Creek, but would result in direct impact to the stream channel. The successful implementation of the WDEQ-required SWPPP would reduce effects from stormwater runoff but would not affect the level of direct impact associated with the different stream crossing methods.

Because of the greater area of surface disturbance, the closer proximity of facilities and number of stream crossings, and the potential for long-term unanticipated discharges to stream channels, Alternative 2 may result in significant adverse impacts when compared with other action alternatives or the No Action Alternative.

4.4.5 Alternative 3

4.4.5.1 Groundwater Impacts

4.4.5.1.1 Impacts of BLM Actions with Alternative 3

All BLM actions potentially affecting groundwater resources are the same as those described in Alternative 1.

4.4.5.1.2 Total Project Impacts with Alternative 3

All BLM actions potentially affecting groundwater resources are the same as those described in Alternative 1.

4.4.5.2 Surface Water Impacts

4.4.5.2.1 Impacts of BLM Actions with Alternative 3

Impacts to surface water resources from Alternative 3 would be proportional to unmitigated effects of short-term or long-term surface disturbance from construction and development activities or long-term operations, as identified in Table 4-5. BLM actions under Alternative 3

would result in approximately 690.70 acres of initial surface disturbance and 35.65 acres of long-term disturbance.

Under this alternative the crossing of Spring Creek and Beaver Creek would be accomplished by boring rather than trenching. Under Alternative 3 there would be 2 pipeline crossings of perennial creeks and 15 pipeline crossings of ephemeral creeks. This action would reduce the overall amount of surface disturbance from pipeline installation. Areas where trenches have been cut across creek channels may be susceptible to accelerated erosion if not properly compacted and reclaimed. Additionally, approaches to creek channels may have slopes altered during the construction processes to allow access of construction equipment.

With implementation of the SWPPP and other mitigation and BMPs identified in Appendix F, Alternative 3 would not result in significant short-term impacts from uncontrolled runoff, compared with other alternatives.

4.4.5.2.2 Total Project Impacts with Alternative 3

Alternative 3 would result in a total of 766.6 acres of short-term surface disturbance, with approximately 75.9 acres on private and state lands outside of BLM jurisdiction. With reduced total surface disturbance compared with Alternative 1, and implementation of the mitigation measures and BMPs identified in Appendix F, no significant adverse impacts to surface water quality would be anticipated.

4.4.6 Alternative 4

4.4.6.1 Groundwater Impacts

4.4.6.1.1 Impacts of BLM Actions with Alternative 4

All BLM actions potentially affecting groundwater resources are the same as those described in Alternative 1.

4.4.6.1.2 Total Project Impacts with Alternative 4

All BLM actions potentially affecting groundwater resources are the same as those described in Alternative 1.

The addition of an EGS would not extract, use, or otherwise affect groundwater resources.

4.4.6.2 Surface Water Impacts

4.4.6.2.1 Impacts of BLM Actions with Alternative 4

Impacts would be similar to those in Alternative 1, except that there would be no disturbance associated with a transmission line. With implementation of the mitigation measures and BMPs identified in Appendix F, and WDEQ-required SWPPP for all federal components, no significant impacts to surface water quality would be anticipated.

4.4.6.2.2 Total Project Impacts with Alternative 4

Alternative 4 would use the same procedures and actions as Alternative 1 concerning installation of pipelines, well pads, and fiber optic cables. Design modifications for Alternative 4 include the addition of a natural gas EGS to supply power to the M&HRF. This

facility would not be located on or near any designated surface waters and would have no direct impacts on those resources. Off-site impacts resulting from combustion products would be dependent on the comparative efficiencies and locations of the on-site versus off-site generation facilities and, because of the complexities and wide range of variables, are not discussed in this document. Installation of this facility would allow for the removal of the transmission line to supply the M&HRF with power as compared to Alternative 1. Less ROW disturbance would reduce the potential for unintended releases of sediment to surface water but would result in a larger unreclaimed surface disturbance in the M&HRF. Successful implementation of a SWPPP would reduce the potential impacts to surface water but would not change the pattern of disturbance. Like Alternative 1, Alternative 4 would require crossing 3 perennial creeks, 1 of which would be bored, and 32 ephemeral creeks, all of which would be trenched. Areas where trenches have been cut across creek channels may be susceptible to accelerated erosion if not properly compacted and reclaimed. Additionally, approaches to creek channels may have slopes shallowed during the construction processes to allow access of construction equipment. Shallower slopes would have a positive impact of being easier to control erosion and reclaim.

With implementation of the WDEQ-required SWPPP for all federal and non-federal components, no significant impacts to surface water quality would be anticipated.

4.4.7 Cumulative Impacts

The RBPA is within and part of the Green River Basin, and multiple other similar oil and gas projects are occurring in other parts of the Green River Basin. The cumulative effects on the water resources of the area would result from impacts of construction, water extraction, water use, long-term surface disturbance, and produced water injection. The Project development would require the use of surface water resources during the construction process. The appropriation and use of this resource is regulated by the WSEO. Because of state regulations, excess water withdrawals would be curtailed during periods of limited availability.

Construction activities and long-term increased risk of slope and land instability, identified in Section 4.2.3, could contribute to cumulative impacts to regional waters in the form of sedimentation of surface water. These cumulative impacts would be speculative and limited in scope if adequate project planning and design and land reclamation efforts are implemented.

4.4.8 Mitigation and Monitoring Opportunities

4.4.8.1 Mitigation

*4.4.8.1.1 BLM-Required Mitigation**

Implementation of Project components shall adhere to all requirements and standards of the Clean Water Act, as well as WDEQ regulations, and applicable requirements in Appendix 3 of the BLM Pinedale RMP.

Water withdrawals from perennial streams on BLM-administered lands shall be conducted in accordance with the WSEO permit requirements.

Culvert installations shall be designed and installed to minimize sediment discharge and shall adhere to Gold Book standards and applicable BMPs from Appendix C of the Pinedale RMP.

In order to protect the existing water quality of the shallow aquifers within the RBPA well drilling and completion of the production and injection wells associated with the Project would use the best available technology in their development. All known existing aquifers and aquitards would be geophysically logged during drilling, and the well would be completed to eliminate the possibility of cross-contamination between aquifers.

If any construction requires the use of dewatering activities, the wastewater would be disposed of in accordance with WDEQ WYPDES permits. Under no circumstances can the extracted waters be disposed of in an unregulated and unapproved method.

Water applied to roads for dust control purposes must be applied at a rate that would not cause excess water to runoff to surface drainages.

Water used for hydrostatic testing of the natural gas and helium pipelines would be discharged in compliance with WDEQ‘s General Permit for Temporary Discharge (Authorization for Temporary Discharges Under the Wyoming Pollutant Discharge Elimination System).

*4.4.8.1.2 Other Mitigation Opportunities***

Construction activities associated with the proposed Project but not part of the federal project, such as M&HRF plant development, have the potential to create pollutants that could be delivered to waters of the state. However, through the implementation of a SWPPP and a SPCC Plan, the opportunity for and risk of pollutants being mobilized would be minimized. In accordance with these plans, BMPs would be applied that would prevent or contain deliverable sediments, oils, and hazardous substances from reaching surface waters.

The SWPPP would be prepared and implemented in accordance with WDEQ Permit WYR10-0000, General Permit to Discharge Storm Water Associated with Large Construction Activity Under the Wyoming Pollutant Discharge Elimination System. BMPs would be applied to minimize surface disturbance and erosion, control any mobilized pollutants, and expedite revegetation efforts. The SPCC Plan applies BMPs intended to prevent spills of fuels, chemicals, or other hazardous materials, and establish procedures to follow in case any spills occur. These procedures should prevent spilled pollutants from reaching waters of the state. This plan would outline all emergency responses to hazardous releases of substances into the environment, limit exposure of the substance to the organisms present in the environment, and provide details for rapid cleanup of the environment. These activities should limit exposure and risk of long-term water quality impacts.

Short-term impacts on surface water quantity can be mitigated by controlling timing and volumes of flow interruption. Pumping from a creek should be done in a manner that leaves a large percentage of flow in the creek during the transfer. Stream withdrawals should not occur during times of low flow.

The placement of culverts and instream structures during the road upgrade process as well as pipeline stream crossings could result in an increase in turbidity and potential downstream sediment delivery. The culvert placements and other instream activities would cause short-term, localized increases in stream water turbidity. The effects on water quality from the

activities would be limited and could be avoided with the application of BMPs, such as diverting water around a site, using containment and filtering techniques, protecting disturbed areas from wildlife and cattle impacts, and limiting mechanized equipment near or along stream banks.

Well drilling and completion of the injection wells associated with the Project would use the best available technology in their development. All known existing aquifers and aquitards would be geophysically logged during drilling, and the well would be completed to eliminate the possibility of cross-contamination between aquifers. This would protect the existing water quality of the shallow aquifers within the RBPA, which may at certain times of the year, supply water directly to a surface water resource through a baseflow connection.

Water used during construction operations would be acquired from sources near the RBPA. Doing this should minimize potential physical and chemical reactions between varying water quality. If haul waters are derived from sources outside the RBPA or the quality of the waters is unknown, a water analysis from a state-certified laboratory would be completed to determine the water quality of the source water. The installation of a subsurface wastewater (septic) treatment system would be developed in compliance with Sublette County and WDEQ standards to minimize potential shallow groundwater impacts.

If any construction requires the use of dewatering activities, the wastewater would be disposed of in accordance with WDEQ WYPDES permits. Under no circumstances can the extracted waters be disposed of in an unregulated and unapproved method.

Water applied to roads for dust control purposes must be applied at a rate that would not cause excess water to runoff to surface drainages.

Water used during construction operations would be acquired from sources near the RBPA. Doing this should minimize potential physical and chemical reactions between varying water quality. If haul waters are derived from sources outside the RBPA or the quality of the waters is unknown, a water analysis from a state-certified laboratory would be completed to determine the water quality of the source water.

If construction would occur near the town of Big Piney and within a source water zone of a public well, extra precautions should be implemented to protect the water source from any possible contamination. Construction activity would be minimized in these areas to limit the risk of spills or the release of any hazardous substances or oils. A spill team would be on site at all times during construction. No equipment would be parked in or near the source water zones in order to limit the potential release of oils or hazardous substance when personnel are not present.

4.4.8.2 Monitoring

*4.4.8.2.1 BLM-Required Monitoring**

A SWPPP would be prepared and implemented in accordance with WDEQ Permit WYR10-0000, General Permit to Discharge Storm Water Associated with Large Construction Activity Under the Wyoming Pollutant Discharge Elimination System. The SWPPP has specific requirements for monitoring of all disturbed areas and mitigation efforts that are applied in the

form of BMPs. The SWPPP requires strict documentation of all monitoring and maintenance activities. These requirements would be followed throughout all phases of the Project development.

*4.4.8.2.2 Other Monitoring Opportunities***

A SWPPP would be prepared and implemented in accordance with WDEQ Permit WYR10-0000, General Permit to Discharge Storm Water Associated with Large Construction Activity Under the Wyoming Pollutant Discharge Elimination System. The SWPPP has specific requirements for monitoring of all disturbed areas and mitigation efforts that are applied in the form of BMPs. The SWPPP requires strict documentation of all monitoring and maintenance activities. These requirements would be followed throughout all phases of the Project development.

Development of a regular groundwater monitoring program using nearby water wells could be implemented by Cimarex to ensure that no long-term effects occur.

*BLM-required mitigation and monitoring only applies to BLM actions/authorizations associated/connected the proposed Project.

**Other mitigation and monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require/impose any mitigation requirements on the non-federal actions.

4.5 VEGETATION RESOURCES AND NOXIOUS WEEDS

Direct adverse impacts to vegetation resources would result from vegetation crushing by heavy equipment and vehicles, surface disturbances such as mechanical grading and clearing of vegetation, and trenching. Short-term vegetation disturbance would result from the installation of utility systems and other facilities until reclamation is complete (BLM 2008b). Short-term impacts to vegetation would include crushing of existing vegetation and compaction of soils from construction and maintenance traffic within the ROW construction corridor, dragging transmission lines, and transporting pipelines through vegetation. The well pads that would be used have been previously cleared of vegetation and would not result in any new initial disturbance. The construction/installation of Project-related facilities and roads would result in a loss of vegetation from these sites for the LOP.

Indirect impacts that could occur as a result of Project activities would include increased water runoff, accelerated soil loss, and erosion due to the surface disturbance, resulting in the loss of the native vegetation seed bank and stabilizing vegetation until interim reclamation stabilizes soil surfaces. Potential soil loss, and the accompanying vegetation loss, would be much greater in areas with steep grades or high exposure to weathering elements. An additional indirect impact would be the invasion of noxious weed species in areas that are cleared of vegetation, or native vegetation damage where the soil has been disturbed and/or exposed. Increase in invasive noxious weeds can produce long-term impacts to the vegetation of an area, and is a frequent and insidious indirect impact of development without aggressive mitigation measures.

Following reclamation, reduction in shrub cover and increased herbaceous cover could temporarily provide increased forage for some wildlife species and livestock. Because it

would take many years for impacted and reclaimed areas to develop the structure and function of their pre-disturbance condition, impacts would persist for an undetermined number of years. Reclaimed areas would produce less wildlife and livestock forage initially until revegetation is considered successful, at which time native grasses, forbs, and shrubs would become established.

4.5.1 Impact Criteria

Impacts to vegetation resources are assumed to be proportional to the amount of new surface disturbance (i.e., increased surface disturbance would result in a corresponding increase to vegetation impacts). Impacts to plant communities could lead to a reduction in vegetation productivity, a change in species composition, and/or an increase in invasive non-native species and noxious weeds. Long-term post construction occupancy of disturbed areas by invasive and/or noxious species would constitute a significant impact. The inability to revegetate disturbed areas with pre-disturbance or suitable alternate native species would also be considered a significant impact.

4.5.2 No Action Alternative

Under the No Action Alternative, BLM would not take action on the Cimarex applications for ROWs or APDs, including the Williams application for an additional pipeline ROW. There would be no impacts to vegetation resources from BLM actions with No Action. However, several non-federal actions would likely occur on private and state lands with this alternative, as identified in Chapter 2. Construction of facilities such as the M&HRF and HLF would occur and a transmission line and pipelines would likely be constructed on private and state lands, but acres of disturbance and affected landcover types is unknown at this time. Gas production wells would be drilled entirely on State of Wyoming land, but disturbance information is not available as the exact locations of the well pad, or pads, is not known at this time.

The result of No Action on vegetation resources is expected to be similar to the total Project impacts described in Alternative 2; the impacts of any non-federal actions would be outside BLM jurisdiction and ability to modify or change.

4.5.3 Alternative 1

Table 4-14 displays estimated surface disturbance to the landcover types present in the RBPA as a result of Alternative 1.

Table 4-14. Acres of Disturbance by Landcover Type for Alternative 1.

Landcover Type	Disturbance Type			
	BLM Actions		Non-federal Actions	
	Short-term	Long-term	Short-term	Long-term
Lodgepole Pine	0	0	0	0
Spruce-Subalpine Fir	0	0	0	0
Mixed Conifer	0	0	0	0
Aspen	6.9	0.1	0.9	0.2
Cottonwood Riparian	0	0	0	0
Greasewood	4.1	0	0.2	0.2
Gardner Saltbush	0.4	0	0	0
Greasewood-Sagebrush	1.2	0	0	0
Greasewood-Saltbush	0	0	0	0
Mixed Desert Shrubs	5.7	0	0	0
Wyoming Big Sagebrush	496.9	23.1	10.0	4.6
Mountain Big Sagebrush	34.7	0.8	20.5	5.7
Mountain Silver Sagebrush	9.4	0.3	5.1	1.7
Alkali/Early Sagebrush	24.4	0.5	0	0
Rabbitbrush	14.2	<0.1	0	0
Curlleaf Mountain Mahogany	4.4	0	0	0
Willow	2.5	0	1.0	0.2
Grass-like Types	<0.1	<0.1	0	0
Basin Grassland	1.8	<0.1	0	0
Foothills Grassland	10.2	0.1	9.0	9.0
Alpine Grassland	0	0	0	0
Riparian/Wet Meadow	1.1	0	<0.1	0
Irrigated Agriculture	10.3	0.5	0	0
Dry-land Pastures	0	0	0	0
Fallow Agricultural Fields	0	0	0	0
Developed Landcover Types	183.0	5.9	4.3	1.5
Total	**811.3**	**31.3**	**51.0**	**23.2**

4.5.3.1 Impacts of BLM Actions with Alternative 1

Crushing of vegetation by equipment would result in short-term disturbance during the construction of the AAM&WS and the installation and tensioning of the transmission lines. Soil disturbance by mechanical grading and trenching to facilitate the installation of fiber optic cables and pipelines would result in short-term disturbance to vegetation before interim reclamation. After construction is complete, unauthorized access by the public of the two-track road created to facilitate installation of the transmission lines could result in the long-term disturbance of vegetation.

Crushing and removal of shrub riparian and forested riparian vegetation due to trenching of pipelines would also result in adverse direct impacts due to the ecological value of these habitat areas. More details of the impacts to riparian and wetland areas are discussed in Section 4.6.

Approximately 628.3 acres of initial disturbance would occur to vegetation resources (not including disturbance to the developed landcover types) from BLM actions under Alternative 1. Of this total, approximately 79.0% (496.9 acres) of the surface disturbance would occur in the Wyoming big sagebrush community; 183.0 acres would occur on lands already classified as developed (developed landcover types); and the remaining disturbance would be distributed among other vegetation communities. These Project effects would result in adverse short-term direct impacts to vegetation. These short-term and direct impacts to vegetation resources would be addressed by implementation of a SWPPP to prevent erosion, following BLM BMPs and design features, and immediate soil stabilization and reclamation using BLM-recommended seed mixtures.

The Project would result in the long-term loss of 31.3 acres of vegetation, primarily native Wyoming big sagebrush and other sagebrush types. Most of this impact is the result of long-term unauthorized use of the ROW by OHVs, forming a two-track road. The direct and indirect effects of OHV use could include the weakening and loss of native vegetation, erosion and exposure of soil, and the repeated introduction of noxious and invasive species. SWPPP, reclamation planning, and implementation of BMPs would not be effective in reducing these impacts since the underlying cause would be unauthorized use.

4.5.3.2 Total Project Impacts

In addition to the impacts described above, clearing of vegetation and grading the soil surface to construct and assemble the proposed M&HRF, HLF, and other non-federal Project components would result in both short-term and long-term surface disturbance and loss of vegetation and habitat. Long-term surface disturbances associated with the M&HRF construction would be approximately 10.0 acres distributed among Wyoming big sagebrush, aspen, mountain big sagebrush, mountain silver sagebrush, and developed landcover types. The construction of the HLF would result in the long-term disturbance of 10.0 acres distributed among greasewood, Wyoming big sagebrush, mountain silver sagebrush, and foothills grassland vegetation communities. Other non-federal Project components would result in mainly short-term impacts to vegetation resources as most of the surface disturbance would be reclaimed.

Overall impacts from BLM and non-federal actions would result in 675.0 acres of short-term impacts to vegetation communities (not including disturbance to the developed landcover types), most of which would occur in the Wyoming big sagebrush community. Of this total, 54.5 acres of long-term disturbance to vegetation communities would remain following reclamation.

4.5.4 Alternative 2

Table 4-15 displays the estimated surface disturbance to the landcover types present in the RBPA as a result of Alternative 2.

4.5.4.1 Impacts of BLM Actions with Alternative 2

Alternative 2 impacts to vegetation would be similar to those for Alternative 1. However, BLM actions would result in only 117.0 acres of total initial disturbance to vegetation communities (not including disturbance to the developed landcover types). Of this total, 69.6% of the disturbance would occur in the Wyoming big sagebrush community, as shown in Table 4-15. Following reclamation, only 12.0 acres of long-term disturbance would remain in vegetation communities as most permanent Project components would be constructed under private and state jurisdiction.

4.5.4.2 Total Project Impacts

Table 4-15 indicates that approximately 32.8% (256.6 acres) of the total short-term impacts to vegetation communities resulting from non-federal actions under this alternative would occur in the irrigated agriculture landcover type. Following reclamation, long-term disturbance to this landcover type would be reduced to 9.5 acres. Additionally, 89.5 acres of riparian/wet meadow, 84.4 acres of willow, 88.1 acres of Wyoming big sagebrush, and 83.6 acres of mountain big sagebrush would be initially disturbed. Overall, a disproportionate amount of short-term impacts would occur within wetlands and riparian areas compared to Alternative 1. Implementation of SWPPPs would prevent erosion; however, disturbance on private land would not be required to follow BLM BMPs, design features, or the same standards for soil stabilization and reclamation. Significant impacts would result if any permanent loss of wetland function were to occur, or if native vegetation cover were reduced as a result of erosion, soil compaction, or unsuccessful reclamation.

Alternative 2 would result in the greatest impacts to vegetation, with total short-term disturbance of 974.5 acres and long-term loss of 59.7 acres of vegetation after reclamation.

Table 4-15. Acres of Disturbance by Landcover Type for Alternative 2.

Landcover Type	Disturbance Type			
	BLM Actions		Non-federal Actions	
	Short-term	Long-term	Short-term	Long-term
Lodgepole Pine	0	0	3.2	0.1
Spruce-Subalpine Fir	0	0	0.4	0
Mixed Conifer	0	0	0	0
Aspen	0.1	0.1	9.8	0.3
Cottonwood Riparian	0	0	9.9	0.4
Greasewood	3.0	0	5.5	0
Gardner Saltbush	0	0	0	0
Greasewood-Sagebrush	0.4	0	0	0
Greasewood-Saltbush	1.2	0	0	0
Mixed Desert Shrubs	4.2	0	0	0
Wyoming Big Sagebrush	81.5	7.7	88.1	0.3
Mountain Big Sagebrush	6.4	<0.1	83.6	7.0
Mountain Silver Sagebrush	2.4	0.1	18.5	7.5
Alkali/Early Sagebrush	0	0	8.2	2.0
Rabbitbrush	7.3	0	0	0.3
Curlleaf Mountain Mahogany	4.9	0	0	0
Willow	1.0	0	84.4	3.1
Grass-like Types	<0.1	<0.1	0	0
Basin Grassland	0	0	10.6	0.2
Foothills Grassland	4.3	0	35.0	9.8
Alpine Grassland	0	0	0	0
Riparian/Wet Meadow	0.3	0	89.5	3.2
Irrigated Agriculture	0	0	256.6	9.5
Dry-land Pastures	0	0	16.8	0.7
Fallow Agricultural Fields	0	0	8.1	0.3
Developed Landcover Types	75.0	4.1	54.3	2.9
Total	**192.0**	**12.0**	**782.5**	**47.7**

4.5.5 Alternative 3

Table 4-16 displays the estimated surface disturbance to the landcover types present in the RBPA as a result of Alternative 3.

Table 4-16. Acres of Disturbance by Landcover Type for Alternative 3.

Landcover Type	Disturbance Type			
	BLM Actions		Non-federal Actions	
	Short-term	Long-term	Short-term	Long-term
Lodgepole Pine	0	0	0	0
Spruce-Subalpine Fir	0	0	0	0
Mixed Conifer	0	0	0	0
Aspen	6.8	0.1	0.9	0.2
Cottonwood Riparian	0	0	0	0
Greasewood	3.6	0	0.2	0.2
Gardner Saltbush	0	0	0	0
Greasewood-Sagebrush	0.4	0	0	0
Greasewood-Saltbush	1.2	0	0	0
Mixed Desert Shrubs	7.9	0	0	0
Wyoming Big Sagebrush	364.1	18.6	10.0	4.6
Mountain Big Sagebrush	23.1	0.6	20.5	5.7
Mountain Silver Sagebrush	7.2	0.3	5.1	1.7
Alkali/Early Sagebrush	14.3	0.4	0	0
Rabbitbrush	10.9	<0.1	0	0
Curlleaf Mountain Mahogany	5.7	0	0	0
Willow	2.6	0	1.0	0.2
Grass-like Types	<0.1	<0.1	0	0
Basin Grassland	0.8	0	0	0
Foothills Grassland	8.3	0.1	9.0	9.0
Alpine Grassland	0	0	0	0
Riparian/Wet Meadow	1.6	0	<0.1	0
Irrigated Agriculture	8.0	0.5	0	0
Dry-land Pastures	0	0	0	0
Fallow Agricultural Fields	0	0	0	0
Developed Landcover Types	164.7	4.9	4.3	1.5
Total	**631.3**	**25.5**	**51.0**	**23.2**

4.5.5.1 Impacts of BLM Actions with Alternative 3

Alternative 3 would include boring natural gas and helium pipelines under Spring Creek and Beaver Creek for the purpose of reducing water quality and aquatic habitat disruption, and collocating pipelines in trenches to reduce surface impacts. Alternative 3 would also include a slight shift in the alignment of the natural gas and helium pipelines, and the transmission line.

The boring of Spring Creek and Beaver Creek would involve the clearing of vegetation on a 150- by 100-foot pad on both sides of each stream. The boring of Spring Creek and Beaver Creek would result in reduced direct short-term disturbance to wetland and riparian vegetation. If possible, the pipeline ROWs would be used to access and develop the bore

pads, reducing the need for disturbance outside of the construction corridor. Standard BMPs to mitigate surface runoff would be sufficient to prevent adverse effects.

Other short-term and long-term impacts to vegetation under this alternative would be similar to Alternative 1. Short-term disturbance from BLM actions would impact 466.6 acres of vegetation (not including disturbance to the developed landcover types), with most of the short-term disturbance occurring in the Wyoming big sagebrush community. Construction would be followed by recontouring and reclamation.

As shown in Table 4-16, BLM actions would result in long-term impacts to 25.5 acres of vegetation. Long-term direct impacts would result from installation of two AAM&WSs. As with Alternative 1, long-term direct and indirect impacts would result from unauthorized OHV use of the transmission line ROW, creating a two-track road.

4.5.5.2 Total Project Impacts

Total long-term impacts are expected to be very similar to Alternative 1, with no significant adverse impacts to vegetation expected. Following reclamation, approximately 42.3 acres of long-term surface disturbance to vegetation would remain (not including disturbance in the developed landcover types).

4.5.6 Alternative 4

Table 4-17 displays the estimated surface disturbance to the landcover types present in the RBPA as a result of Alternative 4.

4.5.6.1 Impacts of BLM Actions with Alternative 4

Impacts from BLM actions for Alternative 4 would result from pipeline ROW, gas well and flowlines, acid gas injection well and flowline, and AAM&WS installation. Since there would be no federal transmission line ROW, the short-term impacts of these actions would disturb 339.8 acres of vegetation (not including disturbance to the developed landcover types), with Wyoming big sagebrush accounting for 251.5 of those acres. Construction would be followed by recontouring and reclamation wherever possible.

Long-term impacts of BLM actions would only result in 12.0 acres of vegetation loss.

4.5.6.2 Total Project Impacts

Non-federal connected actions would result in short-term impacts from the addition of an EGS to supply power for the M&HRF. This facility would result in a long-term disturbance of 7.0 acres distributed among the mountain silver sagebrush, alkali/early sagebrush, willow, and grass-like types landcover types. The total short-term disturbance to vegetation (not including the developed landcover types) under this alternative would be 403.8 acres. After reclamation, long-term disturbance to vegetation (not including the developed landcover types) would be reduced to 37.0 acres. Alternative 4 would result in the least impacts to vegetation.

Table 4-17. Acres of Disturbance by Landcover Type for Alternative 4.

Landcover Type	Disturbance Type			
	BLM Actions		Non-federal Actions	
	Short-term	Long-term	Short-term	Long-term
Lodgepole Pine	0	0	0	0
Spruce-Subalpine Fir	0	0	0	0
Mixed Conifer	0	0	0	0
Aspen	0.1	0.1	9.8	1.1
Cottonwood Riparian	0	0	0	0
Greasewood	4.1	0	0.2	0.2
Gardner Saltbush	0	0	0	0
Greasewood-Sagebrush	0.4	0	0	0
Greasewood-Saltbush	1.2	0	0	0
Mixed Desert Shrubs	5.6	0	0	0
Wyoming Big Sagebrush	251.5	7.7	10.0	4.6
Mountain Big Sagebrush	20.2	<0.1	22.0	5.8
Mountain Silver Sagebrush	6.3	0.1	7.3	3.6
Alkali/Early Sagebrush	16.4	0	<0.1	<0.1
Rabbitbrush	13.7	0	0	0
Curlleaf Mountain Mahogany	4.4	0	0	0
Willow	2.4	0	2.5	1.6
Grass-like Types	<0.1	<0.1	3.1	3.1
Basin Grassland	0.8	0	0	0
Foothills Grassland	8.2	0	9.0	9.0
Alpine Grassland	0	0	0	0
Riparian/Wet Meadow	1.0	0	<0.1	0
Irrigated Agriculture	3.4	0	0	0
Dry-land Pastures	0	0	0	0
Fallow Agricultural Fields	0	0	0	0
Developed Landcover Types	152.4	4.1	4.3	1.5
Total	**492.2**	**12.0**	**68.3**	**30.6**

4.5.7 Cumulative Impacts

The CIAA for vegetation resources is the 14 sixth-order subwatersheds that intersect the RBPA. Existing activities in this area include historical and ongoing oil and gas development, ranching and grazing, fuel reduction projects, and proposed or reasonably foreseeable future oil and natural gas development. These activities contribute to the removal of native vegetation and an increase in potential invasive and noxious weed species in the RBPA.

The Wyoming big sagebrush community is the predominant vegetation type in the RBPA and would experience the greatest amount of disturbance from the Proposed Action or any of the action alternatives. Due to the widespread distribution of the Wyoming big sagebrush

community types in southwestern Wyoming and the CIAA, a relatively small proportion of these plant communities would be impacted. Increased fugitive dust due to cumulative effects of multiple activities could lead to accumulation on plants and reduced photosynthetic activity and growth. Such cumulative effects could result in long-term alteration of species composition, cover, and productivity. If not mitigated, these impacts could cause significant impacts to vegetation. However, based on the mitigation measures described below, significant impacts to the vegetation base in the RBPA are not anticipated.

Reclamation and revegetation efforts would be required for all oil and gas and pipeline projects in the surrounding area. These efforts typically involve recontouring and planting of native grasses, forbs, and shrubs. This often results in a temporary increase of herbaceous vegetation and a general decrease in the shrub cover. This could also lead to an increase of noxious weeds and invasive plants in the CIAA if reclamation is not adequately monitored. Due to limited annual precipitation and poor soil quality in the CIAA, reclamation success may be difficult to achieve, resulting in long-term cumulative impacts to the diversity of native vegetation.

4.5.8 Mitigation and Monitoring Opportunities

4.5.8.1 Mitigation

*4.5.8.1.1 BLM-Required Mitigation**

For all locations and access roads, the Operator would promptly revegetate all disturbed areas not necessary for production with a BLM PFO-approved seed mixture. Revegetation would commence immediately after construction.

The Operator would minimize airborne dust on access roads using water and/or a dust suppressant acceptable to BLM to reduce damage to roadside vegetation communities. The Operator would develop and maintain a weed management plan with the BLM PFO. Control of noxious or invasive weeds through chemical or biological means would be accomplished by certified applicators.

The Operator would conduct all surface activities in accordance with the BLM PFO FEIS RMP (BLM 2008b). The following mitigation measures are recommended to minimize impacts to vegetative resources and to minimize infestations of noxious, non-native, and invasive plant species:

- Construction equipment, materials, and vehicles would be stored at construction sites or at specified construction yards.
- Construction vehicles and equipment would be cleaned, power-washed, and free of soil and vegetation debris prior to entry and use of access roads to prevent transporting weed seeds.
- All personal vehicles, sanitary facilities, and staging areas would be confined to a limited number of specified locations to decrease chances of incidental disturbance and spread of weeds.

- Prompt re-establishment of the desired vegetation in disturbed areas is required. Seeding would occur during the frost-free periods after construction. Certified "noxious weed-free" seed would be used on all areas to be seeded.
- Seeding would be completed with seed mixtures of plant species indigenous to the area and approved by the BLM PFO or applicable Conservation District.
- Pre-construction surveys would be conducted for weed infestations within the site boundaries and along access roads.
- The Sublette County and Lincoln County Weeds and Pest Departments would be consulted to determine treatment for noxious weeds, if identified.
- Revegetated areas would be monitored following seeding to evaluate the need for supplemental seeding and noxious weed control.

The Operator shall develop and implement a comprehensive reclamation and weed monitoring and management plan. The plan shall be completed for BLM approval within six months of the issuance of the Decision Record.

*4.5.8.1.2 Other Mitigation Opportunities***

None identified.

4.5.8.2 Monitoring

*4.5.8.2.1 BLM-Required Monitoring**

The ROW and other disturbed areas would be monitored for weed infestations, and new or expanding populations would be controlled or eradicated for the duration of the construction, operation, and reclamation phases.

Reclamation success would be monitored on an annual basis. Reclamation achievement would be evaluated using the standards agreed upon with the BLM PFO. Rehabilitation efforts would be repeated if it is concluded that the success rate is below an acceptable level as determined by the BLM PFO.

The Operator would collect reclamation monitoring data in an electronic format and submit the spatial data and all associated attributes to the BLM along with their annual reclamation monitoring report.

*4.5.8.2.2 Other Monitoring Opportunities***

The Operator could collect reclamation monitoring data from non-federal project areas and provide BLM with data in an electronic format and spatial data along with their required federal annual reclamation monitoring report.

* BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the proposed Project, as identified in Chapter 2.

** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal Project components.

4.6 WETLANDS, RIPARIAN RESOURCES, AND FLOODPLAINS

4.6.1 Impact Criteria

Wetland and riparian resource impacts that would result from any of the alternatives would be both direct and indirect in nature and would occur primarily during construction and periodic maintenance activities. Direct impacts to wetlands and floodplains would include the direct removal and long-term loss of wetland and riparian areas resulting from Project implementation and potential disturbances and displacement of wetland and riparian vegetation around steel monopole structures and wooden H-frame poles. Other direct impacts would include the discharge of fill material into wetlands and riparian areas due to two-track road development that may change localized hydrology, soil functionality, and vegetative composition within the footprint of the road and immediately adjacent areas.

Direct impacts to wetlands and riparian resources would also occur from equipment operation in wetland areas. The crushing or removal of riparian and wetlands vegetation during inline tensioning and pulling of transmission lines, and the dragging of cables would result in direct impacts to riparian and wetlands resources by disrupting wetland functionalities within the upper O and A1 soils horizons, vegetation and PFC potentials, and potential micro hydrology changes due to tire and equipment rutting. To the extent practical, all segments of the transmission line along the Project corridor that cross drainages and/or riparian areas would span wetland areas, thus minimizing impacts to the resource. In addition, footers, poles, and other Project surface infrastructure would, to the practical extent possible, avoid placement in surface water features.

Indirect impacts to wetland resources may include sedimentation and erosion and other deposition of downgradient, adjacent wetland and riparian features, introduced weeds and upland vegetation along the Project ROW, land-use and habitat shifts from wetland to mesic or terrestrial habitats, agricultural and rangeland loss due to these habitat transformations, socioeconomic losses due to decreased hay production in riparian areas, and potential downstream sedimentation, hydrological changes, and other functionality losses due to pipeline construction and potential associated road improvement or development. Other indirect impacts to wetland resources may include damage to wetland substrate and impacts to water quality and flow from heavy equipment traffic during installation of the towers along the transmission line, trenching of pipelines, groundwater removal during construction, and french-drain effects to surface water proximity to the soil surface along pipeline ROWs. Indirect impacts to wetland and riparian resources would generally occur from potential construction-related erosion and sediment movement, which are mitigated by applicable SWPPPs (see Section 4.4.4) and special and general conditions of all applicable authorizations, such as water quality standards required by the WDEQ.

The proposed transmission line and pipeline ROW would cross riparian valleys and floodplains, stream channels, and wetlands. The Wyoming BLM‘s Standard Mitigation Guidelines for Surface-Disturbing Activities require that projects should avoid surface disturbances within 500 feet of surface water, riparian areas, wetlands, and 100-year floodplains unless it is determined through site-specific analysis and approved in writing by

the BLM. The BLM also requires construction to be restricted within 100 feet of the edge of the inner gorge of intermittent and large ephemeral drainages (BLM 2008b).

All of the proposed alternatives would comply with EO 11988, Floodplain Management, and EO 11990, Protection of Wetlands. WDEQ water quality standards, applicable regulations, and permitting requirements, including stormwater and other WYPDES permits would be required prior to Project implementation.

Potential impacts to wetlands within the RBPA would be permitted and authorized under Section 404 of the CWA under guidance of the USACE Wyoming regulatory office in Cheyenne, Wyoming. By adhering to special conditions in permits issued by the USACE for pipeline and road construction, impacts to those ~~"~~waters of the U.S." or any jurisdictional waters impacted by the Proposed Action would be mitigated. Section 404 of the CWA requires that a permit be issued to insure that no discharge of dredged material or fill material is allowed to enter waters of the U.S. if a practicable alternative exists that is less damaging to the aquatic environment or if the nation's waters would be significantly degraded. Due diligence would be performed by the Project proponent prior to Project implementation to comply with all local and federal regulations pertaining to the wetland habitats and the CWA. If jurisdictional wetlands or waters of the U.S. are identified within the RBPA through alignment- and alternative-specific wetland delineations and surveys, the appropriate permits and authorization would be obtained through the USACE prior to construction activities. Reclamation is expected to be successful due to the availability of moisture and ability of riparian and wetlands areas to regenerate quickly.

Impacts to wetlands, riparian resources, and floodplains would be considered significant if there is any:

- long-term loss of wetlands or wetland function in the area; and/or
- violation of requirements of the Section 404 permit(s).

No wetlands and/or floodplains are known to be present at the proposed M&HRF, HLF, or well pad locations. The types of direct and indirect impacts would be similar for all of the alternatives as Alternative 1, but would differ in the amount of acreage and surface disturbance. Table 4-18 shows the comparison of impacts for each wetland classification between each of the proposed alternatives.

Table 4-18. Acres of Disturbance for Wetland Cover Types Based upon Jurisdiction.

Project Components	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Palustrine Emergent	Palustrine Scrub/Shrub Forested	Palustrine Emergent	Palustrine Scrub/Shrub Forested	Palustrine Emergent	Palustrine Scrub/Shrub Forested	Palustrine Emergent	Palustrine Scrub/Shrub Forested
BLM Actions								
AAM&WS	0	0	0	0	0	0	0	0
Gas well pads and acid gas injection well pad	0	0	0	0	0	0	0	0
Gas flowlines and buried utility lines	0	0	0	0	0	0	0	0
Helium pipeline & fiber optic line*	0.73	0.80	No BLM Action		0.67	0.34	0	0.80
Cimarex gas pipeline*	0.25	0.60	0	1.12	0	0.60	0.25	0.60
Electrical transmission line*	3.84	1.02	No BLM Action		3.84	3.14	0.98	0
Williams gas pipeline*	0	0	0	0	0	0	0	0
Total Acres Affected by BLM Actions	**4.82**	**2.42**	**0**	**1.12**	**3.48**	**1.58**	**0.98**	**1.40**

Project Components	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Palustrine Emergent	**Palustrine Scrub/Shrub Forested**	**Palustrine Emergent**	**Palustrine Scrub/Shrub Forested**	**Palustrine Emergent**	**Palustrine Scrub/Shrub Forested**	**Palustrine Emergent**	**Palustrine Scrub/Shrub Forested**
Non-federal Actions								
Produced water line and injection well	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Natural gas-fired power plant	Not applicable		Not applicable		Not applicable		0	0
M&HRF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
HLF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Helium pipeline & Fiber optic line*	BLM Actions		80.16	11.78	BLM Actions		BLM Actions	
Cimarex gas pipeline			21.29	8.82				
Electrical transmission line	BLM Actions		126.97	15.65	BLM Actions		0	0
Williams gas pipeline*			BLM Actions				BLM Actions	
Total Acres Affected (BLM & Private & State)	**4.82**	**2.42**	**228.42**	**37.37**	**3.48**	**1.58**	**0.98**	**1.40**

AAM&WS = Ambient Air Monitoring and Weather Station
HLF = Helium Liquefaction Facility
M&HRF = Methane and Helium Recovery Facility
* May cross private and state lands.

Alternatives consider modified construction practices include trenching and/or boring of riparian habitat. The trenching of riparian and wetland habitat would be completed using standard trenching practices. All streams and riparian areas in the RBPA would be trenched unless stated otherwise. Under specific alternatives, boring of streams would replace trenching. The boring of streams would involve the clearing of vegetation on a 150- by 100-foot pad on both sides of each stream. The bore length would be approximately 580 feet and would include the collocation of the natural gas and helium pipeline in a single 16- to 18-inch borehole. A separate 2- to 3-foot borehole would be drilled to accommodate the fiber optic cable parallel to the natural gas and helium pipelines at a distance of approximately 10 feet.

4.6.2 No Action Alternative

Under the No Action Alternative, BLM would not take action on the Cimarex applications for ROWs or APDs, including the Williams application for an additional pipeline ROW. There would be no impacts to wetland and riparian resources from BLM actions with No Action. However, several non-federal actions would likely occur on private and state lands with this alternative, as identified in Chapter 2. Construction of facilities such as the M&HRF and HLF would occur and a transmission line and pipelines would likely be constructed on private and state lands, but acres of disturbance in affected wetlands is unknown at this time. Gas production wells would be drilled entirely on State of Wyoming land, but disturbance information is not available as the exact locations of the well pad, or pads, is not known at this time.

The result of No Action on wetland resources is expected to be similar to the total Project impacts described in Alternative 2; the impacts of any non-federal actions would be outside BLM jurisdiction and ability to modify or change.

4.6.3 Alternative 1

4.6.3.1 Impacts of BLM Actions with Alternative 1

According to the USFWS NWI database (UWSFWS 2009a), under Alternative 1, approximately 7.24 acres of wetlands and riparian areas would be initially disturbed during construction of the helium and Cimarex gas pipeline, and the fiber optic and electrical transmission lines.

Construction areas such as the pulling and tensioning stations and equipment staging areas would not be cleared of vegetation and would be designed to avoid wetlands, floodplains, and riparian corridors. To the extent practicable, construction activities would be kept away from these features, so water quality and hydrology would not be impacted by surface disturbances. However, trenching of riparian and wetland areas for pipelines would result in an initial disturbance of 2.38 acres. Beaver Creek would be bored for the installation of the natural gas and helium pipelines, and fiber optic cables.

Wetlands and riparian areas within the construction ROW would be identified and avoided by construction and maintenance traffic where possible, however electrical transmission poles could create long-term disturbance. Any wetlands and floodplains that would be impacted by Project construction would be subject to Section 404 of the CWA and other applicable

regulations pertaining to these types of surface water features. Therefore, Alternative 1 would not result in significant adverse short-term impacts to wetland resources.

4.6.3.2 Total Project Impacts with Alternative 1

All impacts under Alternative 1 would be the result of BLM-related actions; therefore, the total acres of disturbance based upon jurisdiction would be 7.24 acres. See Section 4.6.3.1 for a description of potential impacts.

4.6.4 Alternative 2

4.6.4.1 Impacts of BLM Actions with Alternative 2

There would be approximately 1.12 acres of initial disturbance to wetland and riparian resources from the Cimarex gas pipeline which would cross a small portion of BLM-administered land. See Table 4-18 for acres of disturbance based upon jurisdiction.

4.6.4.2 Total Project Impacts with Alternative 2

Construction areas such as the pulling and tensioning stations and equipment staging areas would be cleared of vegetation only to the extent practical and would be designed to avoid and minimize surface disturbances and the discharge of fill material in wetlands, floodplains, and riparian corridors where possible. The initial surface disturbance associated with the installation of the transmission line would be 142.62 acres.

According to the USFWS NWI database (UWSFWS 2009a), under Alternative 2, approximately 265.79 acres of wetlands and riparian areas would be initially disturbed, resulting in significant adverse impacts to wetland resources. Jurisdictional wetland crossings would be required to comply with Section 404 of the CWA.

In addition, Alternative 2 would include trenching natural gas and helium pipelines and fiber optic utilities through Middle Fork of Piney Creek and South Fork of Piney Creek multiple times on private land, unless landowners specify otherwise. Trenching of riparian and wetland areas for pipelines would result in an initial disturbance of 123.17 acres. Under Alternative 2, all streams and riparian areas would be trenched. The BLM would have no jurisdiction over the placement, construction methods, BMPs, or reclamation on private land.

Alternative 2 would therefore result in significant adverse short-term impacts to wetland resources. Such impacts could be reduced in the long term by implementing adequate mitigation measures and design features, but would not be within BLM jurisdiction.

4.6.5 Alternative 3

4.6.5.1 Impacts of BLM Actions with Alternative 3

Under Alternative 3, there would be an initial disturbance of 5.06 acres to wetland and riparian areas from the helium and Cimarex gas pipeline, and the fiber optic and electrical transmission line. Alternative 3 includes the boring of Spring Creek and Beaver Creek. See Table 4-18 for acres of disturbance based upon jurisdiction.

4.6.5.2 Total Project Impacts with Alternative 3

Alternative 3 would include boring natural gas and helium pipelines under Spring Creek and Beaver Creek for the purpose of reducing water quality impacts and aquatic habitat disruption, and collocating pipelines in trenches to reduce surface impacts. The boring of Spring Creek and Beaver Creek would result in reduced direct disturbance to wetland and riparian vegetation. Alternative 3 would also include a slight shift in the alignment of the natural gas and helium pipelines, and the transmission line. The clearing of the bore pads would create a short-term increase in the potential for surface runoff. Standard BMPs to mitigate surface runoff would be sufficient to prevent adverse effects.

According to the USFWS NWI database (UWSFWS 2009a), there would be approximately 5.06 acres of disturbance to wetlands and riparian areas.

Construction areas such as the pulling and tensioning stations and equipment staging areas would not be cleared of vegetation, and would be designed to avoid wetlands, floodplains, and riparian corridors. Construction activities would be kept at a distance away from these features, so water quality and hydrology would not be impacted by surface disturbances; however, electrical transmission poles could create long-term disturbance. Any wetlands and floodplains that would be impacted by Project construction would be subject to Section 404 of the CWA and other applicable regulations pertaining to these types of surface water features. Therefore, Alternative 3 would not result in significant adverse short-term impacts to wetland resources.

4.6.6 Alternative 4

4.6.6.1 Impacts of BLM Actions with Alternative 4

All potential impacts under Alternative 4 would result from BLM actions. There would be approximately 2.38 acres of initial disturbance to wetland and riparian areas from the helium and Cimarex gas pipeline, and the fiber optic and electrical transmission line. See Table 4-18 for acres of disturbance based upon jurisdiction.

4.6.6.2 Total Project Impacts with Alternative 4

Alternative 4 would result in impacts very similar to Alternative 1 since the same procedures would be used during installation of pipelines, well pads, and fiber optic cables. Construction activities would be kept away from equipment staging areas, so water quality and hydrology would not be impacted by surface disturbances. Design modifications for Alternative 4 include the addition of an EGS to supply power to the M&HRF. This facility would not be located on or near any designated wetlands and would have no additional impact to this resource. Installation of this facility would not require a transmission line to supply the M&HRF with power.

According to the USFWS NWI database (USFWS 2009a), under Alternative 4, approximately 2.38 acres of wetlands and riparian areas would be initially disturbed. Any wetlands and floodplains that would be impacted by Project construction would be subject to Section 404 of the CWA and other applicable regulations pertaining to these types of surface water features.

Therefore, no significant adverse impacts, either short-term or long-term, would result from implementation of Alternative 4.

4.6.7 Cumulative Impacts

Activities that may affect riparian and wetland resources in the area of cumulative effect include historical and ongoing oil and gas development, ranching and grazing, agricultural production, and some recreational opportunities. Other proposed or reasonably foreseeable developments and activities in the area are consistent with these ongoing land uses. The BLM-PFO currently has no applications for future development; however, current trends show that the level of activity in oil and gas development could double in the foreseeable future.

Wetlands, floodplains, waters of the U.S., and riparian areas would be avoided to the practicable extent possible and cumulative impacts are expected to be minimal considering the large amount of wetland and riparian habitat in the area and the temporary nature of impacts to these resources. Grazing and agricultural potentials and allotment PFC may be slightly decreased based on the final alignment, ROW, surface disturbances resulting from the Proposed Action, and other pressures by other land use developments. It can be expected that direct long-term impacts to these resources would be minimal and after reclamation and Project completion, surface disturbances would be mitigated and restored back to preconstruction grades, functionality, and forage potential. Permitting and authorization of any discharge of fill material in jurisdictional waters of the U.S., including wetlands, would be mitigated under the jurisdiction of the CWA and comply with applicable _no net loss‘ policies. The Proposed Action is not expected to contribute incremental impacts to any current or future land uses in wetland or riparian areas, decrease allotment and forage potentials, affect current recreational potentials, or alter historical oil and gas development over the long-term. Therefore, no significant cumulative impact would be anticipated from implementation of the Project.

4.6.8 Mitigation and Monitoring Opportunities

Appropriate areas for power pole installations and placement would be identified during construction design planning; routing of any construction access road would be placed, where possible, outside the 500-foot buffer around wetland areas; and construction activities would be limited to seasons of lower flow or drier conditions.

4.6.8.1 Mitigation

*4.6.8.1.1 BLM-Required Mitigation**

BLM-required mitigation only applies to BLM action/authorizations associated with the proposed Project.

- The Operator would follow BLM stipulations by avoiding surface disturbances within 500 feet of surface water, riparian areas, wetlands, and 100-year floodplains unless it is determined through site-specific analysis, approved in writing by the BLM, that no practicable alternative to the Proposed Action exists.

- All stream crossings would be analyzed on a Project-specific basis during the construction planning process and through CWA authorization and Section 404 permitting as necessary.
- Implementation of site-specific BMPs and construction techniques to minimize the potential for indirect impacts.
- Avoidance and minimization of permanent structures in surface water features.
- All pipeline and transmission line ROWs would be restored back to preconstruction grade and functionality following construction.
- Reclamation and seeding.
- Wetland mitigations, as required, to comply with the CWA and _no net loss‘ policies and directives.

*4.6.8.1.2 Other Mitigation Opportunities***

Other mitigation opportunities can be applied to federal and non-federal Project components. The BLM-PFO may not require mitigation on non-federal Project components.

- The Operator proposes to restrict construction within 100 feet of the edge of the inner gorge of intermittent and large ephemeral drainages.
- Narrowing of ROW in wetlands or riparian areas to minimize and avoid these features and resources.
- Trench breakers and other trenching BMPs could be used to avoid any indirect effects due to french-drain effects.

4.6.8.2 Monitoring

*4.6.8.2.1 BLM-Required Monitoring**

BLM-required monitoring only applies to BLM action/authorizations associated with the proposed Project.

- Continued monitoring and implementation of approved weed management plan.
- Environmental inspections and monitoring as appropriate during and after construction.

*4.6.8.2.2 Other Monitoring Opportunities***

Other monitoring opportunities can be applied to federal and non-federal Project components. The BLM-PFO may not require mitigation on non-federal Project components.

- Continued monitoring of the revegetation success of riparian areas on private and state land.

Continued implementation of these measures would adequately protect riparian areas, floodplains, and wetlands to ensure no significant direct, indirect, or cumulative impacts occur to these resources within and adjacent to the proposed RBPA.

*BLM-required mitigation and monitoring only applies to BLM actions/authorizations associated/connected the proposed Project.

**Other mitigation and monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require/impose any mitigation requirements on the non-federal actions.

4.7 THREATENED AND ENDANGERED SPECIES AND SPECIAL STATUS SPECIES

4.7.1 Introduction

This section considers short- and long-term environmental impacts of the alternatives to USFWS threatened and endangered species, BLM sensitive species, and wildlife and fisheries resources. Short-term impacts are defined as those activities associated with construction of the key components of the Project, repair of existing roads, and the associated increase in human activity. Short-term impacts include, but are not limited to, crushing of existing vegetation and compaction of soils from construction and maintenance traffic and disturbance from noise and human activity. Long-term impacts are defined as those associated with the location, operation, and maintenance of the Project components, as well as the vehicle and human activity required to operate and maintain these facilities. Long-term impacts include, but are not limited to, permanent loss of habitat due to placement of transmission line poles; the HLF, AAM&WS, EGF, and M&HRF; and disturbance from noise and human activity associated with operation and maintenance of these facilities. Short- and long-term environmental impacts can have both direct and indirect adverse impacts.

Potential short-term direct adverse effects to USFWS threatened and endangered species, BLM sensitive species, and wildlife and fisheries resources could include the following:

- risk of direct mortality of during construction of key Project components; and
- loss or degradation of native habitat and displacement of wildlife species from habitat due to development, assessed as acres of temporary surface disturbance within each habitat type.

Potential short-term indirect adverse effects to USFWS threatened and endangered species, BLM sensitive species, and wildlife and fisheries resources could include the following:

- disruption or displacement of species from nesting/birthing and foraging areas, and other activity patterns due to construction, drilling, and increased human activity (including poaching);
- disruption or displacement of wildlife within critical habitat areas during construction, drilling, and other human activities (including poaching); and

- increased predation on sensitive species due to displacement from their habitat during construction, drilling, and other human activities.

Potential long-term direct adverse effects to USFWS threatened and endangered species, BLM sensitive species, and wildlife and fisheries resources could include the following:

- increased risk of direct mortality from vehicle collisions;
- direct loss or degradation of native habitat and displacement of wildlife species from habitat due to development, assessed as acres of permanent surface disturbance within each habitat type; and
- direct mortality of bird species due to the collision threat posed by structures, transmission lines, grounding wires, and guy wires, and potential injury or mortality from electrocution.

Potential long-term indirect adverse effects to USFWS threatened and endangered species, BLM sensitive species, and wildlife and fisheries resources could include the following:

- fragmentation and isolation of connected habitats, including reduced habitat patch size, reduced distance to areas of disturbance, and the potential displacement of wildlife;
- increases in the potential for poaching or harassment of wildlife due to the relative level of access provided from Project-related roads and increased traffic;
- damage to special status species‘ habitat by unauthorized off-road traffic;
- increased predation on special status species due to the operation of the plant or placement of transmission line structures;
- avoidance of suitable habitat near transmission lines by special status species due to increased concentration or composition of raptors using the structures as perches; and
- displacement of species from habitat area due to operation, including increased noise, or location of the Project components.

4.7.2 Impact Criteria for USFWS Threatened, Endangered, and Candidate Species

Impacts to USFWS threatened, endangered, and candidate species could occur in various forms, as described above. Potential impacts and impact criteria are summarized for each federally listed species, described in Section 3.8, for which potentially suitable habitat is provided within the RBPA.

4.7.2.1 Significance Criteria for Black-footed Ferret, Canada Lynx, Gray Wolf, and Grizzly Bear

If these species were found to occupy the RBPA, potential direct impacts could include risk of direct mortality during construction and operation of Project components and direct loss, fragmentation, or degradation of suitable or critical habitat, assessed as acres of permanent surface disturbance within each habitat type. Indirect impacts could include displacement of

species from a habitat area due to operation of the plant or placement of transmission line structures.

Significance criteria for black-footed ferret, Canada lynx, gray wolf, and grizzly bear include:

- risk of direct mortality during construction or operation of Project components;
- direct loss, fragmentation, or degradation of suitable or critical habitat for black-footed ferret, assessed as acres of permanent surface disturbance or surface occupancy within white-tailed prairie dog towns greater than 200 acres in size with a burrow density greater than 20 active burrows per hectare;
- direct loss, fragmentation, or degradation of suitable or critical habitat for Canada lynx, assessed as acres of permanent surface disturbance or surface occupancy within designated critical habitat;
- direct loss, fragmentation, or degradation of suitable habitat for gray wolf, assessed as acres of permanent surface disturbance or surface occupancy within their known breeding range; and
- direct loss, fragmentation, or degradation of suitable habitat for grizzly bear, assessed as acres of permanent surface disturbance or surface occupancy within white bark pine habitats.

4.7.2.2 Impact Criteria for Western Yellow-billed Cuckoo

If western yellow-billed cuckoo were found in the RBPA, direct impacts could occur through mortality due to the collision threat posed by structures, transmission lines, grounding wires, and guy wires; potential injury or mortality from electrocution; and direct loss, fragmentation, or degradation of suitable habitat, assessed as acres of permanent surface disturbance within each habitat type; or displacement of species from habitat area due to operation of the plant or placement of transmission line structures.

Significance criteria for western yellow-billed cuckoo include:

- direct mortality due to the collision threat posed by structures, transmission lines, grounding wires, and guy wires, and electrocution; and
- long-term loss of habitat due to development, assessed as acres of permanent surface disturbance within a 500-foot buffer of surface water, riparian areas, and wetlands.

4.7.2.3 Impact Criteria for Colorado River Fishes

Under the *Recovery Implementation Program for Endangered Species in the Upper Colorado River Basin* (RIP) (USFWS 1987), impacts to Colorado River fishes may occur from water depletions from tributary waters necessary for the continued existence of these endangered fish. Tributaries are defined as contributing to instream flow, and depletion is defined as water that would contribute to flows if not intercepted or removed from the system.

4.7.2.4 Impact Criteria for Ute Ladies‘-tresses

Impacts to Ute ladies‘-tresses could occur as direct mortality and destruction of populations during construction and maintenance activities. Indirect effects could include potential loss of habitat and temporary disturbance due to construction activities which could increase sedimentation to wetlands or cause surface and/or subsurface water drainage changes that would alter the orchid‘s habitat. Loss of suitable habitat could prevent recruitment and colonization of new populations in those areas. Other indirect effects on these species would include impacts from fugitive dust from vehicles that could collect on photosynthetic surfaces and lead to reduced plant vigor, growth, and reproductive success.

Significant adverse impacts would occur to Ute ladies‘-tresses if the Project were to result in the direct mortality and destruction of populations during construction and maintenance activities.

4.7.3 USFWS Threatened, Endangered, and Candidate Species

4.7.3.1 No Action Alternative

Under the No Action Alternative, no federal actions would be taken. Under this alternative, the non-federal actions (i.e., construction of the M&HRF, construction staging/equipment yard, the HLF, air products transmission line, and produced water disposal well on state and private lands) would still occur. Impacts are anticipated to be similar to those described for Alternative 2. All activities related to the construction and operation of the M&HRF would be in accordance with the existing Wyoming Special Use Permit and MOA with WGFD, provided in Appendix B. Noise reduction and other mitigation measures agreed to by Cimarex for operation of the M&HRF, discussed in Appendix B, would reduce effects on any grizzly bears, Canada lynx, or gray wolves that may pass through the RBPA. In addition, all non-federal actions must adhere to provisions of the ESA, Section 10, which requires consultation with USFWS and protection of all ESA listed threatened or endangered species on private and state land. No adverse impacts to any listed threatened or endangered species are anticipated from the No Action Alternative.

4.7.3.2 Alternative 1

4.7.3.2.1 Impacts of BLM Actions

4.7.3.2.1.1 Black-footed Ferrets

BLM actions under Alternative 1 would not directly or indirectly impact black-footed ferrets. No black-footed ferrets were found during 2008 surveys, and the species is not expected to occur within the RBPA due to a lack of known prairie dog towns (BLM 2007b, 2009c; WYNDD 2007a), which represent suitable habitat. If future surveys demonstrate the presence of suitable habitat or black-footed ferrets, then status information should be forwarded to the USFWS and the appropriate avoidance protocol should be implemented.

4.7.3.2.1.2 Canada Lynx

BLM actions under Alternative 1 would not impact the Canada lynx or their designated critical habitat. No lynx have been observed in the RBPA since 1987 and it is unlikely that lynx would occur in areas where non-federal activities may take place with Alternative 1

(WYNDD 2007a). No changes would occur within designated critical habitat for the Canada lynx. Therefore, no adverse short-term or long-term impacts would occur to Canada lynx under Alternative 1.

4.7.3.2.1.3 Gray Wolf

BLM actions under Alternative 1 would not impact the gray wolf. The RBPA is outside of the known range of Wyoming packs and they do not rely on the RBPA for hunting or breeding. Gray wolves are unlikely to be deterred from passing through the RBPA by the operation of the M&HRF due to the Operator agreed-to measures discussed Appendix B.

4.7.3.2.1.4 Grizzly Bear

Suitable habitat for grizzly bear, identified as white-bark pine, is not found in the RBPA; therefore, BLM actions under Alternative 1 would have no impact on the grizzly bear. No grizzly bear habitat or food sources occur in the RBPA and suitable habitat would not be disturbed under Alternative 1. Noise reduction and other mitigation measures agreed to by Cimarex for operation of the M&HRF, discussed in Appendix B, would reduce effects on any grizzly bears passing through the RBPA.

4.7.3.2.1.5 Western Yellow-billed Cuckoo

BLM actions under Alternative 1 would not impact habitat for the western yellow-billed cuckoo. The western yellow-billed cuckoo has no suitable breeding habitat within the RBPA and is unlikely to occur as a migrant due to its rare status in western Wyoming. If yellow-billed cuckoo were to migrate though the RBPA, direct mortality of these birds could occur from collisions with the transmission line where it crosses streams. BLM actions with Alternative 1 include 2 perennial and 15 ephemeral stream crossings associated with overhead transmission lines (see Table 4-19). Perennial streams to be crossed by the transmission line include Spring Creek and Beaver Creek. To protect avian species, including yellow-billed cuckoo, the transmission line design for stream crossings, plus three spans on either side of the stream crossing, would include bird flight diverters installed on the high neutral. With implementation of these design features, no significant adverse impact to yellow-billed cuckoo would be anticipated with the BLM actions of Alternative 1.

4.7.3.2.1.6 Colorado River Fishes

BLM actions under Alternative 1 would not impact Colorado River Fishes. Endangered Colorado River fishes do not occur in the RBPA and there is no designated critical habitat within the RBPA. No direct mortality would be caused by Alternative 1. These species do occur downstream in the Green, Yampa, and Colorado rivers, and South Piney, Spring, and Beaver creeks, which drain the RBPA and are perennial tributaries to the Green River. These species have the potential to be impacted if water quality standards set by the WDEQ are exceeded within the RBPA.

Table 4-19. Perennial and Ephemeral Stream Crossings by Pipelines/Fiber Optic Lines and Transmission Lines.

Project Component	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Perennial	Ephemeral	Perennial	Ephemeral	Perennial	Ephemeral	Perennial	Ephemeral
BLM Actions								
Cimarex gas/helium/fiber optic pipeline*	2	15	0	0	2	15	2	14
Williams gas pipeline*	1	18	1	18	1	18	1	18
Electrical transmission line*	2	15	No BLM Action		1	13	0	0
Non-federal Actions								
Cimarex gas/helium/fiber optic pipeline	0	0	6	29	0	0	0	0
Electrical transmission line	0	0	4	27	0	0	0	0
Total Transmission Line Crossings Affected by All Actions	**2**	**15**	**4**	**27**	**1**	**13**	**0**	**0**
Total Stream Channel Crossings Affected by All Actions	**3**	**33**	**7**	**47**	**3**	**33**	**3**	**32**

*May also cross private and state lands.

Indirect effects to Colorado River Fishes may occur from water withdrawals planned in non-federal connected actions. Drilling and completion activities, as described in Section 4.4, are anticipated to require 10.3 acre-feet of water for the LOP, which would be obtained from valid existing water rights from off-channel local supplies originating from Beaver Creek, Middle Piney Creek, South Piney Creek, or the Green River. The level of water supply required for the LOP would not exceed an average of 100 acre-feet of water annually and would not require a fee to be paid to off set impacts (USFWS 1987). The USFWS finds that all depletions of Colorado River water adversely affect endangered fish (USFWS 1987). Alternative 1 would result in a minor adverse impact from reduction of surface water flow of greater than 0.1 acre feet per year.

4.7.3.2.1.7 Ute Ladies'-tresses

There are no known populations of Ute ladies'-tresses within the RBPA or on public lands in the PFO. Potentially suitable habitat may occur in the riparian areas within the RBPA. In known occupied Ute ladies'-tresses habitat, the USFWS recommends that the BLM use management actions that are compatible with protection and conservation of pollinators of the Ute ladies'-tresses orchid. BLM actions with Alternative 1 includes 3 perennial and 33 ephemeral stream crossings associated with helium and gas pipelines and fiber optic lines (see Table 4-19). The natural gas and helium lines would share separate ROW widths but they would cross each stream in the same general location.

Perennial streams to be crossed by the pipelines and fiber optic lines with Alternative 1 include Spring Creek, Beaver Creek, and Dry Piney Creek. The crossing on Beaver Creek would be directionally drilled, as discussed under Section 4.4.3. The other streams would be trenched. Pre-construction surveys would identify the presence of this species and any found populations would be avoided.

No surface occupancy would occur within the 500-foot buffer of perennial streams, riparian areas, or wetlands. The federal well pad 10-14, the water injection well 24-16, the HLF, and some of the two-track roads associated with the transmission line all fall within the 500-foot buffer of an ephemeral stream. The Wyoming BLM's Standard Mitigation Guidelines for Surface-Disturbing Activities within 500 feet of surface water, riparian areas, wetlands, and 100-year floodplains require site-specific analysis to be approved in writing by the BLM. All disturbance occurring within the high bank plus 50 feet is required to be reclaimed to meet the PFC standards (BLM 2008b). Therefore, the BLM actions of Alternative 1 may affect, but are not likely to adversely impact, Ute ladies'-tresses or its habitat.

4.7.3.2.2 Total Project Impacts with Alternative 1

Potential impacts to black-footed ferrets, Canada lynx, gray wolf, and grizzly bear would be the same as those described for BLM actions for the No Action Alternative, since these species and their habitats are not known to occur in the RBPA, there would be no impact to these species if Alternative 1 is implemented.

4.7.3.2.2.1 Western Yellow-billed Cuckoo

The western yellow-billed cuckoo has no suitable breeding habitat within the RBPA and is unlikely to occur as a migrant due to its rare status in western Wyoming. Therefore, total

Project impacts to western yellow-billed cuckoo would be identical to those described for BLM Actions with Alternative 1 for western yellow-billed cuckoo.

4.7.3.2.2.2 Colorado River Fishes

Water deplections associated with the Project would only result from proposed BLM actions, therefore impacts to Colorado River fishes would be identical to those described under the Impacts of BLM Actions with Alternative 1.

4.7.3.2.2.3 Ute Ladies'-tresses

Habitats suitable for the Ute ladies'-tresses are unlikely to occur within the areas affected by non-federal Project components. Therefore, potential impacts to the species would be identical to those described under the Impacts of BLM Actions

4.7.3.3 Alternative 2

4.7.3.3.1 Impacts of BLM Actions with Alternative 2

As with the No Action Alternative, there would be no impacts to black-footed ferrets, Canada lynx, gray wolf, and grizzly bear. Potential effects to Colorado River fishes would be the same as those described under Alternative 1, resulting in minor adverse impacts.

4.7.3.3.1.1 Western Yellow-billed Cuckoo

There would be no impacts to western yellow-billed cuckoo migrants through direct mortality of these birds from collisions with the transmission line where it crosses streams associated with BLM actions (see Table 4-19). All stream crossings of transmission lines would be associated with non-federal actions.

4.7.3.3.1.2 Ute Ladies'-tresses

BLM actions of Alternative 2 include 1 perennial and 18 ephemeral stream crossings associated with helium and gas pipelines and fiber optic lines (see Table 4-19). The pipelines and fiber optic lines would cross Dry Piney Creek. When possible, Project components, including transmission poles, would be designed so that no surface occupancy occurs within 500 feet of any perennial streams or wetlands, as described under Alternative 1. The number of stream crossing associated with BLM actions of Alternative 2 are lower than Alternatives 1, 3, and 4 because they only include crossings associated with the Williams gas pipeline (Table 4-19). The potential for loss of Ute ladies'-tresses habitat associated with BLM actions is lower under Alternative 2 than Alternatives 1, 3, and 4. Pre-construction surveys would identify the presence of this species and any found populations would be avoided. Therefore, Alternative 2 may affect, but likely would not adversely impact, Ute ladies'-tresses or designated habitat of listed species.

4.7.3.3.2 Total Project Impacts with Alternative 2

As with the Alternative 1, there would be no impacts to black-footed ferrets, Canada lynx, gray wolf, and grizzly bear. Potential effects to Colorado River fishes would be the same as those described under Alternative 1, resulting in minor adverse impacts.

4.7.3.3.2.1 Western Yellow-billed Cuckoo

Impacts to western yellow-billed cuckoo migrants through direct mortality of these birds from collisions with the transmission line where it crosses streams, as described under Alternative 1, could be higher under Alternative 2 compared to the No Action Alternative, and Alternatives 1, 3, and 4 because there would be a total of 4 perennial and 27 ephemeral stream crossings by overhead transmission lines (see Table 4-19). The perennial streams that would be crossed by the transmission lines are South Piney and Middle Piney creeks. An increased number of stream crossings represents an increased potential for collisions. The additional opportunities for bird collisions could result in adverse impacts to this species, although such impacts probably would not be significant with installation of bird flight diverters at every stream crossing. Therefore, Alternative 2 may affect, but likely would not adversely impact, western yellow-billed cuckoo or any designated habitat of listed species.

4.7.3.3.2.2 Ute Ladies'-tresses

Alternative 2 includes 7 perennial and 47 ephemeral stream crossings associated with helium and gas pipelines and fiber optic lines (see Table 4-19). The pipelines and fiber optic lines would cross South Piney, Middle Piney, and Dry Piney creeks. When possible Project components, including transmission poles, would be designed so that no surface occupancy occurs within 500 feet of any perennial streams or wetlands, as described under Alternative 1. The number of stream crossing associated with Alternative 2 is higher than the No Action Alternative and Alternatives 1, 3, and 4. The potential for loss of Ute ladies'-tresses habitat is greatest under Alternative 2. Pre-construction surveys would identify the presence of this species and any found populations would be avoided. Therefore, Alternative 2 may affect but likely would not adversely impact Ute ladies'-tresses or any designated habitat of listed species.

4.7.3.4 Alternative 3

4.7.3.4.1 Impacts of BLM Actions with Alternative 3

Potential impacts to black-footed ferrets, Canada lynx, gray wolf, and grizzly bear would be to the same as those described under the No Action Alternative. Potential impacts to Colorado River fishes associated with Alternative 3 would be the same as those described under Alternative 1.

4.7.3.4.1.1 Western Yellow-billed Cuckoo

Alternative 3 would include 1 perennial and 13 ephemeral stream crossings associated with overhead transmission lines (see Table 4-19). The overhead transmission lines would cross Beaver Creek and not Spring Creek. Alternative 3 has fewer perennial stream crossings by overhead transmission lines than Alternatives 1 and 2. Therefore, impacts of BLM actions with Alternative 3 may affect, but would not adversely impact, western yellow-billed cuckoo.

4.7.3.4.1.2 Ute Ladies'-tresses

Alternative 3 would include 3 perennial and 33 ephemeral stream crossings associated with pipelines and fiber optic lines (see Table 4-19). Alternative 3 has 8.0 miles of shared pipeline trench and ROW (100 feet) for the natural gas and helium pipelines. Perennial stream crossing on both Spring and Beaver creeks would be bored instead of trenched, as discussed under Section 4.4.3. Alternatives 3 and 1 have equal numbers of ephemeral stream crossings

associated with pipelines and fiber optic lines (see Table 4-19). Alternatives 1, 3, and 4 have equal numbers of perennial stream crossings. Pre-construction surveys would identify the presence of this species and any found populations would be avoided. Therefore, impacts of BLM actions with Alternative 3 may affect, but likely would not adversely impact, Ute ladies‘-tresses or any designated habitat of listed species.

4.7.3.4.2 Total Project Impacts with Alternative 3

Potential impacts to black-footed ferrets, Canada lynx, gray wolf, and grizzly bear would be to the same as those described under the No Action Alternative. Potential impacts to Colorado River fishes would be the same as those described under Alternative 1.

4.7.3.4.2.1 Western Yellow-billed Cuckoo

Total Project impacts to western yellow-billed cuckoo would be identical to those described under the Impacts of BLM Actions with Alternative 3 for western yellow-billed cuckoo. No additional impacts would be associated with activities on non-federal lands.

4.7.3.4.2.2 Ute Ladies’-tresses

Total Project impacts to Ute ladies‘-tresses would be identical to those described under the Impacts of BLM Actions with Alternative 3 for Ute ladies‘-tresses. No additional impacts would be associated with activities on non-federal lands.

4.7.3.5 Alternative 4

4.7.3.5.1 Impacts of BLM Actions with Alternative 4

Potential impacts to black-footed ferrets would be the same as those described under the No Action Alternative. Potential impacts to the western yellow-billed cuckoo would be the same as those described under the No Action Alternative because no stream crossings by overhead transmission lines are associated with Alternative 4. Potential impacts to Colorado River fishes would be the same as those described under Alternative 1. Canada lynx, gray wolf, and grizzly bear may have an increased possibility for displacement from those described under the No Action Alternative. Alternative 4 would have increased noise, light, and staff associated with the power plant facility. Canada lynx, gray wolf, and grizzly bear may have an increased likelihood of being deterred from migrating through the area with the additional noise, light, and activity associated with the power plant.

4.7.3.5.1.1 Ute Ladies’-tresses

Alternative 4 would include 3 perennial and 32 ephemeral stream crossings associated with pipelines and fiber optic lines (see Table 4-19), but no stream crossings by transmission lines. The potential for loss of Ute ladies‘-tresses habitat would be lower under Alternative 4 than Alternatives 1, 2, and 3 because disturbance associated with the transmission line would not occur. Pre-construction surveys would identify the presence of this species and any found populations would be avoided. Therefore, Alternative 4 may affect, but likely would not adversely impact, Ute ladies‘-tresses or any designated habitat of listed species.

4.7.3.5.2 Total Project Impacts with Alternative 4

Potential impacts to black-footed ferrets would be the same as those described under the No Action Alternative. Potential impacts to the western yellow-billed cuckoo would be the same

as those described under the No Action Alternative because no overhead transmission lines are associated with Alternative 4. Potential impacts to Colorado River fishes would be the same as those described under Alternative 1. Canada lynx, gray wolf, and grizzly bear may have an increased possibility for displacement than those described under the No Action Alternative. Alternative 4 would have increased noise, light, and staff associated with the power plant facility. Canada lynx, gray wolf, and grizzly bear may have an increased likelihood of being deterred from migrating through the area with the additional noise, light, and activity associated with the power plant.

4.7.3.5.2.1 Ute Ladies'-tresses

Total Project impacts to Ute ladies'-tresses would be identical to those described under the Impacts of BLM Actions with Alternative 4 for Ute ladies'-tresses. No additional impacts would be associated with activities on non-federal lands.

4.7.3.6 Cumulative Impacts

Existing activities in this area include historical and ongoing oil and gas development, ranching and grazing, fuel reduction projects, and proposed or reasonably foreseeable future oil and natural gas development. No specific application for future expansion of oil and gas developments have been received by the BLM PFO, therefore it is assumed that existing development will likely double over the foreseeable future. Existing and reasonably foreseeable future expansions could contribute to increased habitat fragmentation and the reduction in range of some plants and animals in the future. The magnitude, scope, and duration of actual impacts would depend on the number and size of future energy projects and the rate of development. Regardless of other existing and foreseeable future activities in the RBPA, the Project would not impact federally listed and candidate species. Therefore, the Project would not incrementally contribute to cumulative impacts to these species.

4.7.3.7 Mitigation and Monitoring Opportunities

If any federally listed species are observed during pre-construction surveying or Project operations, status information would be forwarded to the USFWS and appropriate avoidance protocol implemented. Operations that would adversely affect the listed species must be discontinued until consultation with the USFWS indicates that impacts are not likely to adversely affect the species

4.7.3.7.1 Mitigation

4.7.3.7.1.1 BLM-Required Mitigation

A Draft Biological Assessment for this Project has been prepared for the USFWS and ESA Section 7 Consultation will take place prior to BLM decision. Final results of this consultation will determine the extent of federal mitigation required for the protection of federally listed species. These mitigation measures will be incorporated into the EA.

In addition to mitigation determined in consultation with USFWS, the following measures would be required by BLM:

- To protect avian species, including western yellow-billed cuckoo, the transmission line design for river crossings, plus three spans on either side, would include bird flight diverters installed on the high neutral line.
- Transmission lines would be constructed with avian-safe design standards and perch discouragers used to deter avian nesting and reduce the risk of electrocutions and collisions that could occur.
- Water quality would be protected through the adherence to permit requirements and BMPs as described in the Section 4.4.
- If populations of Ute ladies'-tresses are located, Project activities would not be authorized closer than 0.25 mile without concurrence of the USFWS and the BLM authorized officer.
- All disturbance occurring within the high bank plus 50 feet is required to be reclaimed to meet the PFC standards.
- Standard no surface occupancy stipulations would be applied within a 500-foot buffer of a riparian area, wetland, or stream channel, and 100-year floodplains unless otherwise determined through site-specific analysis, approved in writing by BLM AO.
- For the protection of aquatic resources and Ute ladies'-tresses and its potential habitat, surface-disturbing activities listed above should be avoided in the following areas: a) identified 100-year floodplains; b) areas within 500 feet from perennial waters, springs, water wells, and wetlands; and c) areas within 100 feet from the inner gorge of ephemeral channels.
- Channel crossings of ephemeral, intermittent, and perennial streams for pipelines would be located and designed in accordance to USACE Section 404 permits to protect channel stability and fish spawning habitat and to prevent increases in water velocity, which could lead to increased erosion and channel instability. Construction generally would be restricted until after spring runoff, when normal or low flows are established. The pipe would be buried at a depth sufficient to ensure the pipeline does not become exposed.

4.7.3.7.1.2 Other Mitigation Opportunities

The ESA is applicable on private, state, and federal lands, therefore all applicable required mitigation measures determined in Section 7 consultation between BLM and USFWS will also be applicable within non-federal jurisdictional areas.

A general suggested mitigation for private land crossings of pipelines is for approved disturbance within the 500-foot buffer of surface water, riparian areas, wetlands, and 100-year floodplains to avoid stripping riparian canopy or stream bank vegetation if possible. Stream-side woody vegetation would be crushed or sheered when possible. Any locations where vegetation is stripped would be immediately revegetated after the crossing is complete.

4.7.3.7.2 Monitoring

4.7.3.7.2.1 BLM-Required Monitoring

- If construction occurs during migratory bird breeding season, a survey for migratory birds (including western yellow-billed cuckoo and BLM sensitive bird species) shall be made just prior to construction. Activities would avoid impacts to nests and fledglings.
- If during pre-construction or construction surveys, or while conducting operations, substantial unanticipated environmental effects to any threatened, endangered, or candidate species are observed (whether effects are direct or indirect), formal consultation with USFWS would be initiated immediately in addition to cessation of all such operations.

4.7.3.7.2.2 Other Monitoring Opportunities

None recommended.

4.7.4 BLM Sensitive Species

Impacts to BLM sensitive species would occur in various forms, as described above (see Section 4.7.2). Potential impacts and impact criteria are summarized for each BLM sensitive species or by groups of sensitive species (based on habitat requirements), described in Section 3.8.2, which are known to occur or have potentially suitable habitat within the RBPA.

4.7.4.1 Impact Criteria for BLM Sensitive Species

4.7.4.1.1 Greater Sage-grouse

Complexes of suitable breeding and brood-rearing habitats are thought to limit populations of sage-grouse (WGFD 2009a). Sage-grouse breeding habitats are composed of leks, nesting, and early brood rearing habitats. Per the BLM Greater Sage-grouse Habitat Management Policy (BLM 2010) there are 28 occupied sage-grouse leks within an 11-mile radius of the Proposed Project (WGFD 2009a). The 28 occupied leks are contained within 14 lek complexes (Upper Green River Basin Sage-Grouse Working Group 2007). Ten of these leks are located within core areas north of the RBPA. The closest lek within core areas is located approximately 8.1 miles north of the Proposed Project.

As described in Section 3.8.2.6, the PFO RMP defines suitable nesting and brood-rearing habitats for sage-grouse as the area within 2 miles of occupied leks. According to WGFD annual monitoring data (WGFD 2009a) and lek perimeter data received from the BLM-PFO (BLM 2009d), eight occupied leks and/or their 2-mile buffer are present within the RBPA. The 2-mile buffer around seven of these leks intersects the RBPA, although the lek itself is located outside the RBPA boundary. Only one occupied lek is located entirely within the RBPA.

Some areas within 2 miles of leks are likely to lack vegetation characteristics necessary for nesting and brood rearing, and areas outside of the 2-mile buffer may be used by sage-grouse. However, ~~"s~~uitable habitat" based on vegetation and documented use has not been mapped for the RBPA, so sage-grouse breeding and brood-rearing habitat (sage-grouse habitat) was assumed to include areas within a 2-mile radius around each occupied lek. The total available

sage-grouse habitat, for the eight occupied leks that fall within the RBPA boundary, is 12,520.1 acres, with overlapping acres of habitat between leks only being counted once.

The BLM has developed guidelines and coordinated with the WGFD department to maintain and protect sage-grouse seasonal habitats, corridors, and habitat connectivity areas (BLM 2010). Outside core areas, the BLM's goal is to sustain lek persistence over the long term in order to maintain connectivity and movements. To avoid high levels of impact, the BLM has adopted WGFD management guidelines for oil and gas development which identify mitigation thresholds for long-term loss of sage-grouse habitat from surface disturbance in non-core areas (BLM 2010; WGFD 2009e). These guidelines recommend limiting well field developments to less than two well pad locations per square mile or 20 to 60 acres of disturbance per square mile within sage-grouse habitat (2 miles of an occupied lek), because habitat effectiveness declines significantly if well pad densities or disturbance per square mile exceed these thresholds and on-site mitigation may not be possible (WGFD 2009e; Holloran and Anderson 2005).

Several researchers and managers have hypothesized indirect adverse effects on sage-grouse from project infrastructure, such as transmission lines, citing various reasons (Braun 1998; Connelly et al. 2000; Atamian et al. 2006; Atamian et al. 2007; Beck et al. 2006; Slater and Smith 2008). Research conducted on sage-grouse, and related species, including greater (*Tympanuchus cupido*) and lesser (*T. pallidicinctus*) prairie-chickens, provide data indicating that available habitat near transmission facilities may not be fully utilized (Connelly et al. 2000; Pitman et al. 2005; Beck et al. 2006; Atamian et al. 2006; Atamian et al. 2007; Slater and Smith 2008; Pruett et al. 2009). The same research studies also provide evidence of animals in close proximity to transmission lines, both on the ground and flying. However, no research has been conducted to date that quantifies changes in adult survival, nest survival, or lek attendance before and after transmission line construction. Indirect effects on sage-grouse may fragment or degrade the quality of suitable habitat by providing perches that are higher than those supplied by local vegetation and topography, potentially attracting raptors and corvids (Knight and Kawashima 1993) and increasing their hunting success in sage-grouse habitat (Ellis 1984; Braun 1998). Studies documenting decreased lek attendance after oil and gas development (Holloran and Anderson 2005; Aldridge and Boyce 2007; Walker et al. 2007), which sometimes includes the construction of transmission lines, are often confounded by other factors such as noise, motor vehicle traffic, West Nile virus, and drought.

Braun (1998) indicated that, "Use of areas near powerlines by sage grouse, as measured by pellet transects, increases as distance from the powerline increases for up to 0.37 mile (600 m) (C.E. Braun, unpubl. data)". The concept that any degradation of sage-grouse habitat caused by transmission lines would decrease quickly with distance from the line is consistent with that proposed by other researchers (Atamian et al. 2006; Atamian et al. 2007; Walker et al. 2007). Bird density, as measured by pellet counts, may correspond to this gradient in habitat quality with fewest birds in close proximity to the line. Braun (1998) speculated that sage-grouse "security" was reduced for up to 0.37 mile (0.6 km) from the transmission line, potentially fragmenting sage-grouse habitat. Braun (1998) proposed that a 0.75-mile (1.0-km) buffer around transmission lines would reduce the effects on sage-grouse.

Researchers at the University of Nevada, Reno, are currently monitoring tagged sage-grouse from 12 leks within 12 miles of the 345-kV transmission line between Falcon and Gondor, Nevada, in order to quantify differences in lek attendance, survival, and nest success as a function of distance from the transmission line (Atamian et al. 2006; Atamian et al. 2007). So far, results indicate that percent cover of shrubs >80 centimeters tall, distance to nearest road, a linear trend in nest age, and clutch size had a greater influence on nest success than distance to the transmission line (Atamian et al. 2006). Survival of adult hens was most influenced by season and age (Atamian et al. 2007). The three leks within 2 miles of the transmission line (the closest being within 0.12 mile) have been active every year between 2003 and 2007, with trends in attendance consistent with those leks located farther from the line (Atamian et al. 2007). A decline in lek attendance occurred across all leks monitored in 2007, which may be attributable to West Nile virus, but also coincides with a 200% increase in counts of common ravens along the transmission line corridor and in lek disturbance events (Atamian et al. 2007).

BLM wildlife management guidelines recommend that no surface occupancy be allowed within 0.25 mile of occupied leks, implying that a significant adverse impact would be expected from actions exceeding this threshold (BLM 2008b). The Wyoming Greater Sage-Grouse Conservation Plan discourages the development of overhead power lines within occupied sage-grouse habitats and suggests that if location of overhead power lines within occupied habitat cannot be avoided, they should be buried, located along existing utility corridors, or modified to reduce predation in key areas (Upper Green River Basin Sage-Grouse Working Group 2007:39). In addition, WGFD Oil and Gas Recommendations for transmission lines state, "To the extent possible, new rights of way should be authorized parallel and adjacent to existing rights of way. Above ground towers should be designed to minimize raptor perching. Any new rights of way that are not sited parallel and adjacent to existing rights of way should be routed at least 750 m (0.5 miles) from the perimeter of occupied sage-grouse leks" (WGFD 2009e).

Based on the above review of pertinent literature, the significance criteria for greater sage-grouse include the following:

- loss of an occupied lek due to Project-related activities;
- a reduction in the local sage-grouse population, contributing to factors causing the species to become listed under the ESA;
- long-term loss of habitat from surface disturbance exceeding 60 acres per square mile within a 2-mile radius of the perimeter of an occupied lek; and
- new transmission line facilities located within 0.5 mile of the perimeter of an occupied lek.

4.7.4.1.2 Raptors

BLM sensitive raptor species considered for impact analysis include bald eagle, golden eagle, ferruginous hawk, northern goshawk, and American peregrine falcon. Raptor nests of other non-BLM sensitive species, such as red-tailed hawk and prairie falcon, are also included in this category.

Transmission line structures could result in mortality of raptors and other species due to collisions and electrocutions. Transmission structures also offer perches for raptors and may increase predation on sensitive species. A recent study in southwestern Wyoming suggests that perch deterrents can reduce raptor and common raven (*Corvus corax*) predation (Slater and Smith 2008). However, results of driving, behavioral observations, and prey-remains surveys also revealed that the deterrent devices did not completely exclude raptors and ravens because some birds are likely to overcome the deterrent devices to take advantage of these rare tall structures in sagebrush steppe. Whereas the addition of tall structures in a landscape that generally lacks trees is seen as a negative impact to prey species due to the potential for increased predation, sensitive raptors may benefit from addition of these structures because they provide perching structures from which to search out prey.

Significance criteria for raptors include:

- a reduction in the population that would contribute to the species becoming listed under the ESA that would be directly or indirectly attributable to Project activities; and
- direct mortality and destruction or abandonment of nests, or winter roosts during Project-related construction, operation, and maintenance activities.

4.7.4.1.3 Species of Greatest Conservation Need

BLM sensitive species that are grouped as ―species of greatest conservation need" for impact analysis because of their overlapping potential impacts include long-eared myotis, Idaho pocket gopher, white-tailed prairie dog, mountain plover, and burrowing owl. These species may be impacted as a result of crushing or removal of vegetation, as well as soil compaction. They may be impacted by increased predation rates if common ravens or raptors use the new structures for nesting or hunting perches in or near their habitat. Specific habitat for these species is either not mapped within the RBPA or has not been documented within the RBPA, such as for prairie dogs and burrowing owl.

Significance criteria for species of greatest conservation need include:

- a reduction in the population that would contribute to the species becoming listed under the ESA that would be directly or indirectly attributable to Project activities.

4.7.4.1.4 Sagebrush Obligates

BLM sensitive species that are grouped as ―sagebrush obligates" for impact analysis because of their overlapping potential impacts due to their reliance on sagebrush stands for habitat include pygmy rabbit, loggerhead shrike, sage thrasher, brewer‘s sparrow, and sage sparrow. The pygmy rabbit is typically found in dense stands of big sagebrush growing in deep, loose soils. However, potential specific habitat for pygmy rabbit and these other species has not been mapped within the RBPA. A vegetation community map (Figure 3-5) of the RBPA was created from the WYGISC landcover type dataset for the SW Wyoming, Pinedale and Green River Wyoming Game and Fish Department Regions (Rodemaker and Driese 2007). The WYGISC vegetation data covers both public and private land and represents the most current spatial vegetation layers available in Sublette County and was used to assess impacts to all of these species.

Significance criteria for sagebrush obligates include:

- a reduction in the population that would contribute to the species becoming listed under the ESA that would be directly or indirectly attributable to Project activities.

4.7.4.1.5 Aquatic Resources – Species and Habitat Function

BLM sensitive species that are grouped as ~~"a~~quatic resources" for impact analysis include trumpeter swan, white-faced ibis, long-billed curlew, boreal toad, northern leopard frog, Columbia spotted frog, fine-spotted Snake River cutthroat trout, and Colorado River cutthroat trout. These species all rely on stream, riparian, and wetland habitats, and could be impacted by changes in water quality and quantity, increased sedimentation of streams, and loss of riparian and wetland vegetation. Fish and amphibian species may also be impacted by the number and type of perennial stream crossings.

Significance criteria for aquatic resources include:

- a reduction in the population that would contribute to the species becoming listed under the ESA that would be directly or indirectly attributable to Project activities; and
- surface occupancy within 500 feet of surface water, riparian areas, and wetlands.

4.7.4.1.6 Plants

BLM sensitive species that are grouped as ~~"p~~lants" for impact analysis include meadow pussytoes, Trelease's racemose milkvetch, cedar rim thistle, large-fruited bladderpod, beaver rim plox, and tufted twinpod. None of these species has been documented within the RBPA; however, populations have been documented within the vicinity of the RBPA. Each species has habitat requirements which vary by surrounding vegetation and soil types (see Section 3.8.2 for details). Detailed soil and vegetation mapping has not been conducted in the RBPA. Impacts to special status plant species could occur as direct mortality and destruction of special status plant populations during construction and maintenance activities. Indirect effects on sensitive plant species would include potential loss of habitat and temporary disturbance due to construction activities.

Significance criteria for plants include:

- loss of any individual sensitive plant due to any activity directly or indirectly attributable to Project activities;
- a reduction in the population that would contribute to the species becoming listed under the ESA that would be directly or indirectly attributable to Project activities.

4.7.4.2 <u>No Action Alternative</u>

Under the No Action Alternative, no federal actions would be taken. Under this alternative, the non-federal actions (i.e., construction of the M&HRF, construction staging/equipment yard, the HLF, air products transmission line, and produced water disposal well on state and private lands) would still occur (as described in Section 2.2 and Table 2-1) (see Table 2-1 for short-term effects on non-federal lands). All activities related to the construction and

operation of the M&HRF would be identical among all alternatives, including No Action, and would be in accordance with the existing Wyoming Special Use Permit and MOA with WGFD, provided in Appendix B. There would be no recognition of BLM sensitive species within non-federal actions. All non-federal actions must adhere to provisions of the Migratory Bird Treaty Act (16 USC 703–712), Bald and Golden Eagle Protection Act (16 USC 668–668d), WGFD regulations, and other state and federal regulations on private and state land.

Potential impacts to these BLM sensitive species from non-federal actions would be speculative and outside of BLM jurisdiction and ability to modify or change. However, the non-federal Project components are not known to overlap with special status species habitats. Pre-construction surveys would be conducted to identify any suspected or unknown areas where special status species populations or habitats exist. Any sensitive species habitats would be avoided when possible. Any rare plant populations identified during pre-construction surveys would be avoided during construction of the Project by marking and placing fencing around the identified populations. With adherence to provisions outlined above there would be no adverse impacts to any wildlife, fisheries, or plant species from the No Action Alternative.

4.7.4.3 Alternative 1

4.7.4.3.1 Impacts of BLM Actions with Alternative 1

BLM seasonal wildlife stipulations (Table 4-20), WGFD MOA located in Appendix B, and BLM required BMPs would be applied to all BLM actions to conserve special status species and minimize impacts to habitats.

Table 4-20. BLM Seasonal Wildlife Stipulations.

Species	Stipulations
Greater sage-grouse	No surface-disturbing activity within 0.25 mile of an occupied lek from 8 p.m.–8 a.m., March 1–May 15
	No surface-disturbing activity within 2 miles of an occupied lek to protect nesting habitat March 15–July 15
	No surface-disturbing activity within identified winter habitat November 15–March 15
	No surface occupancy within 0.25 mile of an occupied lek
Mountain plover	No surface-disturbing activity within nesting area April 10–July 10, buffer determined on case-by-case basis
Burrowing owl	No surface-disturbing activity within a 0.5-mile radius of an active nest April 1–August 15
Bald eagle	No surface-disturbing activity within a 1-mile radius of an active nest February 1–August 15
	No surface-disturbing activity within a 1-mile radius of a winter roost November 1–April 1
Ferruginous hawk	No surface-disturbing activity within a 1-mile radius of an active nest March 1–July 31
Goshawk	No surface-disturbing activity within a 0.25-mile radius of an active nest February 1–July 31

Species	Stipulations
Other raptor nests	No surface-disturbing activity within a 0.25-mile radius of an active nest February 1–July 31
Colorado River cutthroat trout	No work can occur within stream channels with habitat June 1–August 15
Big game	No surface-disturbing activity within pronghorn, elk, moose, and mule deer crucial winter ranges from November 15–April 30
	No surface-disturbing activity within designated parturition areas from May 1–June 30

4.7.4.3.1.1 Greater Sage-grouse

BLM actions under Alternative 1 may result in effects to greater sage-grouse from disturbance of vegetation during construction, and long-term loss of habitat from facility location within suitable habitats. Temporary effects of construction activities such as noise and other human activity on greater sage-grouse nesting activities would be avoided by strict adherence to seasonal stipulations requiring no surface occupancy within 2 miles of occupied leks, and no permanent facilities within 0.25 mile of an occupied lek. Alternative 1 falls within the 2-mile radius of three occupied leks. There would be short-term disturbance of approximately 245 acres of potential habitat within 2 miles of occupied leks (see Table 4-22). The two-track road along the transmission line would permanently impact 6.1 acres within a 2-mile radius of occupied leks, affecting approximately 0.31 acre/square mile of their available habitat within the RBPA. Transmission structures and lines would be located within the 2-mile radius buffer of one occupied lek. No transmission line poles or other surface occupancy would occur within 0.25 mile of sage-grouse leks.

As described in Section 4.7.4.1.1, transmission lines can indirectly impact greater sage-grouse by reducing the quality of habitat within 0.37 to 0.75 mile of the lines. WGFD recommends not locating any new ROW or transmission lines within 0.5 mile of the perimeter of an occupied lek. The transmission line alignment under Alternative 1 would be located within the 0.5-mile buffer of one occupied sage-grouse lek. The transmission line would be located 0.28 mile from the closest sage-grouse lek perimeter and would cross 5.1 miles of sage-grouse habitat within the RBPA.

As a result of direct loss of habitat, moderate adverse impacts to the local population would be anticipated from the BLM actions of Alternative 1. As a result of the location of the transmission line within 0.5 mile of the perimeter of the occupied Calpet 8 sage-grouse lek, significant adverse impacts would be anticipated to that specific lek and Calpet/Deer Hill Lek complex. Surface-disturbing activities would be restricted during the breeding and nesting seasons (see Table 4-20). Adoption of mitigation measures, such as perch deterrents and habitat restoration, and BLM timing stipulations would be required. Implementation of BLM timing stipulations and surface use restrictions would minimize construction-related (short-term) impacts, but significant adverse impacts to the Calpet 8 lek from the 230 kV transmission line would remain.

4.7.4.3.1.2 Raptors

No raptor nests or roosts would be destroyed by Alternative 1. An active eagle nest is one that has been occupied once in the past five years (three years for all other raptors). One historic bald eagle nest was located within 0.5 mile of Alternative 1. Both the Chimney Butte Substation and the HLF fall within 0.5 mile of that site. The nest was recorded in 1983 and no additional records of this nest exist (WGFD 2008b). One active golden eagle (*Aquila chrysaetos*) nest (SWCA 2008) and 22 other raptor nests fall within 0.5 mile of Alternative 1 (Table 4-21). No known raptor nests are within 0.5 mile of the well pads, the AAM&WS, or the M&HRF. Pre-construction raptor surveys would be conducted to determine the species‘ presence and status of nests.

If nests were found to be present within 0.5 mile of the infrastructure, BLM timing stipulations would apply to all surface-disturbing activity within the boundaries of raptor nests as described in Table 4-21. Adoption of BLM timing stipulations and avian safe construction protocols would be recommended.

Table 4-21. Number of Nests or Winter Roosts within 0.5 Mile of Each Alternative.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
BLM Actions				
Bald eagle nest	1[a]	0	1[a]	1[a]
Bald eagle winter roost	0	0	0	0
Ferruginous hawk nest	0	0	0	0
Northern goshawk nest	0	0	0	0
American peregrine falcon nest	0	0	0	0
Red-tailed hawk nest	9	4	9	9
Prairie falcon nest	6	0	6	6
Golden eagle nest	1	0	1	1
Unknown raptor nest	6	4	8	6
Swainson's hawk	0	0	0	0
Non-federal Actions				
Bald eagle nest	0	1[a]	0	0
Bald eagle winter roost	0	2	0	0
Ferruginous hawk nest	0	0	0	0
Northern goshawk nest	0	0	0	0
American peregrine falcon nest	0	0	0	0
Red-tailed hawk nest	0	5*	0	0
Prairie falcon nest	0	3	0	0
Golden eagle nest	0	1	0	0
Unknown raptor nest	0	6**	0	0
Swainson's hawk	0	2	0	0

[a] Nest was recorded in 1983 and no additional records of this nest exist.
Note: Observation dates range from 1995–2006 (BLM 2009c; WGFD 2008b).

Raptors could benefit from the addition of tall structures that provide nest sites and perches from which to hunt. Raptors could also be negatively impacted by potential injury or mortality from the transmission lines. BLM timing stipulations would apply to all surface-disturbing activity within the boundaries of raptor nests as described in Table 4-21. The use of perch deterrents and bird flight diverters installed on the high neutral on transmission lines is recommended to mitigate potential injury or mortality to raptors. The BLM actions associated with Alternative 1 may affect, but likely would not have a significant adverse impact on, raptors. Adoption of BLM timing stipulations and avian safe construction protocols would minimize impacts to raptors.

4.7.4.3.1.3 Species of Greatest Conservation Need

BLM actions under Alternative 1 include crushing of vegetation and disturbance of sagebrush habitats. However, few sensitive habitats occur in the area of impact, and all vegetation would be reclaimed immediately after construction. The construction of 16.7 miles of transmission lines may cause an increase in predation rates on sensitive species that occur in the RBPA. This increased predation may affect the survival of individuals, but would not affect the overall population of these species in the RBPA. The level of impact from predation is difficult to assess without further information on population distribution and status in the RBPA. Predation on sensitive species may be decreased by the installation of perch deterrent devices.

No prairie dog towns occur within the alignment of Alternative 1 (SWCA 2008; BLM 2009c). Species such as burrowing owls and black-footed ferrets that use prairie dog towns are not known to occur within the RBPA. Habitat for mountain plover and long eared myotis has not been identified within the RBPA. Since the Species of Greatest Conservation Need are not known in areas affected by Alternative 1, the BLM actions associated with Alternative 1 are therefore not likely to have a adverse impact on these species. In the event that these species are found to colonize the RBPA the BLM would be consulted prior to construction.

4.7.4.3.1.4 Sagebrush Obligates

Impacts of BLM actions with Alternative 1 would result in 560.7 acres of short-term disturbance and 23.2 acres of long-term disturbance to sagebrush (see Table 4-22). Long-term disturbance is associated with the two-track access road that would be used for maintenance of the transmission lines. Long-term disturbance represents a 0.41 acre/square mile loss of sagebrush habitat within the RBPA. Surface occupancy, consisting of transmission line infrastructure, would occur within the sagebrush habitat. As discussed previously, transmission lines can increase predation by raptors, resulting in increased predation rates on sensitive species that occur in the RBPA. This increased predation may affect the survival of individuals, but would not affect the overall population of these species in the RBPA. Predation on sensitive species may be decreased by the installation of perch deterrent devices. Since most of the impacts to sagebrush would be temporary, although slow to return to mature status, and there is an abundance of this habitat type in the RBPA, the impacts of BLM actions with Alternative 1 would not be significant.

Table 4-22. Short-term and Long-term Impacts to Greater Sage-grouse.

Project Components	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
BLM Actions								
AAM&WS	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0
4 gas production wells and Acid gas injection well pad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Helium pipeline & fiber optic line	58.4	0.0	No BLM Action.		25.8	0.0	58.4	0.0
Cimarex gas pipeline	65.6	0.0	6.1	0.0	31.9	0.0	65.6	0.0
Electrical transmission line	94.3	6.1	No BLM Action.		84.0	0.0	No BLM Action.	
Williams gas pipeline	26.3	0.0	26.3	0.0	26.3	0.0	26.3	0.0
Flowlines and underground electrical and fiber optic lines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acres Impacted by BLM Actions	**244.6**	**6.1**	**32.4**	**0.0**	**170.7**	**0.0**	**150.3**	**0.0**
# Leks with Direct Impacts	**3**		**2**		**3**		**3**	
Non-federal Actions								
Produced water line and injection well	0.0	0.0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Natural gas-fired power plant	Not applicable		Not applicable		Not applicable		0.0	0.0
M&HRF	0.0	0.0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
HLF	0.0	0.0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Helium pipeline & fiber optic line	BLM Actions		0.0	0.0	BLM Actions		BLM Actions	
Cimarex gas pipeline			0.0	0.0				
Electrical transmission line			0.0	0.0			0.0	0.0
Acres Impacted by Non-federal Actions	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
# Leks with Direct Impacts	**0**		**0**		**0**		**0**	
Total Acres of Impacted by All Actions	**244.6**	**6.1**	**32.4**	**0.0**	**170.7**	**0.0**	**150.3**	**0.0**
Total Long-term loss of available habitat (as acres/sq mi of available)[1]	Not applicable	**0.31**	Not applicable	**0.00**	Not applicable	**0.00**	Not applicable	**0.00**
Transmission line length within available habitat[1] (miles)	**5.06**		**0**		**4.62**		**0**	
Transmission line distance to nearest lek (miles)	**0.28**		**2.35**		**0.71**		**4.30**	

[1]Available habitat assumed to be the areas within 2 miles of the perimeter of occupied leks. Within the RBPA there are 12,520.1 acres or 19.56 square miles of available sage-grouse habitat.

Table 4-23. Short-term and Long-term Impacts to Sagebrush Obligate Species.

Project Component	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
BLM Actions								
AAM&WS	2.8	2.8	2.8	2.8	5.4	5.4	2.8	2.8
3 gas production wells and acid gas injection well pad	4.7	2.2	4.7	2.2	4.7	2.2	4.7	2.2
1 gas production well pad (10-14 location)	1.8	0.8	1.8	0.8	1.8	0.8	1.8	0.8
Helium pipeline & fiber optic line	150.2	0.0	No BLM Actions		62.2	0.0	150.2	0.0
Cimarex gas pipeline	61.0	0.0	8.2	0.0	28.5	0.0	61.0	0.0
Electrical transmission line	283.7	17.4	No BLM Actions		239.3	9.4	No BLM Actions	
Williams gas pipeline	47.1	0.0	47.1	0.0	47.1	0.0	47.1	0.0
Flowlines and underground electrical and fiber optic lines	9.4	0.0	9.4	0.0	9.4	0.0	9.4	0.0
Total Acres by BLM Actions	**560.7**	**23.2**	**74.0**	**5.8**	**398.5**	**17.8**	**277.0**	**5.8**
Non-federal Actions								
Produced water line and injection well	4.1	1.3	Same as Alternative 1.		Same as Alternative 1.		Same as Alternative 1.	
Natural gas-fired power plant	Not applicable		Not applicable		Not applicable		2.0	2.0
M&HRF	23.3	8.9	Same as Alternative 1.		Same as Alternative 1.		Same as Alternative 1.	
HLF	1.1	1.1	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Helium pipeline & fiber optic line	BLM Actions		45.4	0.0	BLM Actions		BLM Actions	
Cimarex gas pipeline			34.3	0.0				
Electrical transmission line			95.2	0.0			22.7	0.0
Total Acres by Non-federal Actions	**28.5**	**11.3**	**203.4**	**11.3**	**28.5**	**11.3**	**53.2**	**13.3**
Total Acres Affected by All Actions	**589.2**	**34.5**	**277.4**	**17.1**	**427.0**	**29.1**	**330.2**	**19.1**
Total Long-term loss of available habitat (as acres/sq mi of available)[1]	Not applicable	**0.60**	Not applicable	**0.30**	Not applicable	**0.51**	Not applicable	**0.33**
Total Long-term loss of available habitat (as % of available)[1]	Not applicable	**0.09%**	Not applicable	**0.05%**	Not applicable	**0. 08%**	Not applicable	**0.05%**

[1]Available habitat is defined as all Wyoming big sagebrush, mountain big sagebrush, mountain silver sagebrush, alkali/early sagebrush within the RBPA. There are 36,592.6 acres or 57.2 square miles of available sagebrush habitat within the RBPA.

9148 **4.7.4.3.1.5 Aquatic Resources – Species and Habitat Function**

9149 No surface occupancy would occur within 500 feet of any perennial streams or wetlands.
9150 Short-term disturbance within 500 feet of riparian and wetland areas during construction
9151 activities may temporarily and indirectly impact these sensitive species through crushing and
9152 disturbance of vegetation and the potential for short-term changes to water quality, including
9153 siltation of streams. Adherence to reclamation standards, BMPs, erosion prevention plans, and
9154 SWPPPs, as described in Section 4.4.6, and mitigation opportunities described in Section
9155 4.2.8.1 would minimize impacts to these species during construction activities. The use of the
9156 minimum practical width for ROWs associated with pipeline crossing would also reduce the
9157 short-term and long-term disturbance in riparian areas.

9158 Transmission line crossings would span some ephemeral and perennial streams, riparian, and
9159 wetland areas. Sensitive birds may be directly impacted by increased fatalities due to
9160 electrocutions and collisions with these transmission lines. With the use of avian-safe designs
9161 for transmission lines, expected impacts to sensitive bird species would be minimized.

9162 Impacts of BLM actions with Alternative 1 include 3 perennial and 33 ephemeral stream
9163 crossings associated with helium and gas pipelines and fiber optic lines, as described for the
9164 Ute ladies'-tresses in Section 4.7.3.2.1.3 (see Table 4-19). Adherence to USACE Section 404
9165 permit guidelines, along with mitigation opportunities described in Section 4.4.8.1, and BMPs
9166 for pipeline and utility line crossing for streams and wetlands would also minimize potential
9167 impacts to these species by ensuring the protection of channel stability and fish spawning
9168 habitat. In addition, the perennial streams which contain habitat for Colorado River cutthroat
9169 trout, including Spring and Beaver creeks, would be subject to the timing limitations as
9170 outline in Table 4-20.

9171 Sensitive fish and amphibian species have the potential to be impacted by water depletions
9172 and hydrostatic testing within with RBPA. Water needs for the drilling and completion
9173 activities, as described for the Colorado River fishes in Section 4.7.3.3.1.2, would not
9174 represent a significant adverse impact to these sensitive species due to the minimal amount of
9175 water needed and off channel withdrawal locations. Hydrostatic testing of pipelines would not
9176 represent a significant adverse impact to sensitive species with the adherence to guidelines
9177 and BMPs as described in Section 4.4.8.1.

9178 The potential for impacts to streams and riparian areas due to geohazard risk of multiple
9179 slumps and debris-laden earth flows would be the same as those described under the No
9180 Action Alternative.

9181 **4.7.4.3.1.6 Plants**

9182 No populations of sensitive plants are known to occur within the alignment of Alternative 1.
9183 Pre-construction surveys would be conducted to identify any suspected or unknown areas
9184 where special status plant populations exist. Any rare plant populations identified during pre-
9185 construction surveys would be avoided during construction of the Project by marking and
9186 placing fencing around the identified populations. All results from pre-construction surveys
9187 would be provided to BLM specialists immediately following completion of surveys. As a
9188 result, Alternative 1 would have no direct effect on any BLM sensitive species, and it likely
9189 would not cause a trend to federal listing or a loss of viability of any sensitive plant species.

9190 *4.7.4.3.2 Total Project Impacts with Alternative 1*

9191 **4.7.4.3.2.1 Greater Sage-grouse**

9192 Total Project impacts to greater sage-grouse would be identical to those described under the
9193 Impacts of BLM Actions with Alternative 1 for greater sage-grouse. No additional impacts
9194 would be associated with activities on non-federal lands. Alternative 1 would have more
9195 direct short-term and long-term disturbance within sage-grouse habitat compared to the No
9196 Action Alternative and Alternatives 2, 3, and 4. Alternative 1 is the only alternative where the
9197 transmission line would fall within 0.5 mile of the perimeter of an occupied lek. The
9198 transmission line length within sage-grouse habitat is also greater under Alternative 1
9199 compared to the No Action Alternative and Alternatives 2, 3, and 4. Adoption of mitigation
9200 measures, such as perch deterrents and habitat restoration, and BLM timing stipulations
9201 would be required. Implementation of BLM timing stipulations and surface use restrictions
9202 would minimize construction-related (short-term) impacts. However, significant adverse
9203 impacts to the Calpet 8 lek from the 230 kV transmission line would still occur under
9204 Alternative 1.

9205 **4.7.4.3.2.2 Raptors**

9206 Total Project impacts to raptors would be identical to those described under the Impacts of
9207 BLM Actions with Alternative 1 for raptors. No additional impacts would be associated with
9208 activities on non-federal lands.

9209 **4.7.4.3.2.3 Species of Greatest Conservation Need**

9210 Total Project impacts to species of greatest conservation need would be identical to those
9211 described under the Impacts of BLM Actions with Alternative 1 for species of greatest
9212 conservation need. No additional impacts would be associated with activities on non-federal
9213 lands.

9214 **4.7.4.3.2.4 Sagebrush Obligates**

9215 Alternative 1 would result 589.2 acres of short-term disturbance and 34.5 acres of long-term
9216 disturbance to sagebrush (see Table 4-22). Long-term disturbance is associated with the two-
9217 track access road that would be used for maintenance of the transmission lines, the produced
9218 water line and injection well, the M&HRF and the HLF. Long-term disturbance represents a
9219 0.60 acre/square mile loss of sagebrush habitat within the RBPA. Surface occupancy,
9220 consisting of transmission line infrastructure, the produced water line and injection well, the
9221 M&HRF and the HLF, would occur within the sagebrush habitat. As discussed previously,
9222 transmission lines can increase predation by raptors, resulting in increased predation rates on
9223 sensitive species that occur in the RBPA. This increased predation may affect the survival of
9224 individuals, but would not affect the overall population of these species in the RBPA.
9225 Predation on sensitive species may be decreased by the installation of perch deterrent devices.
9226 Since most of the impacts to sagebrush would be temporary, although slow to return to mature
9227 status, and there is an abundance of this habitat type in the RBPA, the impacts from
9228 Alternative 1 would not be significant.

9229 **4.7.4.3.2.5 Aquatic Resources – Species and Habitat Function**

9230 No surface occupancy would occur within 500 feet of any perennial streams or wetlands.
9231 Short-term disturbance within 500 feet of riparian and wetland areas during construction

activities may temporarily and indirectly impact these sensitive species through crushing and disturbance of vegetation and the potential for short-term changes to water quality, including siltation of streams. Adherence to reclamations standards, BMPs, erosion prevention plans, and SWPPPs, as described in Section 4.4.6, and mitigation opportunities described in Section 4.4.8.1 would minimize impacts to these species during construction activities. The use of the minimum practical width for ROWs associated with pipeline crossings would also reduce the short-term and long-term disturbance in riparian areas.

Transmission line crossings would span some ephemeral and perennial streams, riparian, and wetland areas. Sensitive birds may be directly impacted by increased fatalities due to electrocutions and collisions with these transmission lines. With the use of avian-safe designs for transmission lines, expected impacts to sensitive bird species would be minimized.

Total Project impacts to aquatic resources from stream crossings associated with helium and gas pipelines and fiber optic lines would be identical to those described under the Impacts of BLM Actions with Alternative 1 for aquatic resources. No additional impacts would be associated with activities on non-federal lands.

Sensitive fish and amphibian species have the potential to be impacted by water depletions and hydrostatic testing within with RBPA. Water needs for the drilling and completion activities, as described for the Colorado River fishes in Section 4.7.3.3.1.2, would not represent a significant adverse impact to these sensitive species due to the minimal amount of water needed and off channel withdrawal locations. Hydrostatic testing of pipelines would not represent a significant adverse impact to sensitive species with the adherence to guidelines and BMPs as described in Sections 4.4.8.

The potential for impacts to streams and riparian areas due to geohazard risk of multiple slumps and debris-laden earth flows would be the same as those described under the No Action Alternative.

4.7.4.3.2.6 Plants

Total Project impacts to sensitive plant species would be identical to those described under the Impacts of BLM Actions with Alternative 1 for sensitive plant species. No additional impacts would be associated with activities on non-federal lands.

4.7.4.4 Alternative 2

4.7.4.4.1 Impacts of BLM Actions with Alternative 2

4.7.4.4.1.1 Greater Sage-grouse

Alternative 2 falls within the 2-mile radius of two occupied leks. There would be short-term disturbance of approximately 32.4 acres of potential habitat within 2 miles of occupied leks (see Table 4-23) associated with the BLM actions of Alternative 2. Alternative 2 would have short-term impacts to one lek along the Williams pipeline and one lek near the Williams Natural Gas Hare‘s Ear Compressor Station. Temporary effects of construction activities such as noise and other human activity on greater sage-grouse nesting activities would be avoided by strict adherence to seasonal stipulations requiring no surface occupancy within 2 miles of occupied leks, and no permanent facilities within 0.25 mile of an occupied lek. There would

be no long-term impacts to potential habitat or leks. There would be no impacts associated with the transmission line under Alternative 2. The transmission line is 2.35 miles from the closest occupied lek perimeter. Surface-disturbing activities would be restricted during breeding and nesting season (see Table 4-20). BLM timing stipulations and surface use restrictions would be enforced for sage-grouse; therefore, impacts would be minimized.

Adoption of mitigation measures and BLM timing stipulations would be recommended to minimize indirect impacts. Alternative 2 would have less short-term and long-term disturbance within sage-grouse habitat compared to Alternatives 1, 3, and 4.

4.7.4.4.1.2 Raptors

No raptor nests or roosts would be destroyed by Alternative 2. Eight raptor nests fall within 0.5 mile of BLM actions of Alternative 2 (Table 4-21). Pre-construction raptor surveys would be conducted to determine the species presence and status of nests.

Raptors could benefit from the addition of tall structures that provide nest sites and perches from which to hunt. Raptors could also be negatively impacted by potential injury or mortality from the transmission lines. Transmission line crossings of stream channels associated with Alternative 2 are described above in Section 4.7.3.4.2.1 under the western yellow-billed cuckoo. BLM timing stipulations would apply to all surface-disturbing activity within the boundaries of raptor nests as described in Table 4-21. The use of perch deterrents and bird flight diverters installed on the high neutral on transmission lines would be recommended to mitigate potential injury or mortality to raptors. Adoption of BLM timing stipulations and avian safe construction protocols would minimize impacts to raptors.

4.7.4.4.1.3 Species of Greatest Conservation Need

Potential impacts to prairie dog towns, burrowing owls, and mountain plover would be the same as those described under Alternative 1 (Section 4.7.2.3.1.3), due to the lack of known habitat for these species in the RBPA. Impacts to long-eared myotis would be the same as those described under the No Action Alternative. In the event that these species are found to colonize the RBPA prior to construction, the BLM would be consulted. The potential for increased predation on sensitive species, as described under Alternative 1, may be slightly increased compared to Alternatives 1 and 3 because of the increased length of transmission line (21.2 miles). The level of impact from predation is difficult to assess without further information on population distribution and status in the RBPA. Predation on sensitive species may be decreased by the installation of perch deterrent devices.

4.7.4.4.1.4 Sagebrush Obligates

The BLM actions of Alternative 2 would result in 74.0 acres of short-term disturbance and 5.8 acres of long-term disturbance to sagebrush (see Table 4-22). Long-term disturbance is associated with the two-track access road that would be used for maintenance of the transmission lines. Long-term disturbance represents a 1.29 acres/square mile loss of sagebrush habitat within the RBPA. Since most of the impacts to sagebrush would be temporary, although slow to return to mature status, and there is an abundance of this habitat type in the RBPA, the impacts from Alternative 2 would not be significant. Alternative 2 would have the lowest disturbance in sagebrush habitat when compared to Alternatives 1, 3, and 4.

4.7.4.4.1.5 Aquatic Resources – Species and Habitat Function

The potential for impacts to streams and riparian areas due to geohazard risk of multiple slumps and debris-laden earth flows would be the same as those described under the No Action Alternative. The potential impacts to sensitive fish and amphibian species by water depletions and hydrostatic testing would be the same as those described under Alternative 1.

When possible, Project components would be designed so that no surface occupancy occurs within 500 feet of any perennial streams or wetlands. Short-term disturbance within 500 feet of riparian and wetland areas during construction activities may temporarily and indirectly impact these sensitive species through crushing and disturbance of vegetation and the potential for short-term changes to water quality, including siltation of streams. Adherence to reclamations standards, BMPs, erosion prevention plans, and SWPPPs, as described in Section 4.4.6, and mitigation opportunities described in Section 4.4.8 would minimize impacts to these species during construction activities. The use of the minimum practical width for ROWs associated with pipeline crossing would also reduce the short-term and long-term disturbance in riparian areas.

The BLM actions of Alternative 2 include 1 perennial and 18 ephemeral stream crossings associated the Williams gas pipeline (Table 4-19), as described in Section 4.6.1.5.3. Adherence to USACE Section 404 permit guidelines, mitigation opportunities described in Section 4.4.8, and BMPs for pipeline and utility line crossing for streams and wetlands would also minimize potential impacts to these species by ensuring the protection of channel stability and fish spawning habitat.

4.7.4.4.1.6 Plants

No known populations of sensitive plants occur within the alignment of Alternative 2. Pre-construction surveys would be conducted to identify any suspected or unknown areas where special status plant populations exist. Any rare plant populations identified during pre-construction surveys would be avoided during construction of the Project by marking and placing fencing around the identified populations. All results from pre-construction surveys would be provided to BLM specialists immediately following completion of surveys. As a result, Alternative 2 would have no direct effect on any BLM sensitive species, and it likely would not cause a trend to federal listing or a loss of viability of any sensitive plant species.

4.7.4.4.2 Total Project Impacts with Alternative 2

4.7.4.4.2.1 Greater Sage-grouse

Total Project impacts to greater sage-grouse are identical to those described under the Impacts of BLM Actions with Alternative 2 for greater sage-grouse. No additional impacts would be associated with activities on non-federal lands. Alternative 2 would have less short-term and long-term direct and indirect disturbance within sage-grouse habitat compared to Alternatives 1 and 3. Alternative 2 would have nearly equal short-term and long-term direct and indirect disturbance within sage-grouse habitat compared to Alternative 4. Alternative 2 would have less direct short-term and long-term disturbance within sage-grouse habitat compared to the No Action Alternative and Alternative 4. There would be no impacts associated with the transmission line under Alternative 2.

4.7.4.4.2.2 Raptors

No raptor nests or roosts would be destroyed by Alternative 2. The golden and bald eagle nest described under Alternative 1 (Section 4.7.1.4.2.1) would have the same potential impacts under Alternative 2. In addition to the active golden eagle nest, 24 other raptor nests fall within 0.5 mile of Alternative 2 (Table 4-21). Two eagle roosts also fall within 0.1 and 0.5 mile of Alternative 2. The roosts were identified in 2005 and 2006 and current status is unknown. No known raptor nests are within 0.5 mile of the well pads, the AAM&WS, or the M&HRF. Pre-construction raptor surveys would be conducted to determine the species‘ presence and status of nests.

Raptors could benefit from the addition of tall structures that provide nest sites and perches from which to hunt. Raptors could also be negatively impacted by potential injury or mortality from the transmission lines. Transmission line crossings of stream channels associated with Alternative 2 are described above in Section 4.7.1.4.2.1 under the western yellow-billed cuckoo. BLM timing stipulations would apply to all surface-disturbing activity within the boundaries of raptor nests as described in Table 4-21. The use of perch deterrents and bird flight diverters installed on the high neutral on transmission lines is recommended to mitigate potential injury or mortality to raptors. Adoption of BLM timing stipulations and avian safe construction protocols would minimize impacts to raptors.

4.7.4.4.2.3 Species of Greatest Conservation Need

Total Project impacts to species of greatest conservation need would be identical to those described under the Impacts of BLM Actions with Alternative 2 for species of greatest conservation need. No additional impacts would be associated with activities on non-federal lands.

4.7.4.4.2.4 Sagebrush Obligates

Alternative 2 would result in 277.4 acres of short-term disturbance and 17.1 acres of long-term disturbance to sagebrush (see Table 4-22). Long-term disturbance is associated with the two-track access road that would be used for maintenance of the transmission lines, the produced water line and injection well, the M&HRF and the HLF. Long-term disturbance represents a 0.30 acre/square mile loss of sagebrush habitat within the RBPA. Since most of the impacts to sagebrush would be temporary, although slow to return to mature status, and there is an abundance of this habitat type in the RBPA, the impacts from Alternative 2 would not be significant. Alternative 2 would have the lowest disturbance in sagebrush habitat when compared to Alternatives 1, 3, and 4.

Surface occupancy, consisting of transmission line infrastructure, produced water line and injection well, the M&HRF and the HLF, could occur within the sagebrush habitat. As discussed previously, transmission lines can increase predation by raptors, resulting in increased predation rates on sensitive species that occur in the RBPA. This increased predation may affect the survival of individuals, but would not affect the overall population of these species in the RBPA. Predation on sensitive species may be decreased by the installation of perch deterrent devices.

4.7.4.4.2.5 Aquatic Resources – Species and Habitat Function

The potential for impacts to streams and riparian areas due to geohazard risk of multiple slumps and debris-laden earth flows would be the same as those described under the No Action Alternative. The potential impacts to sensitive fish and amphibian species by water depletions and hydrostatic testing would be the same as those described under Alternative 1.

When possible, Project components, including transmission poles, would be designed so that no surface occupancy occurs within 500 feet of any perennial streams or wetlands. Short-term disturbance within 500 feet of riparian and wetland areas during construction activities may temporarily and indirectly impact these sensitive species through crushing and disturbance of vegetation and the potential for short-term changes to water quality, including siltation of streams. Adherence to reclamation standards, BMPs, erosion prevention plans, and SWPPPs, as described in Section 4.4.6, and mitigation opportunities described in Section 4.8.4.8 would minimize impacts to these species during construction activities. The use of the minimum practical width for ROWs associated with pipeline crossing would also reduce the short-term and long-term disturbance in riparian areas.

Transmission lines would span some ephemeral and perennial streams, riparian, and wetland areas. Sensitive birds may be directly impacted by increased fatalities due to electrocutions and collisions with these transmission lines. With the use of avian-safe designs for transmission lines, expected impacts to sensitive bird species would be minimized.

Alternative 2 would include 7 perennial and 47 ephemeral stream crossings associated with helium and gas pipelines and fiber optic lines, as described in Section 4.6.1.4.2.2 (Table 4-19). Adherence to USACE Section 404 permit guidelines, mitigation opportunities described in Section 4.8.4.8, and BMPs for pipeline and utility line crossing for streams and wetlands would minimize potential impacts to these species by ensuring the protection of channel stability and fish spawning habitat. In addition, the perennial streams that contain habitat for Colorado River cutthroat trout, including South and Middle Piney creeks, would be subject to the timing limitations as outline in Table 4-20.

4.7.4.4.2.6 Plants

Total Project impacts to sensitive plant species would be identical to those described under the Impacts of BLM Actions with Alternative 2 for sensitive plant species. No additional impacts would be associated with activities on non-federal lands.

4.7.4.5 Alternative 3

4.7.4.5.1 Impacts of BLM Actions with Alternative 3

4.7.4.5.1.1 Greater Sage-grouse

Alternative 3 falls within the 2-mile radius of three occupied leks. There would be short-term disturbance of approximately 170.7 acres of potential habitat within 2 miles of occupied leks (see Table 4-23). There would be no long-term disturbance associated with the transmission line because the transmission line will follow an existing road through areas where it overlaps with sage-grouse habitat. The transmission line would be located 0.71 mile from the closest lek perimeter. Transmission line poles would be located within the 2-mile radius buffer of two occupied leks, crossing 4.62 miles of sage-grouse habitat. Temporary effects of construction

activities such as noise and other human activity on greater sage-grouse nesting activities would be avoided by strict adherence to seasonal stipulations requiring no surface occupancy within 2 miles of occupied leks. No transmission line poles or other surface occupancy would occur within 0.25 or 0.50 mile of sage-grouse leks.

Since there are no long-term impacts and no transmission lines located within 0.5 mile of a sage-grouse like, no significant impacts would be anticipated from the BLM actions of Alternative 3. Surface-disturbing activities would be restricted during the breeding and nesting seasons (see Table 4-20). BLM timing stipulations and surface use restrictions would be enforced for sage-grouse; therefore, impacts would be minimized. Adoption of mitigation measures and BLM timing stipulations would be recommended.

4.7.4.5.1.2 Raptors

No raptor nests or roosts would be destroyed by Alternative 3. An active eagle nest is one that has been occupied once in the past five years (three years for all other raptors). One historic bald eagle nest was located within 0.5 mile of Alternative 3. Both the Chimney Butte Substation and the HLF fall within 0.5 mile of that site. The nest was recorded in 1983 and no additional records of this nest exist (WGFD 2008). One active golden eagle nest (SWCA 2008) and 24 other raptor nests fall within 0.5 mile of Alternative 3 (Table 4-21). No known raptor nests are within 0.5 mile of the well pads, the AAM&WS, or the M&HRF. Pre-construction raptor surveys would be conducted to determine the species‘ presence and status of nests.

Raptors could benefit from the addition of tall structures that provide nest sites and perches from which to hunt. Raptors could also be negatively impacted by potential injury or mortality from the transmission lines. BLM timing stipulations would apply to all surface-disturbing activity within the boundaries of raptor nests as described in Table 4-21. The use of perch deterrents and bird flight diverters installed on the high neutral on transmission lines is recommended to mitigate potential injury or mortality to raptors. The BLM actions associated with Alternative 3 may affect, but likely would not have a significant adverse impact on, raptors. Adoption of BLM timing stipulations and avian safe construction protocols would minimize impacts to raptors.

4.7.4.5.1.3 Species of Greatest Conservation Need

Impacts to long-eared myotis would be the same as those described under the No Action Alternative. No prairie dog towns occur within the alignment of Alternative 3 (SWCA 2008; BLM 2009c). Species such as burrowing owls and black-footed ferrets that use prairie dog towns are not known to occur within the RBPA. Habitat for mountain plover also has not been identified within the RBPA. The construction of 16.5 miles of transmission lines may cause an increase in predation rates on sensitive species that occur in the RBPA. This increased predation may affect the survival of individuals, but would not affect the overall population of these species in the RBPA. The level of impact from predation is difficult to assess without further information on population distribution and status in the RBPA. Since the species of greatest conservation need are not known in areas affected by Alternative 3, the BLM actions are therefore not likely to have a adverse impact on these species. In the event that these species are found to colonize the RBPA the BLM would be consulted prior to construction.

4.7.4.5.1.4 Sagebrush Obligates

Impacts of BLM actions with Alternative 3 would result in 398.5 acres of short-term disturbance and 17.8 acres of long-term disturbance to sagebrush (see Table 4-22). Long-term disturbance is associated with the two-track access road that would be used for maintenance of the transmission lines. Long-term disturbance represents a 0.31 acre/square mile loss of sagebrush habitat within the RBPA. Surface occupancy, consisting of transmission line infrastructure, would occur within the sagebrush habitat. As discussed previously, transmission lines can increase predation by raptors, resulting in increased predation rates on sensitive species that occur in the RBPA. This increased predation may affect the survival of individuals, but would not affect the overall population of these species in the RBPA. Predation on sensitive species may be decreased by the installation of perch deterrent devices. Since most of the impacts to sagebrush would be temporary, although slow to return to mature status, and there is an abundance of this habitat type in the RBPA, the impacts of BLM actions with Alternative 3 would not be significant.

4.7.4.5.1.5 Aquatic Resources – Species and Habitat Function

The potential impacts to aquatic resources by surface occupancy, and water depletions would be the same as those described under Alternative 1. The potential for impacts to streams and riparian areas due to geohazard risk of multiple slumps and debris-laden earth flows would be the same as those described under the No Action Alternative.

BLM actions of Alternative 3 include 1 perennial and 13 ephemeral stream crossings associated with overhead transmission lines. BLM actions of Alternative 3 also include 3 perennial and 33 ephemeral stream crossings associated with pipelines and fiber optic lines (see Table 4-19). Alternative 3 would have 8.0 miles of shared pipeline trench and ROW (100 feet) for the natural gas and helium pipelines. Perennial stream crossings of Spring and Beaver creeks would also be bored instead of trenched. Alternatives 3 and 1 would have equal numbers of ephemeral stream crossings associated with pipelines and fiber optic lines (see Table 4-19). Potential impacts to aquatic resources and riparian vegetation at these crossings would be lower compared to Alternatives 1, 2, and 4 because both Spring and Beaver creeks would be bored instead of trenched.

4.7.4.5.2 Total Project Impacts with Alternative 3

The potential impacts to plants would be the same as those described under Alternative 1 (Section 4.7.4.3.2.6).

4.7.4.5.2.1 Greater Sage-grouse

Total Project impacts to greater sage-grouse would be identical to those described under the Impacts of BLM Actions with Alternative 3 for greater sage-grouse. No additional impacts would be associated with activities on non-federal lands. Alternative 3 would have less short- and long-term direct disturbance and indirect disturbance from the transmission line alignment within sage-grouse habitat compared to Alternative 1. Alternative 3 would have more direct and indirect short-term and long-term disturbance within sage-grouse habitat compared to the No Action Alternative and Alternatives 2 and 4.

9518 **4.7.4.5.2.2 Raptors**

9519 No raptor nests or roosts would be destroyed by Alternative 3. The golden and bald eagle nest
9520 described under Alternative 1 (Section 4.7.1.4.2.1) would have the same potential impacts
9521 under Alternative 3. In addition to one active golden eagle nest, 18 other raptor nests fall
9522 within 0.5 mile of Alternative 2 (Table 4-21). Two eagle roosts also fall within 0.1 and 0.5
9523 mile of Alternative 2. The roosts were identified in 2005 and 2006 and current status is
9524 unknown. No known raptor nests are within 0.5 mile of the well pads and the AAM&WS.
9525 Pre-construction raptor surveys would be conducted to determine the species‘ presence and
9526 status of nests.

9527 **4.7.4.5.2.3 Species of Greatest Conservation Need**

9528 Total Project impacts to species of greatest conservation need would be identical to those
9529 described under the Impacts of BLM Actions with Alternative 1 for species of greatest
9530 conservation need. No additional impacts would be associated with non-federal connected
9531 actions.

9532 **4.7.4.5.2.4 Sagebrush Obligates**

9533 Alternative 3 would result in a total of 427.0 acres of short-term disturbance and 29.1 acres of
9534 long-term disturbance to sagebrush (see Table 4-22). Long-term disturbance is associated
9535 with the two-track access road that would be used for maintenance of the transmission lines,
9536 the produced water line and injection well, the M&HRF and the HLF. Long-term disturbance
9537 represents a 0.51 acre/square mile loss of sagebrush habitat within the RBPA. Since most of
9538 the impacts to sagebrush would be temporary, although slow to return to mature status, and
9539 there is an abundance of this habitat type in the RBPA, the impacts from Alternative 3 would
9540 not be significant. Alternative 3 would have lower short-term and long-term disturbance in
9541 sagebrush habitat when compared to Alternative 1. Alternative 3 would have higher short-
9542 term and long-term surface disturbance in sagebrush habitat when compared to the No Action
9543 Alternative, and Alternatives 2 and 4.

9544 Surface occupancy, consisting of transmission line infrastructure, the M&HRF, produced
9545 water line and injection well, and HLF, could occur within the sagebrush habitat. As
9546 discussed previously, transmission lines can increase predation by raptors, resulting in
9547 increased predation rates on sensitive species that occur in the RBPA. This increased
9548 predation may affect the survival of individuals, but would not affect the overall population of
9549 these species in the RBPA. Predation on sensitive species may be decreased by the installation
9550 of perch deterrent devices.

9551 **4.7.4.5.2.5 Aquatic Resources – Species and Habitat Function**

9552 Total Project impacts to aquatic resources from stream crossings associated with overhead
9553 transmission lines, helium and gas pipelines, and fiber optic lines would be identical to those
9554 described under the Impacts of BLM Actions with Alternative 3 for aquatic resources. No
9555 additional impacts would be associated with activities on non-federal lands. Potential impacts
9556 to aquatic resources and riparian vegetation at these crossings would be lower compared to
9557 Alternatives 1, 2, and 4 because both Spring and Beaver creeks would be bored instead of
9558 trenched.

4.7.4.6 Alternative 4

4.7.4.6.1 Impacts of BLM Actions with Alternative 4

No overhead transmission lines are associated with BLM actions of Alternative 4 so potential impacts to all BLM sensitive species that are associated with transmission lines would be the same as those described under the No Action Alternative. Impacts to BLM sensitive species associated with all other Project components would be the same as those described under Alternative 1 (see Tables 4-21, 4-22, and 4-23).

4.7.4.6.2 Total Project Impacts with Alternative 4

4.7.4.6.2.1 Greater Sage-grouse

Alternative 4 falls within the 2-mile radius of three occupied leks. There would be short-term disturbance of approximately 150.3 acres of potential habitat within 2 miles of occupied leks (see Table 4-23). There would be no long-term disturbance associated with Alternative 4. There would be no indirect impacts associated with the transmission line under Alternative 4. Alternative 4 would have no significant adverse impacts to greater sage-grouse. Alternative 4 would have greater short-term direct impacts and equal short- and long-term indirect impacts compared to Alternative 2. Alternative 4 would have less short- and long-term disturbance within sage-grouse habitat compared to Alternative 1. Alternative 4 would have less short-term direct impacts and long-term indirect impacts and equal long-term direct impacts compared to Alternative 3. Surface-disturbing activities would be restricted during the breeding and nesting seasons (see Table 4-20). BLM timing stipulations and surface use restrictions would be enforced for sage-grouse; therefore, impacts would be minimized. Adoption of mitigation measures and BLM timing stipulations would be recommended to minimize indirect impacts.

4.7.4.6.2.2 Raptors

No raptor nests or roosts would be destroyed by Alternative 4 and the same 23 raptor nests described under Alternative 1 fall within 0.5 mile under Alternative 4 (Table 4-21). Pre-construction raptor surveys would be conducted to determine the species presence and status of nests.

Overhead transmission lines would be reduced to 0.23 mile, running from the EGS to the M&HRF and from the substation to the HLF (Table 2-1). Raptors could benefit from the addition of tall structures that provide nest sites and perches from which to hunt. Raptors could also be negatively impacted by potential injury or mortality from the transmission lines. No transmission line crossings of stream channels are associated with Alternative 4 (Table 4-19). BLM timing stipulations would apply to all surface-disturbing activity within the boundaries of raptor nests as described in Table 4-21. The use of perch deterrents and bird flight diverters installed on the high neutral on transmission lines would be recommended to mitigate potential injury or mortality to raptors. Adoption of BLM timing stipulations and avian safe construction protocols would minimize impacts to raptors.

4.7.4.6.2.3 Species of Greatest Conservation Need

Impacts to long-eared myotis would be the same as those described under the No Action Alternative. No prairie dog towns occur within the alignment of Alternative 4 (SWCA 2008; BLM 2009c). Species such as burrowing owls and black-footed ferrets that use prairie dog

towns are not known to occur within the RBPA. Habitat for mountain plover also has not been identified within the RBPA. In the event that these species are found to colonize the RBPA prior to construction, the BLM would be consulted. The construction of 0.23 mile of transmission lines may cause an increase in predation rates on sensitive species that occur in the RBPA. This increased predation may affect the survival of individuals, but would not affect the overall population of these species in the RBPA. The level of impact from predation is difficult to assess without further information on population distribution and status in the RBPA. Predation on sensitive species may be decreased by the installation of perch deterrent devices.

4.7.4.6.2.4 Sagebrush Obligates

Alternative 4 would result in 330.2 acres of short-term disturbance and 19.1 acres of long-term disturbance to sagebrush (see Table 4-22). Long-term disturbance would be associated with the footprint of the EGS. Long-term disturbance represents a 0.33 acre/square mile loss of sagebrush habitat within the RBPA. Surface occupancy, consisting of the EGS and transmission line infrastructure, would occur within the sagebrush habitat. As discussed previously, transmission lines can increase predation by raptors, resulting in increased predation rates on sensitive species that occur in the RBPA. This increased predation may affect the survival of individuals, but would not affect the overall population of these species in the RBPA. Predation on sensitive species may be decreased by the installation of perch deterrent devices. Since most of the impacts to sagebrush would be temporary, although slow to return to mature status, and there is an abundance of this habitat type in the RBPA, the impacts from Alternative 4 would not be significant. Long-term impacts to sagebrush habitats under Alternative 4 would be higher than under Alternative 2 and lower than Alternatives 1 and 3.

4.7.4.6.2.5 Aquatic Resources – Species and Habitat Function

The potential for impacts to streams and riparian areas due to geohazard risk of multiple slumps and debris-laden earth flows would be the same as those described under the No Action Alternative. The potential impacts to sensitive fish and amphibian species by water depletions and hydrostatic testing would be the same as those described under Alternative 1. Total Project impacts to aquatic resources from stream crossings associated with helium and gas pipelines and fiber optic lines would be identical to those described under Alternative 1 for aquatic resources. Total Project impacts associated with Alternative 4 would be lower than those associated with Alternatives 1, 2, and 3 because there would be no transmission line crossings of ephemeral and perennial streams, riparian, and wetland areas.

4.7.4.6.2.6 Plants

No populations of sensitive plants are known to occur within the alignment of Alternative 4. Pre-construction surveys would be conducted to identify any suspected or unknown areas where special status plant populations exist. Any rare plant populations identified during pre-construction surveys would be avoided during construction of the Project by marking and placing fencing around the identified populations. All results from pre-construction surveys would be provided to BLM specialists immediately following completion of surveys. As a result, Alternative 4 would have no direct effect on any BLM sensitive species, and it likely would not cause a trend to federal listing or a loss of viability of any sensitive plant species.

4.7.4.7 Cumulative Impacts

The proposed Project would contribute incremental adverse impacts, including disturbance and long-term loss of sagebrush and sage-grouse habitat, to the impacts occurring near the RBPA as the result of existing and future foreseeable energy development projects. Existing activities in this area include historical and ongoing oil and gas development, ranching and grazing, fuel reduction projects, and proposed or reasonably foreseeable future oil and natural gas development. Based on BLM estimates, existing oil and gas development will likely double over the foreseeable future. Existing and reasonably foreseeable future expansions could contribute to increased habitat fragmentation and the reduction in range of some animals in the future. Studies in the RBPA have found that sage-grouse are negatively impacted by oil and gas development, including the associated habitat loss, fragmentation, traffic, and noise (BLM 2008b).

The proposed Project would contribute to existing disturbance that is causing sagebrush habitat declines in the RBPA. There are currently 108.5 acres/square mile of existing disturbance from oil and gas development, roads and railroads, and/or urban industrial development within sagebrush habitat in the RBPA. Projected future oil and gas development in the RBPA would contribute an additional 38.4 acres/square mile of disturbance within sagebrush habitat in the RBPA. With the incremental addition of the proposed Project disturbance, the total cumulative disturbance would be approximately 147 acres/square mile of sagebrush habitat within the RBPA depending on the alternative selected. The proposed Project would add between 0.20% and 0.41% to the total cumulative disturbance for sagebrush habitat in the RBPA, depending on the alternative selected.

The proposed Project would contribute to existing disturbance that is causing sage-grouse declines in the area. There are currently 52.7 acres/square mile of existing disturbance from oil and gas development, roads and railroads, and/or urban industrial development within sage-grouse habitat in the RBPA. There are currently above ground structures, impoundments, and transmission lines within sage-grouse habitat in the RBPA. Existing disturbance within the sage-grouse habitat within the RBPA is classified as High Impact (20–60 acres/square mile) by the WGFD (2009e). Projected future oil and gas development in the RBPA would contribute an additional 16.7 acres/square mile of disturbance within sage-grouse habitat in the RBPA.

Potential cumulative impacts to sage-grouse from this and other reasonably foreseeable federal and private actions would add additional stress to the Calpet and Deer Hill sage-grouse evaluation area (Upper Green River Basin Sage-Grouse Working Group 2007). With the incremental addition of the proposed Project disturbance, the total cumulative disturbance of the proposed Project would be approximately 70 acres/square mile of disturbance within sage-grouse habitat in the RBPA, depending on the alternative selected. The proposed Project would add between 0.00% and 0.45% to the total cumulative impacts for sage-grouse habitat in the RBPA, depending on the alternative selected. This cumulative disturbance of the Project exceeds the significance thresholds of disturbance identified in Section 4.7.4.1.1.

In addition, Alternatives 1 and 3 of the proposed Project would add a new type of structure, a 230-kv transmission line, in sage-grouse habitat. This cumulative disturbance of the Project would be reduced through the BLM-required mitigation identified in Section 4.7.4.8.1. Future

development should follow additional mitigation measures as outlined by the Upper Green River Basin Sage-Grouse Working Group (2007) and WGFD's Recommendations for Oil and Gas Development (WGFD 2009e).

4.7.4.8 Mitigation and Monitoring Opportunities

4.7.4.8.1 Mitigation

4.7.4.8.1.1 BLM-Required Mitigation*

In addition to the BLM seasonal stipulations (Table 4-20), and mitigation opportunities described in Section 4.1.2.5.6, the following BLM-required mitigation measures (Appendix F) would be applied to all alternatives.

- Cimarex will provide a detailed reclamation plan, developed in consultation with BLM and WGFD and meeting BLM approval, including the possibility of:
  - Vegetation fertilization project to enhance herbaceous understory within the vicinity of Calpet 8 and Widowmaker Leks.
  - Collection of local seed (mainly sagebrush) to be used for reclamation.

  The reclamation plan will include maps, methods, acres, and measureable outcomes.
- Initiation of the Project should occur within 14 days of plover surveys if plovers are determined to not be present. If an active plover nest is found in the survey area, the planned activity should be delayed 37 days, or one week post-hatching. If a brood of flightless chicks is observed, activities should be delayed at least seven days.
- USFWS and WGFD consultation and coordination would be conducted for all mitigation activities relating to raptors and threatened and endangered species and their habitats, and all permits required for movement, removal, and/or establishment of raptor nests would be pursued if they meet the requirements of the USFWS Migratory Bird Treaty Act.
- Permanent structures requiring repeated human presence would not be constructed within 1,000 feet (1,400 feet for ferruginous hawks; 2,600 feet for bald eagles) of active raptor nests.
- Perch discouragers will be placed on every power pole.
- In river crossings or wetland areas, three spans on either side would include bird flight diverters (design to be discussed) installed on the high neutral.
- If while conducting operations, substantial unanticipated environmental effects to listed, proposed, or candidate species are observed (whether effects are direct or indirect), formal consultation with USFWS would be initiated immediately in addition to cessation of all such operations.
- Facilities should be sited at a sufficient distance from the edge of an occupied greater sage-grouse lek to result in a noise level increase from operating facilities no greater than 10 dBA above background (i.e., 39 dBA background + 10 dBA = 49 dBA).
- To avoid potentially significant noise impacts, compressor engines would be located 2,500 feet or more from a sage-grouse lek.

- Avoid sensitive biological resources within the ROW. Avoidance areas would be clearly marked with wooden stakes 3 to 4 feet in height, which would be spray painted to indicate avoidance.

The following required mitigation applies to Alternative 1 only:

- Reclamation of two-track traversing the Calpet 8 lek, subject to coordination with BLM grazing permittee.
- Reclaim unused oil and gas roads within the vicinity of Calpet 8 lek, subject to approval of facility owner.
- Burial or removal of overhead distribution lines within the vicinity of Calpet 8 lek, subject to approval of facility owner.
- Reclamation of unused well pads in the vicinity of the Calpet 8 lek, subject to approval of facility owner.

4.7.4.8.1.2 Other Mitigation Opportunities**

- Implement off-site mitigation measures within the Calpet/Deer Hill Lek complex for enhancing sage-grouse or habitat, as needed, to offset impacts of surface-disturbing activities.
- Provide funding for sage-grouse lek and winter concentration flights.

The following mitigation opportunities apply to Alternatives 2, 3, and 4:

- Reclamation of two-track traversing the Calpet 8 lek, subject to coordination with BLM grazing permittee
- Reclaim unused oil and gas roads within the vicinity of Calpet 8 lek, subject to approval of facility owner.
- Burial or removal of overhead distribution lines within the vicinity of Calpet 8 lek, subject to approval of facility owner.
- Reclamation of unused well pads in the vicinity of the Calpet 8 lek, subject to approval of facility owner.

4.7.4.8.2 Monitoring

4.7.4.8.2.1 BLM-Required Monitoring*

- Pre-construction surveys for sensitive raptors and other species would be conducted in areas of potential habitat by a qualified biologist.
- If construction occurs during migratory bird breeding season, a survey for migratory birds (including BLM sensitive bird species) shall be made just prior to construction. Activities would avoid impacts to nests and fledglings.
- Pre-construction surveys to verify locations of occupied leks and to identify the presence of other leks within 0.5 mile of proposed pipeline and transmission line alignments.

- Use standardized methods to establish baseline sage-grouse population demographics and monitor for declined use of leks (# males/lek) directly and indirectly impacted by Project components; this information is necessary to adaptively manage as development intensifies.
- Monitoring of perch discouragers, used to deter raptor nesting and reduce the risk of raptor electrocutions and collisions that could occur, and initiate adjustments as necessary to ensure effectiveness of perch discourages. A monitoring plan will be developed by the Operator and approved by the BLM within six months of the EA approval.

4.7.4.8.2.2 Other Monitoring Opportunities**

- Monitor sage-grouse use of habitat (defined as area within 2-mile buffer of occupied leks) within the 0.5-mile band centered on transmission lines.

*BLM-required mitigation and monitoring only applies to BLM actions/authorizations associated/connected the proposed Project.

**Other mitigation and monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require/impose any mitigation requirements on the non-federal actions.

4.8 WILDLIFE AND FISHERIES RESOURCES

4.8.1 Impact Criteria

4.8.1.1 Potential Impacts on Wildlife and Fisheries Resources

Impacts to wildlife and fisheries resources would arise from direct or indirect effects of Project activities that cause 1) a loss of available habitat, 2) a reduction in habitat quality/value, and 3) changes in wildlife behavior that affect breeding success and/or survival. The duration of effects on wildlife can be short-term or long-term, resulting in different impacts, as discussed in this section.

Examples of direct impacts to wildlife include removal of soil and vegetation for the construction of pipelines, transmission lines, well pads, and associated facilities, resulting in loss, degradation and/or fragmentation of habitats, increased vehicular collisions, or avian injury or electrocutions from striking power lines. Direct impacts to wildlife resources may consist of the long-term loss, fragmentation, degradation, and isolation of connected habitats of habitat through the creation of roads, well pads, and associated facilities. Short-term direct impacts could include loss or degradation of native habitat and displacement of wildlife species from habitat during the construction phase of the Project activities, but the effects of which are reclaimed and restored following construction.

Direct impacts to fisheries resources could also be long-term or short-term and could consist of degradation of aquatic habitats due to runoff and creek crossings by equipment, well sites, transmission lines, and pipelines. Short-term surface disturbance could create localized erosion of sediment depending on the season and distribution of surface-disturbing activities. Short-term impacts would cease after construction is completed, however, long-term effects of Project operation could result in impact fisheries if channel morphology, water temperature, or water quality are altered by ongoing processes.

Indirect effects to wildlife and fisheries extend beyond the footprint of the construction zone or facilities to include the presence of human activities, increased traffic, noise, changed visual cues, introduction of pollutants, introduction of noxious and invasive weeds, and other factors that reduce the availability or quality of terrestrial and aquatic habitats, change wildlife use of habitats, or change breeding success, or other wildlife behavior.

Long-term and indirect impacts on wildlife are often difficult to identify and quantify since the effects are felt at a distance from the facilities and occur over many years. These could include vehicle collisions with wildlife; dust accumulation on vegetation which lowers the palatability for big game, weed proliferation that reduces the quality and availability of forage. Indirect impacts could also include the loss of access to crucial winter foraging habitats, nesting, or shelter due to wildlife avoidance of areas with high human activity, unpredictable disturbance, or loud noises.

Modification of the behavioral or physiological state and reproductive success of some wildlife may occur as they expend more effort to avoid humans or equipment. Displaced individuals may exert more energy to find suitable movement routes and activity areas that may result in wildlife altering habitat selection by seeking less favorable areas to forage and breed (Sawyer et al. 2006). Vehicular traffic and noise associated with facilities may further displace animals from Project-related infrastructures. Traffic patterns, vehicle type, vehicle speed, and noise levels may affect how wildlife movements are restricted or displaced across roadways and may increase stress levels in wildlife (Rowland et al. 2005).

Wildlife responses to new development vary by species, ranging from habituating to the disturbances over time to the abandonment of a particular habitat (Langbein and Putman 1992). Wildlife responses to either human disturbances or energy exploration and development activities may also vary depending on the type, timing, location, frequency, and predictability of the disturbance (Miller 1998). Little peer-reviewed scientific literature exists to assess potential effects of energy exploration, development, and production activities on migration patterns of mule deer in this area; however, Sawyer et al. (2006) reported mule deer altered their habitat selection to less-preferred and less suitable habitats within one year of development of a natural gas field.

Previous studies on the indirect effects on wildlife have found displacement would likely be approximately 0.5 mile from wells, roads, pipelines, and facilities during the construction phase (Gusey 1986; Guenzel 1987; Easterly et al. 1991), however these effects vary greatly. Freddy et al. (1986) found that mule deer responded negatively to disturbance up to a 0.25-mile radius and Sawyer et al. (2006) reported that the highest probability of mule deer use after one year of development of a natural gas field was 1.23 miles (2.7 km) from the nearest well pad and 1.68 miles (3.7 km) after three years of development. Elk are known to respond negatively to areas where noise and human presence are elevated (greater than 0.5 mile) (Brekke 1988; Hayden-Wing Associates 1990; Hiatt and Baker 1981 cited in WGFD 2009e). Van Dyke and Klein (1996) reported that the installation of an oil well created shifts in elk range, centers of activity, and habitat use but elk did not abandon their range and social stability was not affected.

Some individual animals can ―habituate" to the new human infrastructure and activity; however, it is generally assumed that, overall, the increased human presence in an area is detrimental to big game species. Wildlife have been observed to habituate to human disturbances primarily if they are predictable and non-threatening (e.g., vehicles on a well-traveled road) (Miller 1998). Ward (1984) reported that elk in Wyoming have become adapted to human activities that are repetitive or constant, such as traffic, but are displaced by people on foot. Elk in southcentral Wyoming also showed similar responses to human activity associated with seismic operations, displacing to locations that were out of sight and at least 0.5 mile away from human activities (Ward 1984). However, noise associated with seismic operations showed limited impact to elk; although elk preferred to stay out of sight behind hills, there was no evidence that elk were moving additional distances away from loud explosions, even when explosions recorded readings of over 84 dBA at 1 mile (line-of-sight) and 40 dBA at 6 miles (Ward 1984). Wisdom et al. (2004) subjected elk to various forms of human activity (all-terrain vehicles [ATVs], hikers, mountain bikers, and horseback riders) and observed a 65 percent probability of elk flight response when ATV, hiking, and biking disturbances were within 500 m from elk.

Furthermore, disturbance of big game species during the parturition period and on winter range can increase stress and may influence species distribution (Hayden-Wing Associates 1990; Morgantini and Hudson 1980), resulting in short-term and long-term adverse effects. Although methodologies for documenting animal displacement or changes in distribution are fairly straightforward, those for documenting population-level impacts (i.e., survival and reproduction) are extremely complex. Thus, although studies can measure the spatial and temporal displacement of ungulates relative to energy exploration, development, and production activities, little information is available concerning how human-related disturbances impact reproduction and survival of ungulates (Western EcoSystems Technology Inc. 2003).

4.8.2 Significance Criteria

Impact criteria for determining significance of adverse impacts to wildlife resources include loss of habitat value for habitats defined by WGFD as Vital or High. For habitats classified as Moderate, no significant adverse impacts would occur as long as no net loss of habitat value occurs after restoration or other mitigation.

4.8.2.1 Significance Criteria for Mule Deer, Pronghorn, and Moose

Mule deer, pronghorn, and moose could be affected by conditions that could result due to surface disturbance, noise, and other human activities associated with construction and operation of the proposed plant and infrastructure. Significance criteria would be met if these responses were attributed to the development and operation of the proposed site. Significance criteria used for mule deer, pronghorn, and moose, as established by the WGFD, are summarized in Table 4-24.

Table 4-24. Significance Thresholds for Mule Deer, Pronghorn, and Moose (WGFD 2009e).

	Significance Threshold - High Impact Criteria			
	Well Pads per Square Mile	**Acres Disturbance per Square Mile**	**% of Disturbance per Square Mile**	**Surface Occupancy**
Mule Deer Crucial Winter Range	4	60	9	
Pronghorn Crucial Winter Ranges	16	80	12.5	
Moose Crucial Winter Range	16	80	12.5	
Big Game Migration Corridors				No Surface Occupancy within migration corridors or bottlenecks less than 0.5 mile wide; avoid further constrictions of broader corridors

4.8.2.2 Significance Criteria for Elk

The following significance criteria have been identified, and represent conditions that could result due to surface disturbance, noise, and other human activities associated with construction and operation of the proposed plant and infrastructure. Although natural fluctuations in elk movement, population size, and habitat quality (among other factors) would be expected to occur throughout the LOP, the conditions identified below represent elk responses that may occur as a direct result of the proposed plant site, drilling rig, and other related activities or indirectly as a result of noise associated with the plant. Avoidance of the plant site and associated operations, including vehicular travel to and from the site, could result in behavioral shifts in elk winter habits and lower the value and functionality of the Riley Ridge Winter Range Complex. Thus, significance criteria focus on evaluating the amount of surface disturbance within the Riley Ridge Winter Range Complex and the range of indirect effects (i.e., noise) associated with the Project. Significance criteria would be met if these responses were attributed to the development and operation of the proposed site:

1) greater than 60 acres/square mile of surface disturbance in the elk Riley Ridge Winter Range Complex and/or elk parturition habitat within the RBPA during the LOP;
2) decibel limits greater than baseline conditions (49 decibels) associated with production activities overlap 9% (60 acres/square mile) of the elk Riley Ridge Winter Range Complex and/or elk parturition area within the RBPA; and

In addition to the impacts discussed above, the loss of habitat for forage and cover could be another direct impact to wildlife. The forage production within this impacted area would be lost for the LOP, and therefore would constitute a long-term impact. Loss of habitat could result in the displacement of wildlife from disturbed areas to surrounding, less-disturbed areas. Depending on the carrying capacity of the habitats and the number of animals involved,

displacement could result in overcrowding of habitats into which the animals are displaced. This overcrowding may cause an increase in competition for space and forage, an increase in the animals' stress levels, and a decrease in the animals' physical conditions. Winter mortality may also increase, and successful reproduction may decrease, resulting in long-term reductions in animal populations (Sawyer et al. 2006).

Displacement is of greatest concern in areas that have been recognized as crucial habitat areas essential for the maintenance of local populations. Cumulatively, these indirect impacts potentially resulting from elk avoidance of Project-related activities, when combined with other land use changes, could displace elk to less-favorable habitats and influence population dynamics (see review in Hebblewhite 2008). Long-term displacement of wildlife from preferred habitats and migration routes has the potential to affect or even eliminate "migration memory" within entire cohorts of young animals (WGFD 2008b). The degree of wildlife displacement and reduction in habitat value would vary depending on the habitat types, vegetative cover, topography, existing herd size, winter snow conditions, animal health, traffic levels, and amount of noise and human presence.

4.8.3 No Action Alternative

Under the No Action Alternative, BLM would not take action on the application for ROWs or drilling. As a result, impacts would not occur from BLM actions. Under this alternative, the non-federal actions (i.e., construction of the M&HRF, construction staging/equipment yard, the HLF, air products transmission line, and produced water disposal well on state and private lands) would still occur (as described in Section 2.2 and Table 2-1). All non-federal actions must adhere to provisions of the Migratory Bird Treaty Act (16 USC 703–712), Bald and Golden Eagle Protection Act (16 USC 668–668d), WGFD regulations, Special Use Permit and MOA with the State of Wyoming, and other state and federal regulations on private and state land.

Impacts resulting from the No Action Alternative would be similar to those described in Alternative 2. The M&HRF will overlap with crucial wildlife ranges. Short-term impacts would occur during approved construction periods, and habitat restoration would begin immediately after construction is complete. Long-term disturbance to habitat will be below significance thresholds (see Tables 4-24 through 4-35).

Noise levels from the well sites could create additional indirect short-term and long-term impacts to elk due to the noise generated from construction activities and Project operations. To evaluate potential impacts of noise on elk, the extent of noise level which would be higher than 49 dBA was determined for each noise source, including activities associated with construction events. A threshold of 49 dBA was used based on the requirement of an MOA between WGFD and Cimarex (see Appendix B), which stipulates that the M&HRF shall be adequately muffled to reduce noise levels to 49 dBA at the fenceline enclosing 10 acre facility.

Crucial habitat areas could experience noise levels above ambient conditions during construction affecting elk behavior and activity. Assumptions used to generate disturbance acres for noise associated with pipeline/transmission line construction include 1) six pieces of

equipment are evenly spaced over 1,000 feet; 2) equipment noise levels are 83 dBA at 50 feet; 3) individual equipment is treated as a point source with a 6 dBA decrease for every doubling of distance; and 4) noise exposure at 200 feet is the sum of the six sources of varying distance. Assumptions used to generate disturbance acres for noise associated with well drilling include 1) one 4,000 hp engine is operating for 100 consecutive days at 24 hours/day, and 2) equipment noise level is 83 dBA at 50 feet. Tables 4-31, 4-32, and 4-33 provide the acres of disturbance to elk crucial habitat from noise by alternative.

Animals may change their movements to avoid potential noise and human disturbance associated with activities associated with construction and operation of non-federal Project components. However, timing of construction activities would avoid winter months, thus reducing the extent of activities that could potentially disrupt elk migration routes. Noise reduction and other mitigation measures agreed to by Cimarex for operation of the M&HRF, discussed in Appendix B, would also reduce potential effects on any wildlife species passing through the RBPA. Additionally, noise levels associated with non-federal Project components are below significance thresholds.

The existing road would be used to access this facility and traffic and operational restrictions would be followed (as described in Appendix B and Appendix F). Significant impacts to wildlife resources are not anticipated from non-federal actions.

Table 4-25. Acres of Disturbance to Mule Deer Crucial Winter[1] Range by Alternative, as Defined by Acres of Direct Habitat Loss, and the Percentage of Disturbance to that Habitat within the RBPA.

Project Component	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
AAM&WS	0	0	0	0	4.0	4.0	0	0
3 gas production wells and acid gas injection well pad	0	0	0	0	0.0	0.0	0	0
1 gas production well pad (10-14 location)	0	0	0	0	0.0	0.0	0	0
Helium pipeline & fiber optic line*	68.6	0	No BLM Action		28.6	0.0	0.0	0
Cimarex gas pipeline*	59.4	0	14.5	0	29.4	0.0	59.4	0
Electrical transmission line*	92.2	6	No BLM Action		108.8	0.3	No BLM Action	
Williams gas pipeline*	118.7	0	118.7	0	118.7	0.0	118.7	0
Flowlines and underground electrical and fiber optic lines *	0	0	0	0	0.0	0.0	0	0
Total Acres Affected by BLM Actions	**338.9**	**6**	**133.2**	**0**	**289.4**	**4.3**	**246.7**	**0**
Produced water line and injection well	Same as No Action.		Same as No Action.		Same as No Action.		Same as No Action.	
Natural gas-fired power plant	Not applicable		Not applicable		Not applicable		0	0
M&HRF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
HLF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Helium pipeline & fiber optic line	BLM Actions		0	0	BLM Actions		BLM Actions	
Cimarex gas pipeline			0	0				
Electrical transmission line			0	0			0	0
Williams gas pipeline			BLM Actions				BLM Actions	
Total Acres Affected by Non-federal Actions	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Acres Affected by All Actions	**338.9**	**6.0**	**133.2**	**0.0**	**289.4**	**4.3**	**246.7**	**0.0**
Total Long-term Loss of Available Habitat (as acres/sq mi of available)[1]	Not applicable	**0.16**	Not applicable	**0.00**	Not applicable	**0.11**	Not applicable	**0.00**
Total Long-term Loss of Available Habitat (as % of available)[1]	Not applicable	**0.02%**	Not applicable	**0.00%**	Not applicable	**0.02%**	Not applicable	**0.00%**

[1] Crucial winter range is the sum of crucial winter and crucial winter season ranges. Total area of crucial winter range within the RBPA is 24,746 acres or 38.67 square miles.
*May also cross private and state lands.

Table 4-26. Acres of Disturbance to Mule Deer Migratory Routes[1] by Alternative, as Defined by Acres of Direct Habitat Loss, and the Percentage of Disturbance to that Habitat within the RBPA.

Project Component	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
AAM&WS	0	0	0	0	4.0	4.0	0	0
3 gas production wells and acid gas injection well pad	0	0	0	0	0	0	0	0
1 gas production well pad (10-14 location)	0	0	0	0	0	0	0	0
Helium pipeline & fiber optic line*	92.5	0	No BLM Action		46.4	0	92.5	0
Cimarex gas pipeline*	15.9	0	0	0	8.1	0	15.9	0
Electrical transmission line*	152.7	9.2	No BLM Action		148.8	6.7	No BLM Action	
Williams gas pipeline*	46.7	0	46.7	0	46.7	0	46.7	0
Flowlines and underground electrical and fiber optic lines *	0	0	0	0	0	0	0	0
Total Acres Affected by BLM Actions	**307.7**	**9.2**	**46.7**	**0**	**254.0**	**10.7**	**155.1**	**0**
Produced water line and injection well	Same as No Action.		Same as No Action.		Same as No Action.		BLM Actions	
Natural gas-fired power plant	Not applicable		Not applicable		Not applicable		0	0
M&HRF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
HLF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Helium pipeline & fiber optic line	BLM Actions		36.1	0	BLM Actions		BLM Actions	
Cimarex gas pipeline			17.7	0				
Electrical transmission line			84.4	4.7			22.3	0
Williams gas pipeline			BLM Actions					
Total Acres Affected by Non-federal Actions	**0**	**0**	**138.2**	**4.7**	**0**	**0**	**22.3**	**0**
Total Acres Affected by All Actions	**307.7**	**9.2**	**184.9**	**4.7**	**254.0**	**10.7**	**177.3**	**0.0**
Total Long-term Loss of Available Habitat (as acres/sq mi of available)[1]	Not applicable	**0.27**	Not applicable	**0.14**	Not applicable	**0.31**	Not applicable	**0.00**
Total Long-term Loss of Available Habitat (as % of available)[1]	Not applicable	**0.04%**	Not applicable	**0.02%**	Not applicable	**0.05%**	Not applicable	**0.00%**

[1]Total acres of migration routes within the RBPA is 22,013 or 34.4 square miles.
*May also cross private and state lands.

Table 4-27. Acres of Disturbance to Pronghorn Crucial Winter Range[1] by Alternative, as Defined by Acres of Direct Habitat Loss, and the Percentage of Disturbance to that Habitat within the RBPA.

Project Component	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
AAQ&WS	0	0	0	0	0	0	0	0
3 gas production wells and acid gas injection well pad	0	0	0	0	0	0	0	0
1 gas production well pad (10-14 location)	0	0	0	0	0	0	0	0
Helium pipeline & fiber optic line*	48.7	0	No BLM Action		24.3	0	48.7	0
Cimarex gas pipeline*	0	0	0	0	0	0	0	0
Electrical transmission line*	88.4	5.0	No BLM Action		81.7	4.0	No BLM Action	
Williams gas pipeline*	11.2	0	11.2	0	11.2	0	11.2	0
Flowlines and underground electrical and fiber optic lines *	0	0	0	0	0	0	0	0
Total Acres Affected by BLM Actions	**148.3**	**5.0**	**11.2**	**0**	**117.2**	**4.0**	**59.9**	**0**
Produced water line and injection well	Same as No Action.		Same as No Action.		Same as No Action.		Same as No Action.	
Natural gas-fired power plant	Not applicable		Not applicable		Not applicable		0	0
M&HRF	Same as No Action.		Same as No Action.		Same as No Action.		Same as No Action.	
HLF	10.0	10.0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Helium pipeline & fiber optic line	BLM Actions		23.0	0	BLM Actions		BLM Actions	
Cimarex gas pipeline			0	0				
Electrical transmission line			65.6	2.9			22.7	0
Williams gas pipeline			BLM Actions				BLM Actions	
Total Acres Affected by Non-federal Actions	**10.0**	**10.0**	**98.6**	**12.9**	**10.0**	**10.0**	**32.7**	**10.0**
Total Acres Affected by All Actions	**158.3**	**15.0**	**109.8**	**12.9**	**147.3**	**15.0**	**92.6**	**10.0**
Total Long-term Loss of Available Habitat (as acres/sq mi of available)[1]	Not applicable	**0.97**	Not applicable	**0.84**	Not applicable	**0.91**	Not applicable	**0.65**
Total Long-term Loss of Available Habitat (as % of available)[1]	Not applicable	**0.15%**	Not applicable	**0.13%**	Not applicable	**0.14%**	Not applicable	**0.10%**

[1]Crucial winter range is defined as crucial winter season ranges. Total acres of crucial winter range within the RBPA is 9,885 or 15.5 square miles.
*May also cross private and state lands.

Table 4-28. Acres of Disturbance to Pronghorn Migration Routes[1] by Alternative, as Defined by Acres of Direct Habitat Loss, and the Percentage of Disturbance to that Habitat within the RBPA.

Project Component	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
AAQ&WS	0	0	0	0	0	0	0	0
3 gas production wells and acid gas injection well pad	0	0	0	0	0	0	0	0
1 gas production well pad (10-14 location)	0	0	0	0	0	0	0	0
Helium pipeline & fiber optic line*	23.9	0	No BLM Action		12.2	0	23.9	0
Cimarex gas pipeline*	0.5	0	5.7	0	0.3	0	0.5	0
Electrical transmission line*	30.4	2.0	No BLM Action		19.3	0.3	No BLM Action	
Williams gas pipeline*	0	0	0	0	0	0	0	0
Flowlines and underground electrical and fiber optic lines *	0	0	0	0	0	0	0	0
Total Acres Affected by BLM Actions	**54.8**	**2.0**	**5.7**	**0**	**31.8**	**0.3**	**24.4**	**0**
Produced water line and injection well	Same as No Action.		Same as No Action.		Same as No Action.		Same as No Action.	
Natural gas-fired power plant	Not applicable		Not applicable		Not applicable		0	0
M&HRF	Same as No Action.		Same as No Action.		Same as No Action.		Same as No Action.	
HLF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Helium pipeline & fiber optic line	BLM Actions		6.9	0	BLM Actions		BLM Actions	
Cimarex gas pipeline			7.4	0				
Electrical transmission line			10.4	0.7			0	0
Williams gas pipeline			BLM Actions				BLM Actions	
Total Acres Affected by Non-federal Actions	**0**	**0**	**24.7**	**0.7**	**0**	**0**	**0**	**0**
Total Acres Affected by All Actions	**54.8**	**2.0**	**30.4**	**0.7**	**31.8**	**0.3**	**24.4**	**0.0**
Total Long-term Loss of Available Habitat (as acres/sq mi of available)[1]	Not applicable	**0.27**	Not applicable	**0.09**	Not applicable	**0.04**	Not applicable	**0.00**
Total Long-term Loss of Available Habitat (as % of available)[1]	Not applicable	**0.04%**	Not applicable	**0.01%**	Not applicable	**0.01%**	Not applicable	**0.00%**

[1]Total acres of migration routes in the RBPA is 4,812 or 7.5 square miles.
*May also cross private and state lands.

4.8.4 Alternative 1

4.8.4.1 Impacts of BLM Actions with Alternative 1

BLM seasonal wildlife stipulations (Table 4-20), measures included in the WGFD MOA (Appendix B, and BLM mitigation guidelines and BMPs (Appendix F) would be applied to all BLM actions to conserve wildlife and fisheries resources and minimize impacts to habitats.

4.8.4.1.1 Mule Deer

BLM actions under Alternative 1 would result in long-term disturbance to 6.0 acres of crucial winter range within the RBPA due to unauthorized use of the transmission line ROW forming a two-track road. This represents 0.16 acre/square mile of crucial winter range within the RBPA (Table 4-25). Alternative 1 would also result in 9.2 acres of long-term disturbance to mule deer migration corridors, which represents 0.27 acre/square mile of mule deer migration corridors within Hunt Area 143 (Table 4-26). Short-term impacts would disturb approximately 339 acres of crucial winter range (Table 4-25) and 308 acres of migration corridors (Table 4-26). These short-term impacts would occur during construction of BLM actions including the Cimarex natural gas pipeline, helium/fiber optic line, Williams pipeline, the Cimarex transmission line, and well drilling activities. Construction would only occur during BLM-approved wildlife timing stipulations, and restoration of vegetation would begin as early as possible after construction is completed. Therefore, the short-term effects of road use, human activity, noise, and other effects would not have adverse impacts on mule deer that might be present in the area.

The mule deer migration routes through Alternative 1 areas of effect are greater than 0.5 mile wide, as shown in Map 3-9, and passes through areas where proposed BLM ROW for pipelines and transmission lines would cross Beaver Creek. The Project design includes a maximum of four wells per section, which is within WGFD guidelines of four wells per section in migration corridors wider than 0.5 mile (WGFD 2008b). Alternative 1 also conforms to WGFD guidelines requiring no surface occupancy by the gas production wells and acid gas injection well pad within any mule deer migration corridors. For migration routes that bisect pipeline and transmission line corridors (see Maps 3-8 through 3-11), construction activities would be focused within discrete portions of the pipeline/transmission line corridor and move from one end of that corridor to the other, thus reducing the extent of activities that could potentially disrupt mule deer migration routes. These short-term impacts would occur during construction periods authorized by BLM, and restoration of habitats would immediately follow construction activities. Therefore, no short-term adverse impacts to mule deer or their migration is anticipated as a result of BLM actions Alternative 1.

4.8.4.1.2 Pronghorn

BLM actions under Alternative 1 would result in long-term disturbance to 5.0 acres of crucial winter range within the RBPA. This represents 0.32 acre/square mile of crucial winter range within the RBPA (Table 4-27). Alternative 1 would result in 2.0 acres of long-term disturbance to pronghorn migration corridors, which represents 0.27 acre/square mile of pronghorn migration corridors within the RBPA (Table 4-28). Short-term impacts would disturb approximately 54.8 acres of crucial winter range (Table 4-27) and 5.7 acres of migration corridors (Table 4-28).

Transmission line poles and the two-track access road would be located within two different portions of a pronghorn migration corridor that is less than 0.5 mile wide (see Map 3-8). For other migration corridors, animals may displace their movements to avoid potential noise and human disturbance associated with activities associated with pipeline and transmission line construction. For migration routes that bisect pipeline and transmission line corridors (see Maps 3-8 through 3-11), construction activities would be focused within discrete portions of the pipeline/transmission line corridor and move from one end of the corridor to the other, thus reducing the extent of activities that could potentially disrupt pronghorn migration routes. These short-term impacts would occur during construction periods authorized by BLM, and restoration of habitats would immediately follow construction activities. Therefore, no adverse impacts to pronghorn or their migration would occur as a result of BLM actions in Alternative 1.

4.8.4.1.3 Moose

BLM actions under Alternative 1 would result in long-term disturbance to 15.1 acres of moose crucial winter range within the RBPA. This represents 0.42 acre/square mile of crucial winter range within the RBPA (Table 4-29). Short-term impacts to moose habitats would disturb approximately 287.1 acres of crucial winter range (Table 4-29).Restoration of habitats would begin immediately after construction is completed.

Other short-term effects include vehicular traffic and construction activities associated with pipeline, transmission line, and utility corridor construction within crucial winter range along South Piney Creek and Middle Piney Creek. Construction would not occur during sensitive winter months to avoid disrupting moose activities within these drainages, in accordance with BLM wildlife stipulations identified in Appendix F. Therefore, no short-term adverse impacts to moose would occur as a result of BLM actions in Alternative 1.

4.8.4.1.4 Elk

BLM actions under Alternative 1 would result in long-term disturbance to 6.4 acres of crucial winter range within the Riley Ridge Winter Range Complex as a result of the AAM&WS and multi-well pad for the gas wells. This represents 0.30 acre/square mile of crucial winter range within the Riley Ridge Winter Range Complex (Table 4-30). There would be 6.4 acres of long-term disturbance to an elk parturition area; this represents 1.73 acres/square mile of parturition areas within the RBPA (Table 4-31). Alternative 1 would result in 0.2 acre of long-term disturbance to elk migration corridors, which represents 0.04 acre/square mile of elk migration corridors within the RBPA (Table 4-32). These long-term impacts are much lower than thresholds for adverse impacts to the species identified in Section 4.8.2.2.

Table 4-29. Acres of Disturbance to Moose Crucial Winter[1] Range by Alternative, as Defined by Acres of Direct Habitat Loss, and the Long-term Disturbance to that Habitat within the RBPA.

Project Component	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
AAM&WS	4.4	4.0	4.4	4.0	8.4	8.0	4.4	4.0
3 gas production wells and acid gas injection well pad	5.5	2.5	5.5	2.5	5.5	2.5	5.5	2.5
1 gas production well pad (10-14 location)	4.6	2.1	4.6	2.1	4.6	2.1	4.6	2.1
Helium pipeline & fiber optic line*	70.7	0	No BLM Action		31.4	0	70.7	0
Cimarex gas pipeline*	70.7	0	1.3	0	31.4	0	70.7	0
Electrical transmission line*	116.1	6.5	No BLM Action		112.4	0	No BLM Action	
Williams gas pipeline*	0.0	0	0	0	0	0	0	0
Flowlines and underground electrical and fiber optic lines *	15.1	0	15.1	0	15.1	0	15.1	0
Total Acres Affected by BLM Actions	**287.1**	**15.1**	**30.9**	**8.6**	**208.9**	**12.6**	**171.0**	**8.6**
Produced water line and injection well	Same as No Action.		Same as No Action.		Same as No Action.		Same as No Action.	
Natural gas-fired power plant	Not applicable		Not applicable		Not applicable		7.0	7.0
M&HRF	26.1	9.9	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
HLF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Helium pipeline & fiber optic line	BLM Actions		138.1	0	BLM Actions		BLM Actions	
Cimarex gas pipeline			94.7	0				
Electrical transmission line			244.9	14.5			17.7	0
Williams gas pipeline			BLM Actions				BLM Actions	
Total Acres Affected by Non-federal Actions	**26.1**	**9.9**	**503.8**	**24.4**	**26.1**	**9.9**	**50.8**	**16.9**
Total Acres Affected by All Actions	**313.2**	**25**	**534.7**	**33**	**235.0**	**22.5**	**221.8**	**25.5**
Total Long-term Loss of Available Habitat (as acres/sq mi of available)[1]	Not applicable	**0.70**	Not applicable	**0.93**	Not applicable	**0.97**	Not applicable	**0.65**
Total Long-term Loss of Available Habitat (as % of available)[1]	Not applicable	**0.00%**	Not applicable	**0.14%**	Not applicable	**0.15%**	Not applicable	**0.10%**

[1]Total acres of crucial winter range in the RBPA is 22,790 or 35.61 square miles.
*May also cross private and state lands.

Table 4-30. Acres of Disturbance to Elk Habitat in the Riley Ridge Winter Range Complex[1] by Alternative, as Defined by Acres of Direct Habitat Loss and the Long-term Disturbance to that Habitat within the RBPA.

Project Component	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
AAM&WS	4.4	4.0	4.4	4.0	8.4	4.0	4.4	4.0
3 gas production wells and acid gas injection well pad	5.5	2.5	5.5	2.5	5.5	2.5	5.5	2.5
1 gas production well pad (10-14 location)	0	0	0	0	0	0	0	0
Helium pipeline & fiber optic line	99.4	0	No BLM Action		7.4	0	99.4	0
Cimarex gas pipeline	94.6	0	15.9	0	80.6	0	94.6	0
Electrical transmission line	164.1	0	No BLM Action		154.0	1.3	No BLM Action	
Williams gas pipeline	0	0	0	0	0	0		
Flowlines and underground electrical and fiber optic lines	14.2	0	14.1	0	14.2	0	14.2	0
Total Acres Affected by BLM Actions	**382.2**	**6.4**	**39.9**	**6.4**	**270.0**	**7.8**	**218.1**	**6.5**
Produced water line and injection well	Same as No Action.		Same as No Action.		Same as No Action.		Same as No Action.	
Natural gas-fired power plant	Not applicable		Not applicable		Not applicable		7.0	7.0
M&HRF	26.1	10	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
HLF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Helium pipeline & fiber optic line	BLM Actions		3.5	0	BLM Actions		BLM Actions	
Cimarex gas pipeline			3.6	0				
Electrical transmission line			21.2	0.5			17.7	1.4
Williams gas pipeline			BLM Actions				BLM Actions	
Total Acres Affected by Non-federal Actions	**26.1**	**10.0**	**54.3**	**10.5**	**26.1**	**10.0**	**50.8**	**18.4**
Total Acres Affected by All Actions	**408.3**	**16.4**	**66.0**	**16.4**	**296.1**	**17.8**	**268.9**	**24.9**
Total Long-term Loss of Available Habitat (as acres/sq mi of available)[1]	Not applicable	**0.77**	Not applicable	**0.77**	Not applicable	**0.84**	Not applicable	**1.17**
Total Long-term Loss of Available Habitat (as % of available)[1]	Not applicable	**0.12%**	Not applicable	**0.12%**	Not applicable	**0.13%**	Not applicable	**0.18%**

[1]Total acres of Riley Ridge Winter Range Complex in the RBPA is 13,361 or 21.3 square miles.
*May also cross private and state lands.

Table 4-31. Acres of Disturbance to Elk Parturition Areas[1] by Alternative, as Defined by Acres of Direct Habitat Loss and the Long-term Disturbance to that Habitat within the RBPA.

Project Component	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
AAM&WS	4.4	3.9	4.4	3.9	4.4	3.9	4.4	3.9
3 gas production wells and acid gas injection well pad	5.5	2.5	5.5	2.5	5.5	2.5	5.5	2.5
1 gas production well pad (10-14 location)	0	0	0	0	0	0	0	0
Helium pipeline & fiber optic line	0	0	No BLM Action		0	0	0	0
Cimarex gas pipeline	0	0	0	0	0	0	0	0
Electrical transmission line	0	0	No BLM Action		0	0	No BLM Action	
Williams gas pipeline	0	0	0	0	0	0	0	0
Flowlines and underground electrical and fiber optic lines	2.1	0	2.1	0	2.1	0	2.1	0
Total Acres Affected by BLM Actions	**12.0**	**6.4**	**12.0**	**6.4**	**12.0**	**6.4**	**12.0**	**6.4**
Produced water line and injection well	Same as No Action.		Same as No Action.		Same as No Action.		Same as No Action.	
Natural gas-fired power plant	Not applicable		Not applicable		Not applicable		0	0
M&HRF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
HLF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Helium pipeline & fiber optic line	BLM Actions		0	0	BLM Actions		BLM Actions	
Cimarex gas pipeline			0	0				
Electrical transmission line			0	0			0	0
Williams gas pipeline			BLM Actions				BLM Actions	
Total Acres Affected by Non-federal Actions	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Acres Affected by All Actions	**12.0**	**6.4**	**12.0**	**6.4**	**12.0**	**6.4**	**12.0**	**6.4**
Total Long-term Loss of Available Habitat (as acres/sq mi of available)[1]	Not applicable	**1.73**	Not applicable	**1.73**	Not applicable	**1.73**	Not applicable	**1.73**
Total Long-term Loss of Available Habitat (as % of available)[1]	Not applicable	**0.27%**	Not applicable	**0.27%**	Not applicable	**0.27%**	Not applicable	**0.27%**

[1]Total acres of parturition areas within the RBPA is 2,367 or 3.7 square miles.
*May also cross private and state lands.

Table 4-32. Acres of Disturbance to Elk Migration Corridors[1] by Alternative, as Defined by Acres of Direct Habitat Loss, and the Long-term Disturbance to that Habitat within the RBPA.

Project Component	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
AAM&WS	0	0	0	0	0	0	0	0
3 gas production wells and acid gas injection well pad	0	0	0	0	0	0	0	0
1 gas production well pad (10-14 location)	0.4	0.2	0.4	0.2	0.4	0.2	0.4	0.2
Helium pipeline & fiber optic line	35.5	0	No BLM Action		13.9	0	35.5	0
Cimarex gas pipeline	33.3	0	0	0	13.9	0	33.3	0
Electrical transmission line	45.5	0	No BLM Action		70.4	1.6	No BLM Action	
Williams gas pipeline	0	0	0	0	0	0	0	0
Flowlines and underground electrical and fiber optic lines	5.5	0	5.4	0	5.5	0	5.5	0
Total Acres Affected by BLM Actions	**120.2**	**0.2**	**5.8**	**0.2**	**104.0**	**1.8**	**74.7**	**0.2**
Produced water line and injection well	Same as No Action.		Same as No Action.		Same as No Action.		Same as No Action.	
Natural gas-fired power plant	Not applicable		Not applicable		Not applicable		0	0
M&HRF	0.7	0.3	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
HLF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Helium pipeline & fiber optic line	BLM Actions		14.1	0	BLM Actions		BLM Actions	
Cimarex gas pipeline			14.1	0				
Electrical transmission line			23.4	0			0	0
Williams gas pipeline			BLM Actions				BLM Actions	
Total Acres Affected by Non-federal Actions	**0.7**	**0.3**	**52.3**	**0.3**	**0.7**	**0.3**	**0.7**	**0.3**
Total Acres Affected by All Actions	**120.9**	**0.5**	**58.1**	**0.5**	**104.7**	**2.1**	**75.4**	**0.5**
Total Long-term Loss of Available Habitat (as acres/sq mi of available)[1]	Not applicable	**0.10**	Not applicable	**0.10**	Not applicable	**0.41**	Not applicable	**0.10**
Total Long-term Loss of Available Habitat (as % of available)[1]	Not applicable	**0.02%**	Not applicable	**0.02%**	Not applicable	**0.06%**	Not applicable	**0.02%**

[1]Total acres of migration corridors within the RBPA is 3,289 or 5.14 square miles.
*May also cross private and state lands.

Short-term impacts under Alternative 1 would include disturbance and construction of pipelines, transmission lines, helium/fiber optic lines, and other facilities, affecting approximately 382 acres of habitat within the Riley Ridge Winter Range Complex and approximately 12 acres of parturition area and 120 acres of migration corridors within the RBPA. These short-term impacts would occur during approved construction periods, and habitat restoration would begin immediately after construction is complete. These short-term impacts to elk from BLM actions may be adverse without required mitigation measures identified in Section 4.8.9.1.1. Rapid and effective restoration of habitat values within elk crucial winter range is essential to reducing adverse impacts to the species.

Noise levels from the well sites could create additional indirect short-term and long-term impacts to elk due to the noise generated from construction activities and Project operations. To evaluate potential impacts of noise on elk the extent of noise level which would be higher that 49dBA was determined for each noise source, including activities associated with construction events, the extent of noise levels. A threshold of 49 dBA was used based on the requirement of an MOA between WGFD and Cimarex (see Appendix B), which stipulates that the M&HRF shall be adequately muffled to reduce noise levels to 49 dBA. Based on this analysis, the acres of crucial habitats which would experience noise levels above ambient conditions were calculated, thus providing an estimate of crucial habitat acreages that could be potentially affected by noise-generating facilities and activities, and which could potentially serve to impact elk behavior and activity. Assumptions used to generate disturbance acres for noise associated with pipeline construction include 1) six pieces of equipment are evenly spaced over 1,000 feet, 2) equipment noise levels are 83 dBA at 50 feet, 3) individual equipment is treated as a point source with a 6 dBA decrease for every doubling of distance, and 4) noise exposure at 200 feet is the sum of the six sources of varying distance. Assumptions used to generate disturbance acres for noise associated with well drilling include 1) one 4000 hp engine is operating for 100 consecutive days at 24 hours/day, and 2) equipment noise level is 83 dBA at 50 feet. Tables 4-33, 4-34, and 4-35 provide the acres of disturbance to elk crucial habitat from noise by alternative.

Short-term noise impacts associated with construction of the pipeline and well drilling would extend over a very large area and would not occur during the time that wildlife stipulations are applied (Table 4-20). The timing of drilling at the well sites would be planned from June 30 to November 15 and construction of the pipeline would be planned from August through November 15 (April 15 to November 15 if no migratory birds are determined to be present along the proposed pipeline ROW or if exemptions to migratory bird monitoring are granted); specific starting dates in August would be determined based on migratory bird monitoring (see BLM-Required Monitoring section below). Although noise associated with short-term construction and drilling activities would cover approximately 97% (626 acres/square mile) of elk habitat within the Riley Ridge Winter Range Complex and short-term impacts would cover approximately 94% (600.4 acres/square mile) of parturition areas (Table 4-34), these activities would not occur during winter, as shown in Appendix F, and adverse impacts are therefore unlikely to occur as a result of Alternative 1.

Table 4-33. Acres of Disturbance to Elk Crucial Winter Range in the Riley Ridge Winter Range Complex[1] by Alternative, as Defined by Acres of Indirect Effects from Noise Associated with Project-Related Facilities and Activities, and the Long-term Disturbance to that Habitat within the RBPA.

Project Component	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
AAM&WS	0	0	0	0	0	0	0	0
3 gas production wells and acid gas injection well pad	511.3	0	511.3	0	511.3	0	511.3	0
1 gas production well pad (10-14 location)	54.6	0	54.6	0	54.6	0	54.6	0
Cimarex gas pipeline, flowlines and underground electrical and fiber optic lines	12,768.0	0	10,020.9		12,771.9	0	12,768.0	0.0
Williams gas pipeline	0	0	0	0	0	0	0	0
Total Acres Affected by BLM Actions	**13,333.9**	**0**	**10,586.8**	**0**	**13,337.7**	**0**	**13,333.9**	**0**
Produced water line and injection well	Same as No Action.		Same as No Action.		Same as No Action.		Same as No Action.	
Natural gas-fired power plant	Not applicable		Not applicable		Not applicable		11.0	11.0
M&HRF	56.9	10.0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
HLF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Cimarex gas pipeline, flowlines and underground electrical and fiber optic lines	BLM Actions				BLM Actions		BLM Actions	
Williams gas pipeline			BLM Actions					
Total Acres Affected by Non-federal Actions	**56.9**	**10.0**	**56.9**	**10.0**	**56.9**	**10.0**	**67.9**	**21.0**
Total Acres Affected by All Actions	**13390.8**	**10.0**	**10643.7**	**10.0**	**13394.6**	**10.0**	**13,401.8**	**21.0**
Total Long-term Loss of Available Habitat (as acres/sq mi of available)[1]	Not applicable	**0.47**	Not applicable	**0.47**	Not applicable	**0.47**	Not applicable	**0.99**
Total Long-term Loss of Available Habitat (as % of available)[1]	Not applicable	**0.07%**	Not applicable	**0.07%**	Not applicable	**0.07%**	Not applicable	**0.15%**

[1]Total acres of Riley Ridge Winter Range Complex within the RBPA is 13,631 or 21.3 square miles.
*May also cross private and state lands.

Table 4-34. Acres of Disturbance to Elk Parturition Areas[1] by Alternative, as Defined by Acres of Indirect Effects from Noise Associated with Project-Related Facilities and Activities, and Long-term Disturbance to that Habitat within the RBPA.

Project Component	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
AAM&WS	0	0	0	0	0	0	0	0
3 gas production wells and acid gas injection well pad	315.6	0	315.6	0	315.6	0	315.6	0
1 gas production well pad (10-14 location)	0	0	0	0	0	0	0	0
Cimarex gas pipeline, flowlines and underground electrical and fiber optic lines	1,905.1	0	1,905.1	0	1,905.1	0	1,905.1	0
Williams gas pipeline	0	0	0	0	0	0	0	0
Total Acres Affected by BLM Actions	**2,220.7**	**0**	**2,220.7**	**0**	**2,220.7**	**0**	**2,220.7**	**0**
Produced water line and injection well	Same as No Action.		Same as No Action.		Same as No Action.		Same as No Action.	
Natural gas-fired power plant	Not applicable		Not applicable		Not applicable		0	0
M&HRF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
HLF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Cimarex gas pipeline, flowlines and underground electrical and fiber optic lines	BLM Actions		BLM Actions		BLM Actions		BLM Actions	
Williams gas pipeline								
Total Acres Affected by Non-federal Actions	**0**	**0**	1,905.1	**0**	**0**	**0**	**0**	**0**
Total Acres Affected by All Actions	**2,220.7**	**0**	**2,220.7**	**0**	**2,220.7**	**0**	**2,220.7**	**0**
Total Long-term Loss of Available Habitat (as acres/sq mi of available)[1]	Not applicable	**0.00**	Not applicable	**0.00**	Not applicable	**0.00**	Not applicable	**0.00**
Total Long-term Loss of Available Habitat (as % of available)[1]	Not applicable	**0.00%**	Not applicable	**0.00%**	Not applicable	**0.00%**	Not applicable	**0.00%**

[1]Total acres of parturition areas in the RBPA is 2,367 or 3.7 square miles.
*May also cross private and state lands.

Table 4-35. Acres of Disturbance to Elk Migration Corridors[1] by Alternative, as Defined by Acres of Indirect Effects from Noise Associated with Project-Related Facilities and Activities, and Long-term Disturbance to that Habitat within the RBPA.

Project Component	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
AAM&WS	0	0	0	0	0	0	0	0
3 gas production wells and acid gas injection well pad	0	0	0	0	0	0	0	0
1 gas production well pad (10-14 location)	248.0		248.0	0	248.0	0	248.0	0
Cimarex gas pipeline, flowlines and underground electrical and fiber optic lines	2,794.3	0	2,063.6	0	2,794.7	0	2,794.3	0
Williams gas pipeline	0	0	0	0	0	0	0	0
Total Acres Affected by BLM Actions	**3,042.3**	**0**	**2,311.6**	**0**	**3,042.7**	**0**	**3,042.3**	**0**
Produced water line and injection well	Same as No Action.		Same as No Action.		Same as No Action.		Same as No Action.	
Natural gas-fired power plant	Not applicable		Not applicable		Not applicable		0	0
M&HRF	4.6	0.3	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
HLF	0	0	Same as Alt 1.		Same as Alt 1.		Same as Alt 1.	
Cimarex gas pipeline , flowlines and underground electrical and fiber optic lines	BLM Action		BLM Action		BLM Action		BLM Action	
Williams gas pipeline								
Total Acres Affected by Non-federal Actions	**4.6**	**0.3**	**4.6**	**0.3**	**4.6**	**0.3**	**4.6**	**0.3**
Total Acres Affected by All Actions	**3,046.9**	**0.5**	**2,316.2**	**0.5**	**3,047.4**	**0.5**	**3,046.9**	**0.5**
Total Long-term Loss of Available Habitat (as acres/sq mi of available)[1]	Not applicable	**0.10**	Not applicable	**0.10**	Not applicable	**0.10**	Not applicable	**0.10**
Total Long-term Loss of Available Habitat (as % of available)[1]	Not applicable	**0.02%**	Not applicable	**0.02%**	Not applicable	**0.02%**	Not applicable	**0.02%**

[1]Total acres of migration corridors in the RBPA is 3,289 or 5.14 square miles.
*May also cross private and state lands.

Short-term impacts associated with pipeline construction and drilling may disrupt fall migration patterns (Table 4-35), as previous telemetry data (Smith 2008) indicate elk moving eastward to the Riley Ridge area from summer range to the south and west between September 1 and October 31. However, BLM-action construction activities would only occur for two seasons of elk migration, and thus are unlikely to impact long-term migratory movements. Transmission line poles and the two-track access road would be located within three different portions of an elk migration corridor that is less than 0.5 mile wide (see Map 3-10). Animals may change their movements to avoid potential noise and human disturbance associated with activities associated with pipeline construction. However, timing of construction activities would avoid winter months, thus reducing the extent of activities that could potentially disrupt elk migration routes.

4.8.4.1.5 Small Mammals

Small mammals may be affected by construction and operation activities of BLM actions associated with Alternative 1. The construction and operation of 16.7 miles of transmission lines may cause an increase in predation rates on small mammals that occur in the RBPA. This increased predation may affect the survival of individuals, but would not affect the overall population of these species in the RBPA. The level of impact from predation is difficult to assess without further information on population distribution and status in the RBPA. Predation on small mammals may be decreased by the installation of perch deterrent devices. Therefore, no long-term adverse impacts to small mammals are anticipated as a result of BLM actions of Alternative 1.

Individuals may be temporarily displaced during the construction of transmission lines, pipelines, and fiber optic lines. Mortality of fossorial (burrowing) mammals may occur as those species may be less able to disperse from construction activities. These short-term impacts would occur during construction periods authorized by BLM, and restoration of habitats would immediately follow construction activities. Therefore, no short-term adverse impacts to small mammals are anticipated as a result of BLM actions of Alternative 1.

4.8.4.1.6 Reptiles and Amphibians

Similar impacts to upland reptile species and amphibians may occur as described for small mammals. Individuals may be temporarily displaced during the construction of transmission lines, pipelines, and fiber optic lines. Operation and maintenance of the various Project components could temporarily dislocate upland reptile species in the immediate work vicinity, if present.

Amphibian species have the potential to be impacted by water depletions and hydrostatic testing within with RBPA. Project water use for drilling and completion activities would not represent a significant adverse impact to amphibians due to the minimal amount of water needed and off channel withdrawal locations. Hydrostatic testing of pipelines would not represent a significant adverse impact to amphibians with the adherence to guidelines and BMPs as described in Section 4.4.8.1.

These short-term impacts would occur during construction periods authorized by BLM, and restoration of habitats would immediately follow construction activities. Therefore, no short-

term adverse impacts to reptiles and amphibians are anticipated as a result of BLM actions of Alternative 1.

4.8.4.1.7 Birds

BLM actions associated with Alternative 1 could have short-term and long-term impacts on bird species in the RBPA. Short-term impacts from construction activities could result in the temporary loss habitats, such as big sagebrush habitat, now available to birds for nesting, predator avoidance cover, and foraging. These impacts would be temporary as restoration of habitats would immediately follow construction activities.

Long-term loss of habitats, such as sagebrush habitat, would occur at the substations, individual pole locations, and two-track roads associated with the Project. The long-term loss of vegetation is not likely to affect habitat value to bird species.

The construction and operation of 16.7 miles of overhead transmission line have the potential to increase predation and injury or morality to birds from electrocution and/or collision with transmission line structures. Perch- and nest-discouraging devices would be used to reduce the use of poles and cross arm structures by birds that require trees, or suitable tree-like surrogates, for a nesting substrate. Line visibility devices would be used to reduce the potential for bird collisions with structures, transmission lines, grounding wires, and guy wires, and potential injury or mortality from electrocution. The risk of electrocution to perching and migratory birds has been minimized over the years by designing insulators and conductors to preclude birds from perching on the conductors. Waterfowl are typically more prone to collisions with power lines, especially the grounding wires located at the top of the structures (Meyer 1978; James and Haak 1979; Beaulaurier 1981; Beaulaurier et al. 1982; Faanes 1987). Raptors are less likely to collide with the power lines, perhaps due to their excellent eyesight and tendency to not fly at dusk or in low visibility weather conditions (Olendorff and Lehman 1986). Smaller migratory birds are at risk, but generally are not as prone to collision because of their small size, their ability to quickly maneuver away from obstacles, and the fact that they often migrate high enough above the ground to avoid transmission lines. Permanent resident birds that fly in tight flocks may be at higher risk than other species. The main issues influencing avian mortality from collisions and electrocutions are species-specific factors such as size, age, and agility; environmental factors including the effects of weather on line visibility or activities that either attract or frequently flush birds from an area; and electrical equipment design (Avian Power Line Interaction Committee [APLIC] 2006).

Even with some level of direct or indirect impacts to avian species from collisions with structures or cables, and increased electrocution risk, these impacts would be minor to the overall health of the populations in the RBPA with implementation of mitigation measures. Therefore, no significant adverse impacts would occur to birds as a result of Alternative 1.

4.8.4.1.8 Aquatic Species

Impacts of BLM actions with Alternative 1 include 3 perennial and 33 ephemeral stream crossings associated with helium and gas pipelines and fiber optic lines (see Table 4-19). Adherence to USACE Section 404 permit guidelines, along with mitigation opportunities

described in Section 4.4.8.1, and BMPs for pipeline and utility line crossing for streams and wetlands would also minimize potential impacts to these species by ensuring the protection of channel stability and fish spawning habitat. In addition, the perennial streams which contain habitat for Colorado River cutthroat trout, including Spring and Beaver creeks, would be subject to the timing limitations as outline in Table 4-20.

No surface occupancy would occur within 500 feet of any perennial streams or wetlands. Short-term disturbance within 500 feet of riparian and wetland areas during construction activities may temporarily and indirectly impact aquatic species through crushing and disturbance of vegetation and the potential for short-term changes to water quality, including siltation of streams. Adherence to reclamation standards, BMPs, erosion prevention plans, and SWPPPs, as described in Section 4.4.8, and mitigation opportunities described in Section 4.4.8.1 would minimize impacts to these species during construction activities. The use of the minimum practical width for ROWs associated with pipeline crossing would also reduce the short-term and long-term disturbance in riparian areas.

Aquatic species have the potential to be impacted by water depletions and hydrostatic testing within with RBPA. Water needs for the drilling and completion activities would not represent a significant adverse impact to aquatic species due to the minimal amount of water needed and off channel withdrawal locations. Hydrostatic testing of pipelines would not represent a significant adverse impact to aquatic species with the adherence to guidelines and BMPs as described in Section 4.4.8.1.

The potential for impacts to streams and riparian areas due to geohazard risk of multiple slumps and debris-laden earth flows which could potentially impact South Piney Creek and Beaver Creek are discussed under the Geology, Minerals, and Geohazards Section 4.1.3.

With implementation of BMPs and mitigation measures, no significant adverse impacts would occur to aquatic species as a result of Alternative 1.

4.8.4.2 Total Project Impacts with Alternative 1

4.8.4.2.1 Mule Deer

The non-federal actions associated with Alternative 1 would not result in any disturbance to mule deer crucial winter range or migration corridors within the RBPA. Total Project impacts to mule deer would be identical to those described under the Impacts of BLM Actions with Alternative 1 for mule deer. Long-term disturbance to mule deer crucial winter range and migration corridors would not exceed 0.16 acres/square mile (6.0 acres; Table 4-25) and 0.27 acre/square mile (9.2 acres; Table 4-26), respectively, of those crucial ranges within the RBPA. Seasonal timing restrictions identified in Appendices B and F would aid in reducing impacts to wintering and migrating mule deer. Additional mitigation measures aimed at reducing noise impacts and timing of construction activities would further limit potential indirect impacts to mule deer. Therefore, no significant adverse impacts would occur to mule deer as a result of Alternative 1.

10255 *4.8.4.2.2 Pronghorn*

10256 The non-federal actions associated with Alternative 1 would result in short-term and long-
10257 term disturbance to 10 acres of crucial winter range associated with the HLF. This represents
10258 0.65 acre/square mile of crucial winter range within the RBPA (Table 4-27). There would no
10259 disturbance within pronghorn migration corridors as a result of non-federal actions (Table 4-
10260 28).

10261 When combining BLM and non-federal disturbance, long-term disturbance to pronghorn
10262 crucial winter range and migration corridors would not exceed 0.97 acre/square mile (15
10263 acres; Table 4-27) and 0.27 acre/square mile (2 acres; Table 4-28), respectively, of those
10264 crucial ranges within the RBPA. Seasonal timing restrictions would aid in reducing impacts to
10265 wintering and migrating pronghorn. Additional mitigation measures aimed at reducing noise
10266 impacts and timing of construction activities would further limit potential indirect impacts to
10267 pronghorn. Therefore, no significant adverse impacts to pronghorn would occur as a result of
10268 the total Project actions of Alternative 1.

10269 *4.8.4.2.3 Moose*

10270 The non-federal actions associated with Alternative 1 would result in long-term disturbance to
10271 9.9 acres of crucial winter range associated with the M&HRF. This represents 0.28
10272 acre/square mile of crucial winter range within the RBPA (Table 4-29). Short-term
10273 disturbance associated with the M&HRF would impact approximately 26.1 acres of crucial
10274 winter range (Table 4-29). These short-term impacts would occur during construction periods
10275 authorized by BLM, and restoration of habitats would immediately follow construction
10276 activities.

10277 Moose may avoid the portion of the RBPA in the vicinity of the M&HRF and may seek more
10278 favorable habitat to avoid areas where noise levels are closer to ambient conditions and that
10279 are not within line-of-sight of movement routes and foraging areas. Vehicular activities along
10280 South Piney Creek and Middle Piney Creek may also disrupt moose activities within these
10281 drainages, particularly during sensitive winter months. However, construction activities would
10282 not occur during winter, thus reducing the extent of activities that could potentially disrupt
10283 moose crucial winter habitat.

10284 When combining BLM and non-federal disturbance long-term disturbance to moose crucial
10285 winter range would not exceed 0.70 acre/square mile (25.0 acres) within the RBPA and
10286 seasonal timing restrictions would aid in reducing impacts to wintering moose. Additional
10287 mitigation measures aimed at reducing noise impacts and timing of construction activities, as
10288 described in Appendices B and F, would further limit potential indirect impacts to moose.
10289 Therefore, no significant adverse impacts to moose would occur as a result of the total Project
10290 actions of Alternative 1.

10291 *4.8.4.2.4 Elk*

10292 The non-federal actions associated with Alternative 1 would result in long-term disturbance of
10293 10.0 acres of crucial winter range associated with the M&HRF within the RBPA. This
10294 represents 0.47 acre/square mile of habitat in the Riley Ridge Winter Range Complex (Table
10295 4-30). There would be no long-term disturbance to an elk parturition area (Table 4-31), but

there would be 0.3 acre of long-term disturbance to elk migration corridors (Table 4-32), which represents 0.06 acre/square mile of elk migration corridors within the RBPA. Short-term disturbance associated with the M&HRF would impact approximately 26.1 acres of elk habitat (Table 4-30) within the Riley Ridge Winter Range Complex and 0.7 acre of migration corridors (Table 4-32). These short-term impacts would occur during construction periods approved by BLM and WGFD, as identified in Appendices B and F.

Noise levels from the M&HRF could create additional indirect short-term and long-term impacts to elk due to the noise generated from the facility. Long-term noise impacts associated with the M&HRF operations would impact 10.0 acres or 0.47 acres/square mile of habitat in the Riley Ridge Winter Range Complex (Table 4-33; Table 4-60) which is less than the criteria for a significant impact (60 acres/square mile). Telemetry data collected between 2000 and 2002 indicate that elk utilize areas surrounding the M&HRF, but are mainly concentrated to the south and west of the plant site (Smith 2008). More recent studies initiated in January 2009 indicate that between January 5 through March 17 the highest density of elk locations in the Riley Ridge area occur immediately to the west and south of the proposed M&HRF. These concentrations coincide with the south-facing slopes of the Spring Creek drainage and the western ridgeline of Riley Ridge. Lower densities of elk locations occur to the northeast and south, including (to the south) the Spring Creek drainage and Reed Ridge, and (to the northeast) the eastern portion of Riley Ridge and the southern slopes of the South Piney Creek drainage.

No parturition areas would be impacted by noise from construction activities greater than 49 dBA, from the operation of the M&HRF (Table 4-34; Table 4-60). Elk have been found to use areas outside of mapped parturition areas (Barbknecht et al. 2007). Construction activities during May and June may indirectly influence elk behavior on unmapped parturition areas near the M&HRF. During the remaining months elk are concentrated within summer range to the west (Smith 2008).

Long-term noise impacts associated with the M&HRF operations would impact 0.3 acres of migration corridors (Table 4-35; Table 4-60) which accounts for 0.10 acre/square mile of migration routes within the RBPA. The M&HRF lies along the southern portion of an elk migration route and this area might be avoided by elk during migration periods. Elk may seek more favorable movement routes to avoid areas where noise levels are closer to ambient conditions and that are not within line-of-sight of the M&HRF. However, timing of outdoor construction activities at the site would avoid winter months, thus reducing the extent of activities that could potentially disrupt elk migration routes.

When combining BLM and non-federal disturbance, long-term disturbance to habitat would not exceed 0.77 acre/square mile (16.4 acres) of that range within the Riley Ridge Winter Range Complex. Long-term disturbance to parturition areas and migration routes would not exceed 1.73 acres/square mile (6.4 acres) and 0.10 acre/square mile (0.5 acre), respectively, of those crucial ranges within the RBPA. Seasonal timing restrictions would aid in reducing impacts to wintering and migrating elk. Additional mitigation measures aimed at reducing noise impacts and timing of construction activities would further limit potential indirect impacts to elk. Therefore, significant adverse impacts to elk would not occur as a result of Alternative 1.

4.8.4.2.5 Other Wildlife

Potential impacts to small mammals, reptiles, amphibians, birds, and aquatic species from the non-federal actions associated with Alternative 1 would include the construction of the M&HRF and the HLF. These facilities would result in a total of 20.0 acres of long-term and 36.1 acres of short-term disturbance (Table 2-1).

When combining BLM and non-federal actions, the Project would result in 64.7 acres of long-term and 859.6 acres of short-term disturbance (Table 2-1). Impacts from construction of overhead transmission lines, helium pipeline, fiber optic lines, and gas pipelines will be the same as those described under the BLM Actions associated with Alternative 1. Seasonal timing restrictions identified in Appendices B and F, mitigation measures, and BMPs would aid in reducing short-term and long-term impacts to small mammals, reptiles, amphibians, birds, and aquatic species. Therefore, no significant adverse impacts would occur to small mammals, reptiles, amphibians, birds, and aquatic species as a result of Alternative 1.

4.8.5 Alternative 2

4.8.5.1 Impacts of BLM Actions with Alternative 2

4.8.5.1.1 Mule Deer

The BLM actions of Alternative 2 would not include any long-term disturbance to crucial winter range (Table 4-25) or migration corridors within the RBPA (Table 4-26). No surface occupancy would occur within migration corridors less than 0.5 mile wide. Short-term impacts would disturb approximately 133 acres of crucial winter range (Table 4-25) and 47 acres of migration corridors (Table 4-26). These short-term impacts would occur during construction periods authorized by BLM (Appendices B and F), and restoration of habitats would immediately follow construction activities. Responses by mule deer to these activities would be the same as those identified in Alternative 1, and no adverse impacts would occur as a result of BLM actions with Alternative 2.

4.8.5.1.2 Pronghorn

The BLM actions of Alternative 2 would not include long-term disturbance to crucial winter range (Table 4-27) or migration corridors within the RBPA (Table 4-28). No surface occupancy would occur within migration corridors less than 0.5 mile wide. Short-term impacts would disturb approximately 11 acres of crucial winter range (Table 4-27) and 6 acres of migration corridors (Table 4-28). These short-term impacts would occur during construction periods authorized by BLM (Appendices B and F), and restoration of habitats would immediately follow construction activities. Responses by pronghorn to these activities would be the same as those identified in Alternative 1, and no adverse impacts would occur as a result of BLM actions with Alternative 2.

4.8.5.1.3 Moose

Impacts of the BLM actions of Alternative 2 include 8.6 acres of long-term disturbance to crucial winter range within the RBPA. This represents 0.24 acre/square mile of crucial winter range within the RBPA and is approximately 6.5 acres less than the long-term disturbance to crucial winter range under Alternative 1 (Table 4-29). Short-term impacts from BLM actions would result in disturbance to approximately 31 acres of crucial winter range (Table 4-29).

These short-term impacts would occur during construction periods authorized by BLM (Appendices B and F), and restoration of habitats would immediately follow construction activities. Responses by moose to road use, human activities, and well pad activity under Alternative 2 would be the same as those identified in Alternative 1.

4.8.5.1.4 Elk

BLM actions under Alternative 2 would result in long-term disturbance of 6.4 acres of habitat within the Riley Ridge Winter Range Complex (Table 4-30). This represents 0.30 acre/square mile of the habitat within the Riley Ridge Winter Range Complex and is less than the threshold for adverse impacts for the species. There would be 6.4 acres of long-term disturbance to an elk parturition area (Table 4-31); this range represents 1.73 acres/square mile of parturition areas within the RBPA. Alternative 2 would result in 0.2 acre or 0.04 acre/square mile of long-term disturbance of elk migration corridors within the RBPA (Table 4-32). The disturbances to all of these crucial ranges are equal to the respective long-term disturbances under Alternative 1, and is less than impact thresholds established for the species.

Short-term effects from BLM actions would disturb approximately 40 acres of habitat in the Riley Ridge Winter Range Complex, approximately 12 acres of parturition area, and approximately 6 acres of migration corridors. These short-term impacts would occur during authorized construction periods and impacts from BLM actions would be the same as those identified in Alternative 1.

Additional short-term BLM actions under Alternative 2 include road use and other human activities, well pad drilling, and pipeline construction. These activities would result in noise impacts to approximately 10,587 acres of crucial winter range (Table 4-33), 2,221 acres of parturition area (Table 4-34), and 2,312 acres of migration corridors (Table 4-35). These impacts are less than the amount of crucial winter range, parturition area, and migration corridor influenced under Alternative 1. Although there would be fewer acres of crucial habitats influenced by noise levels associated with construction and drilling operations, the timing of these activities would have the same influence on elk as those identified in Alternative 1.

4.8.5.1.5 Other Wildlife

Potential impacts to small mammals, reptiles, amphibians, birds, and aquatic species from BLM actions under Alternative 2 would be much less than those described in Alternative 1 since Alternative 2 has less overall length of transmission lines, pipelines, and fiber optic lines, and fewer stream crossings occurring on BLM lands. Thus there would be a decreased potential for temporary displacement of these species from their habitats under Alternative 2 compared to Alternatives 1, 3, and 4, as a result of BLM actions.

4.8.5.2 Total Project Impacts with Alternative 2

4.8.5.2.1 Mule Deer

The non-federal actions associated with Alternative 2 would have no long-term disturbance to crucial winter range within the RBPA (Table 4-25). There would be 4.7 acres or 0.14 acre/square mile of long-term disturbance to mule deer migration corridors due to the

unauthorized use of the two-track road along the overhead transmission line (Table 4-26). The disturbance to migration corridors is 4.7 acres greater than non-federal impacts to migration corridors under Alternative 1. Short-term impacts would disturb approximately 138 acres of migration corridors (Table 4-26). These short-term impacts would occur during construction periods authorized by BLM (Appendices B and F), and restoration of habitats would immediately follow construction activities. Responses by mule deer would be identical to those identified in Alternative 1.

When combining BLM and non-federal disturbance, there would be no long-term disturbance to mule deer crucial winter range, which is 6 acres less than disturbance to crucial winter range under Alternative 1 (Table 4-25). Long-term disturbance on BLM and non-federal lands would not exceed 0.14 acre/square mile (4.7 acres) of migration corridors within the RBPA, which is 5.5 acres less than impacts to migration corridors under Alternative 1 (Table 4-26). Seasonal timing restrictions would aid in reducing impacts to wintering and migrating mule deer. Additional mitigation measures aimed at reducing noise impacts and timing of construction activities would further limit potential indirect impacts to mule deer. Therefore, no significant adverse impacts to mule deer would occur as a result of Alternative 2.

4.8.5.2.2 Pronghorn

The non-federal actions associated with Alternative 2 would result in long-term disturbance of 12.9 acres or 0.84 acre/square mile of crucial winter range on non-federal lands within the RBPA (Table 4-27). Alternative 2 would also result in 0.7 acre or 0.09 acre/square mile of long-term disturbance to pronghorn migration corridors within the RBPA (Table 4-28). Both of these measures are less than the amount of long-term disturbance to these crucial ranges on non-federal lands with Alternative 1. Short-term effects would disturb approximately 99 acres of crucial winter range (Table 4-27) and 25 acres of migration corridors (Table 4-28). These short-term impacts would occur during BLM approved construction periods and responses by pronghorn would be identical to those identified for non-federal components with Alternative 1.

When combining BLM and non-federal lands, long-term disturbance to pronghorn crucial winter range and migration corridors would not exceed 0.84 acre/square mile (12.9 acres) and 0.09 acre/square mile (0.7 acre), respectively, within the RBPA. This is 2.1 acres and 1.3 acres less than the long-term disturbance to crucial winter range and migration corridors under Alternative 1. Seasonal timing restrictions would aid in reducing impacts to wintering and migrating pronghorn. Additional mitigation measures aimed at reducing noise impacts and timing of construction activities would further limit potential indirect impacts to pronghorn. Therefore, no significant adverse impacts would occur to pronghorn as a result of Alternative 2.

4.8.5.2.3 Moose

The non-federal actions associated with Alternative 2 would result in long-term disturbance of 24.4 acres of crucial winter range would be disturbed, long-term, on non-federal lands within the RBPA. This represents 0.69 acre/square mile of crucial winter range within the RBPA and is approximately 14 acres greater than long-term disturbance to crucial winter range on non-federal lands under Alternative 1 (Table 4-29). Short-term impacts would be greater, and

would disturb approximately 504 acres of crucial winter range (Table 4-29). These short-term impacts would occur during construction periods and responses by moose would be identical to those identified in Alternative 1. Additional responses by moose to roads, human activities, and the M&HRF would be similar to those identified in Alternative 1.

When combining BLM and non-federal disturbance, long-term disturbance to moose crucial winter range would not exceed 0.93 acre/square mile (33 acres) within the RBPA. This disturbance is approximately 8 acres more than total disturbance associated with Alternative 1. Seasonal timing restrictions would aid in reducing impacts to wintering moose. Additional mitigation measures aimed at reducing noise impacts and timing of construction activities would further limit potential indirect impacts to moose. Therefore, no significant adverse impacts would occur to moose as a result of Alternative 2.

4.8.5.2.4 Elk

The non-federal actions associated with Alternative 2 would result in long-term disturbance of 10.5 acres or 0.49 acre/square mile of habitat within the Riley Ridge Winter Range Complex on non-federal lands within the RBPA (Table 4-30). There would be no long-term disturbance to elk parturition areas (Table 4-31) and 0.3 acre or 0.06 acre/square mile of long-term disturbance to elk migration corridors within the RBPA (Table 4-32). The disturbances to migration corridors and parturition areas are equal to the respective long-term disturbances compared with Alternative 1. The disturbance to habitat within the Riley Ridge Winter Range Complex is 0.5 acre higher compared to Alternative 1. Short-term impacts would disturb approximately 54 acres of habitat within the Riley Ridge Winter Range Complex, and approximately 52 acres of migration corridors. These short-term impacts would occur during construction periods and responses by elk to these activities would be the same as those identified in Alternative 1. Additional responses by elk to roads, human activities, and well pad activity would be identical to those identified in Alternative 1.

Long-term noise impacts associated with the M&HRF operations would be identical to those described under Alternative 1. Additional short-term disturbance associated with the utility corridor would overlap habitat within the Riley Ridge Winter Range Complex, parturition area, and migration corridors; however, no long-term disturbance would be associated with construction activities. Tables 4-33, 4-34, and 4-35 provide the acres of disturbance to elk crucial habitat from noise by alternative. Additional impacts associated with roads, human activities, well pad drilling, and pipeline/transmission line construction would be identical to Alternative 1. Short-term noise impacts associated with well drilling and pipeline/transmission line construction would overlap 10,587 acres of habitat within the Riley Ridge Winter Range Complex (Table 4-33), 2,221 acres of parturition area (Table 4-34), and 2,312 acres of migration corridors (Table 4-35). These impacts affect 2,747 acres and 731 acres, respectively, less than the amount of habitat within the Riley Ridge Winter Range Complex and migration corridor influenced under Alternative 1. Although there would be more acres of crucial habitats influenced by noise levels associated with construction and drilling operations, the timing of these activities would have the same influence on elk as those identified under Alternative 1.

When combining BLM and non-federal disturbance, long-term disturbance to habitat within the Riley Ridge Winter Range Complex would not exceed 0.77 acre/square mile (16.4 acres)

of that range within the RBPA (Table 4-30). Long-term disturbance to parturition areas and migration routes would not exceed 1.73 acres/square mile (6.4 acres; Table 4-31) and 0.10 acre/square mile (0.5 acre; Table 4-32), respectively, of those crucial ranges within the RBPA. Long-term disturbance to these crucial ranges is identical to total long-term impacts to those respective crucial ranges under Alternative 1. Seasonal timing restrictions would aid in reducing impacts to wintering and migrating elk. Additional mitigation measures aimed at reducing noise impacts and timing of construction activities would further limit potential indirect impacts to elk. Therefore, with implementation of mitigation measures and BMPs presented in Section 4.8.9 and in Appendices B and F, no significant adverse impacts to elk would occur as a result of Alternative 2.

4.8.5.2.5 Other Wildlife

Potential impacts to small mammals, reptiles, amphibians, birds, and aquatic species under Alternative 2 would be similar to those described under Alternative 1. Alternative 2 has greater length of transmission lines, pipelines, and fiber optic lines and more ephemeral and perennial stream crossings than the other Alternatives. Thus there would be an increased potential for temporary displacement of these species from their habitats under Alternative 2 compared to Alternatives 1, 3, and 4. With implementation of mitigation measures and BMPs presented in Section 4.8.4 and in Appendices B and F, no significant adverse impacts to small mammals, reptiles, amphibians, birds, and aquatic species would occur as a result of Alternative 2.

4.8.6 Alternative 3

4.8.6.1 Impacts of BLM Actions with Alternative 3

4.8.6.1.1 Mule Deer

BLM actions under Alternative 3 would result in long-term disturbance to 4.3 acres or 0.11 acre/square mile of mule deer crucial winter range within the RBPA. This disturbance is less than long-term impacts to crucial winter range anticipated for federal actions under Alternative 1 (Table 4-25). BLM actions under Alternative 3 would also result in 10.7 acres or 0.31 acre/square mile of long-term disturbance to mule deer migration corridors within the RBPA (Table 4-26).

Short-term impacts of BLM actions under Alternative 3 would disturb approximately 289.4 acres of crucial winter range (Table 4-25) and 254.0 acres of migration corridors (Table 4-26). These short-term impacts associated with roads, human activities, and transmission lines would occur during construction periods authorized by BLM (Appendices B and F), and restoration of habitats would immediately follow construction activities. The responses of mule deer to these activities would be reduced from those described under Alternative 1. Therefore, no significant adverse impacts would occur to mule deer as a result of the BLM actions under Alternative 3.

4.8.6.1.2 Pronghorn

BLM actions under Alternative 3 would result in long-term disturbance to 4.0 acres or 0.26 acre/square mile of crucial winter range within the RBPA (Table 4-27). BLM actions under Alternative 3 would also result in long-term disturbance to 0.3 acre or 0.04 acre/square mile

of pronghorn migration corridors within the RBPA (Table 4-28). Long-term disturbance within crucial winter range is 1.0 acre less than the disturbance under Alternative 1. Long-term disturbance within migration corridors is 4.7 acres less than disturbance Alternative 1.

Short-term impacts would disturb approximately 117.2 acres of crucial winter range (Table 4-27) and 31.7 acres of migration corridors (Table 4-28). These short-term impacts would occur during construction periods authorized by BLM (Appendices B and F), and restoration of habitats would immediately follow construction activities. The responses of pronghorn to these activities would be reduced from those described under Alternative 1. Therefore, no significant adverse impacts would occur to pronghorn as a result of the BLM actions under Alternative 3.

4.8.6.1.3 Moose

BLM actions under Alternative 3 would result in long-term disturbance to 12.6 acres or 0.35 acre/square mile of crucial winter range within the RBPA. This disturbance is 2.5 acres less than the long-term disturbance to moose crucial winter range under Alternative 1 (Table 4-29). Short-term impacts would disturb approximately 208.9 acres of crucial winter range (Table 4-29). These short-term impacts would occur during construction periods authorized by BLM (Appendices B and F), and restoration of habitats would immediately follow construction activities. The responses of moose to these activities would be reduced from those described under Alternative 1. Therefore, no significant adverse impacts would occur to moose as a result of the BLM actions under Alternative 3.

4.8.6.1.4 Elk

BLM actions under Alternative 3 would result in long-term disturbance to 7.8 acres or 0.37 acre/square mile of habitat within the Riley Ridge Winter Range Complex. This is 1.4 acres greater than the amount of habitat within the Riley Ridge Winter Range Complex disturbed under Alternatives 1 and 2 (Table 4-30). There would be 6.4 acres of long-term disturbance to an elk parturition area; this range represents 1.73 acres/square mile of parturition areas within the RBPA and approximately equal to the long-term disturbance to parturition area under Alternative 1 (Table 4-31). Alternative 3 would also result in long-term disturbance to 1.8 acres or 0.35 acre/square mile of elk migration corridors within the RBPA (Table 4-32).

Short-term impacts would be lower compared with Alternative 1, and would disturb approximately 270.0 acres of crucial winter range, approximately 12 acres of parturition area, and approximately 104.7 acres of migration corridors. These short-term impacts would occur during construction periods authorized by BLM (Appendices B and F), and restoration of habitats would immediately follow construction activities. Responses by elk to these activities would be similar to those described under Alternative 1. Therefore, no significant adverse impacts would occur to elk as a result of the BLM actions under Alternative 3.

4.8.6.1.5 Other Wildlife

Potential impacts to small mammals, reptiles, amphibians, birds, and aquatic species associated with the BLM actions under Alternative 3 would be similar to those described under Alternative 1. Alternative 3 has the same number of stream crossings associated with pipelines and fiber optic lines compared to Alternative 1, however Alternative 3 has 8.0 miles

of shared pipeline trench and ROW (100 feet) for the natural gas and helium pipelines. Perennial stream crossing on Spring and Beaver creeks would also be bored instead of trenched, as discussed under Section 4.4. Potential impacts to riparian vegetation at these crossings would be reduced when compared with Alternatives 1, 2, and 4. Therefore, no significant adverse impacts would occur to small mammals, reptiles, amphibians, birds, and aquatic species as a result of the BLM actions under Alternative 3.

4.8.6.2 Total Project Impacts with Alternative 3

4.8.6.2.1 Mule Deer

The non-federal actions associated with Alternative 3 would have no short-term or long-term impacts to mule deer crucial winter range or migration corridors within the RBPA. The absence of disturbance to these crucial ranges is similar to impacts on non-federal lands under Alternative 1.

When combining BLM and non-federal disturbance, there would be 4.3 acres of long-term disturbance to mule deer crucial winter range, which is 0.11 acre/square mile of crucial winter range within the RBPA (Table 4-25). This disturbance is 1.7 acres less than disturbance to crucial winter range under Alternative 1. Long-term disturbance on BLM and non-federal lands would not exceed 0.31 acre/square mile (10.7 acres) of migration corridors within the RBPA, which is 1.5 acres greater than impacts to migration corridors under Alternative 1 (Table 4-26). Seasonal timing restrictions would aid in reducing impacts to wintering and migrating mule deer. Additional mitigation measures aimed at reducing noise impacts and timing of construction activities would further limit potential indirect impacts to mule deer. Therefore no significant adverse impacts to mule deer would occur as a result of Alternative 3.

4.8.6.2.2 Pronghorn

The non-federal actions associated with Alternative 3 would result in long-term disturbance to 10.0 acres of crucial winter range within the RBPA. This represents 0.65 acre/square mile of crucial winter range within the RBPA (Table 4-27). The non-federal actions of Alternative 3 would result in no disturbance to pronghorn migration corridors (Table 4-28). Both of these disturbance acres are equal to the amount of long-term disturbance to these crucial ranges when compared with Alternative 1.

When combining BLM and non-federal lands, long-term disturbance to pronghorn crucial winter range and migration corridors would not exceed 0.91 acre/square mile (14.0 acres; Table 4-27) and 0.04 acre/square mile (0.3 acre; Table 4-28), respectively, within the RBPA. Disturbance within crucial winter range is equal to the amount of disturbance to this range under Alternative 1. Disturbance within migration corridors is less than the amount of disturbance to this range under Alternative 1. Seasonal timing restrictions would aid in reducing impacts to wintering and migrating pronghorn. Additional mitigation measures aimed at reducing noise impacts and timing of construction activities would further limit potential indirect impacts to pronghorn as a result of Alternative 3. Therefore no significant adverse impacts to pronghorn would occur as a result of Alternative 3.

10628 *4.8.6.2.3 Moose*

10629 The non-federal actions associated with Alternative 3 would result in long-term disturbance to
10630 9.9 acres of crucial winter range within the RBPA. This represents 0.28 of crucial winter
10631 range within the RBPA and is equal to the amount of long-term disturbance to crucial winter
10632 range on non-federal lands under Alternative 1 (Table 4-29). Short-term impacts would
10633 disturb approximately 26.1 acres of crucial winter range (Table 4-29). These short-term
10634 impacts would occur during construction periods and responses by moose to road use, human
10635 activities, and the construction of the M&HRF would be similar to those identified in
10636 Alternative 1.

10637 When combining BLM and non-federal disturbance, long-term disturbance to moose crucial
10638 winter range would not exceed 0.97 acre/square mile (22.5 acres) within the RBPA. This
10639 disturbance is approximately 2.5 acres less than the total disturbance associated with
10640 Alternative 1. Seasonal timing restrictions and other mitigation measures aimed at reducing
10641 noise impacts further aid in reducing impacts to wintering moose (Appendices B and F).
10642 Therefore, significant adverse impacts to moose would not occur as a result of Alternative 3.

10643 *4.8.6.2.4 Elk*

10644 The non-federal actions associated with Alternative 3 would result in long-term disturbance to
10645 10.0 acres or 0.47 acre/square mile of habitat within the Riley Ridge Winter Range Complex
10646 (Table 4-30). There would be no long-term disturbance to elk parturition area (Table 4-31)
10647 and 0.3 acre or 0.06 acre/square mile of long-term disturbance to elk migration corridors
10648 (Table 4-32). The disturbances to all three of these crucial ranges are equal to the respective
10649 long-term disturbances under Alternative 1. Long-term noise impacts associated with the
10650 M&HRF operations would be identical to Alternative 1. Implementation of mitigation
10651 measures identified in Appendices B and F would reduce the long-term impacts of noise on
10652 elk movements to levels acceptable to BLM and WGFD.

10653 Short-term impacts would disturb approximately 26 acres of habitat within the Riley Ridge
10654 Winter Range Complex, approximately 12 acres of parturition area, and approximately 0.7
10655 acre of migration corridors. These short-term impacts would occur during construction
10656 periods authorized by BLM (Appendices B and F), and restoration of habitats would
10657 immediately follow construction activities. Responses by elk to construction activities would
10658 be the same as those identified in Alternative 1.

10659 When combining BLM and non-federal disturbance, long-term disturbance to habitat within
10660 the Riley Ridge Winter Range Complex would not exceed 0.84 acre/square mile (17.8 acres)
10661 of that range within the RBPA. Long-term disturbance to parturition areas and migration
10662 routes would not exceed 1.73 acre/square mile (6.4 acres) and 0.41 acre/square mile (2.1
10663 acres), respectively, of those crucial ranges within the RBPA. Long-term disturbance to
10664 habitat in the Riley Ridge Winter Range Complex and migration corridors is greater under
10665 Alternative 3 when compared with all other alternatives. Implementation of seasonal timing
10666 restrictions and other mitigation measures aimed at reducing noise impacts and impacts of
10667 construction activities would further limit potential indirect impacts to elk as a result of
10668 Alternative 3. Therefore, no significant adverse impacts would occur to elk as a result of
10669 Alternative 3.

4.8.6.2.5 Other Wildlife

Potential impacts to small mammals, reptiles, amphibians, birds, and aquatic species under Alternative 3 would be similar to those described under Alternative 1. Alternative 3 has an equal number of stream crossings associated with pipelines and fiber optic lines compared to Alternative 1; however, Alternative 3 has 8.0 miles of shared pipeline trench and ROW (100 feet) for the natural gas and helium pipelines. Perennial stream crossings on Spring and Beaver creeks would also be bored instead of trenched, as discussed under Section 4.5.5. Potential impacts to riparian vegetation at these crossings would be reduced compared to Alternatives 1, 2, and 4. Therefore, no significant adverse impacts would occur to small mammals, reptiles, amphibians, birds, and aquatic species as a result of the Alternative 3.

4.8.7 Alternative 4

4.8.7.1 Impacts of BLM Actions with Alternative 4

4.8.7.1.1 Mule Deer

BLM actions under Alternative 4 would result in no long-term disturbance to mule deer crucial winter range (Table 4-25) or migration corridors (Table 4-26) within the RBPA. This is 6.0 acres and 9.2 acres less, respectively, than the amount of crucial winter range and migration corridors impacted in the long-term by Alternative 1 (Table 4-25 and Table 4-26).

Short-term impacts would disturb approximately 247 acres of crucial winter range (Table 4-25) and 155 acres of migration corridors (Table 4-26). These and other short-term impacts associated with increased road use, human activities, and construction of pipelines would occur within wildlife timing stipulations and responses by mule deer to these activities would be identical to those identified in Alternative 1. Therefore, no significant adverse impacts would occur to mule deer as a result of the BLM actions under Alternative 4.

4.8.7.1.2 Pronghorn

BLM actions under Alternative 4 would result in no long-term disturbance to crucial winter range or migration corridors within the RBPA. This is 5.0 acres and 2.0 acres less, respectively, than the amount of crucial winter range and migration corridors that would be impacted in the long-term by Alternative 1 (Table 4-27 and Table 4-28). Short-term impacts would disturb approximately 60 acres of crucial winter range (Table 4-27) and 24 acres of migration corridors (Table 4-28). These and other short-term impacts associated with roads, human activities, and construction of pipelines would occur within wildlife timing stipulations, resulting in impacts identical to those identified in Alternative 1. Therefore, no significant adverse impacts would occur to pronghorn as a result of the BLM actions under Alternative 4.

4.8.7.1.3 Moose

BLM actions under Alternative 4 would result in long-term disturbance to 8.6 acres or 0.24 acre/square mile of moose crucial winter range. This disturbance is 6.5 acres less than long-term disturbance to crucial winter range under Alternative 1 (Table 4-29). Short-term impacts would be greater, and would disturb approximately 171 acres of crucial winter range (Table 4-29). These and other short-term impacts associated with moose responses to road use, human activities, and construction of pipelines would occur within wildlife timing stipulations,

resulting in short-term impacts similar to those identified in Alternative 1. Therefore, no significant adverse impacts would occur to moose as a result of the BLM actions under Alternative 4.

4.8.7.1.4 Elk

BLM actions under Alternative 4 would result in long-term loss of 6.5 acres or 0.31 acre/square mile of habitat within the Riley Ridge Winter Range Complex. This disturbance is similar to the amount of crucial winter range disturbed, long-term, under Alternative 1 (Table 4-30). There would be 6.4 acres of long-term disturbance to an elk parturition area and 0.2 acre or 0.04 acre/square mile of long-term disturbance to elk migration corridors, which represents of elk migration corridors within the RBPA and is equal to the amount of long-term disturbance to migration corridors under Alternative 1 (Table 4-32).

Short-term impacts to habitat within the Riley Ridge Winter Range Complex and migration corridors would result in temporary disturbance of approximately 218 acres of crucial habitat within the Riley Ridge Winter Range Complex (Table 4-30) and approximately 75 acres of migration corridors (Table 4-32). Short-term impacts to parturition areas would be the same as in Alternative 1 (Table 4-31). These and other short-term impacts associated with elk responses to road use, human activities, and construction of pipelines would occur during construction periods with timing stipulations, resulting in impacts identical to those identified in Alternative 1. Additional impacts associated with roads, human activities, well pad drilling, and pipeline/transmission line construction would be identical to Alternative 1. Short-term noise impacts associated with well drilling and pipeline/transmission line construction would overlap 13,334 acres of habitat within the Riley Ridge Winter Range Complex (Table 4-33), 2,221 acres of parturition area (Table 4-34), and 3,042 acres of migration corridors (Table 4-35). Implementation of mitigation measures and BMPs identified in Appendices B and F would reduce short-term impacts to elk from BLM actions under Alternative 4. Therefore, no significant adverse impacts would occur to elk as a result of the BLM actions under Alternative 4.

4.8.7.1.5 Other Wildlife

Potential impacts to small mammals, reptiles, amphibians, birds, and aquatic species from pipeline crossings under Alternative 4 would be the same as those described under Alternative 1. The potential for loss of habitat is lower under Alternative 4 than Alternatives 1, 2, and 3 because disturbance associated with the transmission line would not occur. Potential impacts to riparian vegetation at these crossings would be lower compared to Alternatives 1, 2, and 3. Therefore, no significant adverse impacts would occur to small mammals, reptiles, amphibians, birds, and aquatic species as a result of the BLM actions under Alternative 4.

4.8.7.2 Total Project Impacts with Alternative 4

4.8.7.2.1 Mule Deer

The non-federal actions associated with Alternative 4 would result in no long-term disturbance to mule deer crucial winter range or migration corridors on non-federal lands within the RBPA. The absence of disturbance to these crucial ranges is similar to impacts on non-federal lands under Alternative 1.

When combining BLM and non-federal disturbance, there would be no long-term disturbance to mule deer crucial winter range or migration corridors (Tables 4-25 and 4-26). This disturbance is 6.0 acres and 9.1 acres less, respectively, than disturbance to crucial winter range and migration corridors under Alternative 1. Seasonal timing restrictions would aid in reducing impacts to wintering and migrating mule deer. Additional mitigation measures aimed at reducing noise impacts and timing of construction activities would further limit potential indirect impacts to mule deer. Therefore, no significant adverse impacts would occur to mule deer as a result of Alternative 4.

4.8.7.2.2 Pronghorn

The non-federal actions associated with Alternative 4 would result in long-term disturbance to 10 acres or 0.65 acre/square mile of crucial winter range within the RBPA (Table 4-27). Alternative 4 would result in no long-term disturbance to pronghorn migration corridors, which is equal to the long-term disturbance to migration corridors under Alternative 1 (Table 4-28).

When combining BLM and non-federal lands, there would be 10 acres of long-term disturbance to pronghorn crucial winter range within the RBPA, which is less than crucial winter range disturbed, long-term, under Alternative 1. No long-term disturbance to migration corridors would occur under Alternate 4. Seasonal timing restrictions would aid in reducing impacts to wintering and migrating pronghorn. Additional mitigation measures aimed at reducing noise impacts and timing of construction activities would further limit potential indirect impacts to pronghorn. Therefore, no significant adverse impacts would occur to pronghorn as a result of Alternative 4.

4.8.7.2.3 Moose

The non-federal actions associated with Alternative 4 would result in long-term disturbance to 16.9 acres or 0.47 acre/square mile of crucial winter range within the RBPA (Table 4-29). This disturbance is 7 acres greater than long-term disturbance to crucial winter range on non-federal lands under Alternative 1 (Table 4-29). Short-term impacts would disturb approximately 51 acres of crucial winter range (Table 4-29). These short-term impacts would be greater under Alternative 4 compared to Alternative 1. Additional responses by moose to roads, human activities, and the M&HRF would be similar to those identified in Alternative 1. The addition of the natural gas power plant would result in long-term disturbance to moose crucial winter habitat and could add additional noise impacts to moose utilizing areas surrounding the M&HRF and power plant.

When combining BLM and non-federal disturbance, long-term disturbance to moose crucial winter range would not exceed 0.65 acre/square mile (25.5 acres) within the RBPA. This disturbance is 0.5 acre greater than the total disturbance associated with Alternative 1. Seasonal timing restrictions would aid in reducing impacts to wintering moose. Additional mitigation measures aimed at reducing noise impacts and timing of construction activities would further limit potential indirect impacts to moose. Therefore, no significant adverse impacts would occur to moose as a result of Alternative 4.

10792 *4.8.7.2.4 Elk*

10793 The non-federal actions associated with Alternative 4 would result in long-term disturbance to
10794 18.4 acres or 0.86 acre/square mile of habitat within the Riley Ridge Winter Range Complex
10795 within the RBPA (Table 4-30). This disturbance is 8.4 acres greater than the amount of habitat
10796 disturbed, long-term under the non-federal actions under Alternative 1 (Table 4-30). There
10797 would be no long-term disturbance to an elk parturition area (Table 4-31) and 0.3 acre of
10798 long-term disturbance to elk migration corridors (Table 4-32); these impacts are equal to those
10799 impacts for similar crucial ranges under Alternative 1. Short-term impacts would disturb
10800 approximately 51 acres of habitat within the Riley Ridge Winter Range Complex (Table 4-
10801 30), and less than 1 acre of migration corridors (Table 4-32). These short-term impacts would
10802 occur during construction periods and responses by elk to these activities would be the same
10803 as those identified in Alternative 1. Additional responses by elk to roads, human activities,
10804 and well pad activity would be identical to those identified in Alternative 1.

10805 Under Alternative 4, long-term noise impacts to parturition areas (Table 4-34) and migration
10806 corridors (Table 4-35) would be identical to Alternative 1; impacts to habitat within the Riley
10807 Ridge Winter Range Complex would be 11 acres greater than Alternative 1. Additional short-
10808 term disturbance associated with the M&HRF and natural gas power plant would overlap
10809 habitat within the Riley Ridge Winter Range Complex, parturition area, and migration
10810 corridors; however, no long-term disturbance would be associated with construction activities.
10811 Tables 4-33, 4-34, and 4-35 provide the acres of disturbance to elk crucial habitat from noise
10812 by alternative. Additional impacts associated with roads, human activities, and facility
10813 operation would be identical to Alternative 1. Short-term noise impacts associated with
10814 construction would overlap 68 acres of habitat within the Riley Ridge Winter Range Complex
10815 (Table 4-33), and 4.6 acres of migration corridors (Table 4-35). These impacts are 11 acres
10816 greater than the amount of habitat within the Riley Ridge Winter Range Complex under
10817 Alternative 1; short-term impacts to parturition areas and migration corridors would be equal
10818 to those under Alternative 1. The timing of these activities would have the same influence on
10819 elk as those identified Alternative 1. The addition of the natural gas power plant would result
10820 in long-term disturbance to elk crucial winter habitat and could add additional noise impacts
10821 to elk utilizing a migration corridor located to the north of the M&HRF and power plant.

10822 When combining BLM and non-federal disturbance, long-term disturbance to habitat within
10823 the Riley Ridge Winter Range Complex would not exceed 1.17 acres/square mile (24.9 acres)
10824 of that range within the RBPA (Table 4-30). Long-term disturbance to parturition areas and
10825 migration routes would not exceed 1.73 acres/square mile (6.4 acres; Table 4-31) and 0.10
10826 acre/square mile (0.5 acre; Table 4-32), respectively, of those crucial ranges within the
10827 RBPA. Long-term disturbance to migration corridors and parturition areas are identical to
10828 total long-term impacts to migration corridors under Alternative 1; impacts to habitat within
10829 the Riley Ridge Winter Range Complex and parturition areas are approximately 9 acres
10830 greater when compared to Alternative 1. Seasonal timing restrictions would aid in reducing
10831 impacts to wintering and migrating elk. Additional mitigation measures aimed at reducing
10832 noise impacts and timing of construction activities would further limit potential indirect
10833 impacts to elk. Therefore, with implementation of mitigation measures and BMPs provided in
10834 Appendices B and F, no significant adverse impacts would occur to elk as a result of
10835 Alternative 4.

10836 *4.8.7.2.5 Other Wildlife*

10837 Potential impacts to small mammals, reptiles, amphibians, birds, and aquatic species from
10838 pipeline crossings under Alternative 4 would be the same as those described under Alternative
10839 1. The potential for loss of habitat is lower under Alternative 4 than Alternatives 1, 2, and 3
10840 because disturbance associated with the transmission line would not occur. Potential impacts
10841 to riparian vegetation at these crossings would be lower compared to Alternatives 1, 2, and 3.
10842 As described under the No Action Alternative, long-term disturbance associated with the
10843 M&HRF would be associated with the footprint of the plant site (10 acres) and increased
10844 human activity associated with the operation of the M&HRF. Additional long-term
10845 disturbance and human activity would be associated with the natural gas power plant. This
10846 temporary dislocation and long-term loss of habitat should not affect small mammals, reptiles,
10847 amphibians, birds, and aquatic species or their prey within the vicinity of the M&HRF and
10848 natural gas power plant. Therefore, no significant adverse impacts would occur to small
10849 mammals, reptiles, amphibians, birds, and aquatic species as a result of Alternative 4.

10850 **4.8.8 Cumulative Impacts**

10851 The proposed Project would contribute incremental adverse impacts to existing and future
10852 foreseeable projects, including disturbance along migration routes and long-term loss of
10853 crucial winter ranges and parturition areas that occur within and adjacent to the RBPA as the
10854 result of multiple energy development projects. Existing and future expansion of oil and gas
10855 developments, such as the existing La Barge and Tip Top oil and gas field developments and
10856 the proposed Big Piney-LaBarge Infill Project, as well as associated industrial, commercial,
10857 and residential development, could cumulatively contribute to increased habitat fragmentation
10858 and the reduction in range of some animals in the future. The BLM-PFO estimates existing oil
10859 and gas development will likely double over the foreseeable future. Existing and reasonably
10860 foreseeable future expansions could contribute to increased habitat fragmentation and the
10861 reduction in range of some animals in the future.

10862 Studies in the RBPA have found that elk have demonstrated some avoidance of noise and
10863 human activity associated with oil and gas developments (Hayden-Wing Associates 1980).
10864 The proposed Project could contribute to avoidance of the RBPA by migrating big game
10865 species and elk and moose that winter in the vicinity of the proposed M&HRF. Potential
10866 avoidance and displacement of elk, in particular, to future increases in oil and gas
10867 developments could result in elk increasing their distribution on private lands, which in turn
10868 could increase the damage to crops, increase the potential for commingling with livestock,
10869 and raise the risk of brucellosis transmission. Brucellosis transmission could also increase due
10870 to elk being displaced from native range to feedgrounds (e.g., Finnegan feedground).
10871 Displacement could also cause elk to move to other Hunt Areas, thus reducing the population
10872 objective for Hunt Area 94 and the hunter opportunity in that Hunt Area.

10873 The proposed Project would contribute to existing disturbance within elk habitat in the Riley
10874 Ridge Winter Range Complex. There are currently 41.0 acres/square mile of existing
10875 disturbance from oil and gas development, roads and railroads, and/or urban industrial
10876 development within habitat in the Riley Ridge Winter Range Complex in the RBPA.
10877 Projected future oil and gas development in the RBPA would contribute an additional 9.6
10878 acres/square mile of disturbance within habitat in the Riley Ridge Winter Range Complex in

the RBPA. With the incremental addition of the proposed Project disturbance, the total cumulative disturbance would be approximately 51.3 acres/square mile to 51.7 acres/square mile of habitat in the Riley Ridge Winter Range Complex within the RBPA depending on the alternative selected. The proposed Project would add between 1.50% and 2.26% to the total cumulative disturbance habitat in the Riley Ridge Winter Range Complex in the RBPA, depending on the alternative selected.

The proposed Project would contribute to existing disturbance within mule deer crucial winter and crucial winter habitat within the RBPA. There are currently 92.5 acres/square mile of existing disturbance from roads and railroads, and/or urban industrial development within habitat in crucial winter and crucial winter habitat in the RBPA. Projected future oil and gas development in the RBPA would contribute an additional 46.1 acres/square mile of disturbance within crucial winter and crucial winter habitat within the RBPA. With the incremental addition of the proposed Project disturbance, the total cumulative disturbance would be approximately 138.6 acres/square mile to 138.7 acres/square mile of mule deer crucial winter and crucial winter habitat within the RBPA depending on the alternative selected. The proposed Project would add between 0% and 0.11% to the total cumulative disturbance habitat in mule deer crucial winter and crucial winter habitat in the RBPA, depending on the alternative selected.

The proposed Project would contribute to existing disturbance within moose crucial winter habitat within the RBPA. There are currently 25.0 acres/square mile of existing disturbance from roads and railroads, and/or urban industrial development within habitat in moose crucial winter habitat in the RBPA. Projected future oil and gas development in the RBPA would contribute an additional 1.5 acres/square mile of disturbance within moose crucial winter habitat within the RBPA. With the incremental addition of the proposed Project disturbance, the total cumulative disturbance would be approximately 26.6 acres/square mile to 26.9 acres/square mile of moose crucial winter habitat within the RBPA depending on the alternative selected. The proposed Project would add between 2.4% and 3.4% to the total cumulative disturbance in moose crucial winter habitat in the RBPA, depending on the alternative selected.

The proposed Project would contribute to existing disturbance within pronghorn crucial winter habitat within the RBPA. There are currently 26.8 acres/square mile of existing disturbance from roads and railroads, and/or urban industrial development within habitat in pronghorn crucial winter habitat in the RBPA. Projected future oil and gas development in the RBPA would contribute an additional 4.5 acres/square mile of disturbance within pronghorn crucial winter habitat within the RBPA. With the incremental addition of the proposed Project disturbance, the total cumulative disturbance would be approximately 31.9 acres/square mile to 32.2 acres/square mile of pronghorn crucial winter habitat within the RBPA depending on the alternative selected. The proposed Project would add between 2.0% and 3.0% to the total cumulative disturbance in pronghorn crucial winter habitat in the RBPA, depending on the alternative selected.

The proposed Project would contribute to existing disturbance within elk parturition areas. There are currently 44.4 acres/square mile of existing disturbance from roads and railroads, and/or urban industrial development within habitat in elk parturition areas in the RBPA. There

is no projected future oil and gas development within elk parturition areas in the RBPA. With the incremental addition of the proposed Project disturbance, the total cumulative disturbance would be approximately 45.6 acres/square mile to 46.1 acres/square mile of habitat in elk parturition areas within the RBPA depending on the alternative selected. The proposed Project would add between 2.73% and 3.75% to the total cumulative disturbance in elk parturition areas in the RBPA, depending on the alternative selected.

Cumulative impacts to big game could also include short-term effects of increased stress due to human/wildlife encounters, potential reductions in birth/survival rates, increased human and vehicular access along roads, and possible alterations of migration routes. Past, present, and reasonably foreseeable actions regarding energy development projects would be similar to the impacts from this Project and would include a decrease in foraging habitat, increase in human activity, disruption of movement routes, and increase in roads and energy-related activities. Additional indirect impacts could come from further habitat fragmentation and habitat loss from future road and well site construction, increased traffic and associated noise, and increased human activity across the landscape. Potential cumulative impacts to wildlife and fisheries resources from this and other reasonably foreseeable actions would not be likely to result in significant adverse impacts, providing timing and mitigation stipulations are followed. The magnitude, scope, and duration of actual impacts would depend on the number and size of future energy projects and the rate of development.

4.8.9 Mitigation and Monitoring Opportunities

4.8.9.1 Mitigation

*4.8.9.1.1 BLM-Required Mitigation**

BLM-required mitigation only applies to BLM action/authorizations associated with the proposed Project. BLM-required mitigation measures for wildlife and big game include:

- mechanically graded areas will be seeded with a predetermined seed mixture identified by the BLM to restore the grass and forbs in the disturbed big sagebrush habitat;
- weed control measures will be implemented to reduce the spread of non-native/invasive plant species that may diminish big game foraging habitat in areas disturbed by construction; and
- to reduce the potential for animal/vehicle collisions, a speed limit of 35 miles per hour (mph) or lower will be established for BLM controlled roads. Posted speed limits would be based on the engineering design speed for the road, but in no case would exceed 35 mph.
- carpool or bussing of work crews during shift changes to reduce vehicle disturbance to wildlife;
- blading turnouts on both uphill and downhill sides of the road at 0.5- to 1.0-mile intervals and at known game crossings during winter road maintenance to allow wildlife escape routes;
- avoiding routine maintenance flaring operations between November 15 and April 30 to reduce disturbance to wintering elk;

- limiting motorized access to established roads when accessing the RRU 17-34 well site;
- limiting snow plowing operations to only the main road to the plant site and RRU 17-34 well; and
- avoiding travel between dawn hours (6–8 a.m.) and dusk hours (4–6 p.m.) between November 15 and April 30.

*4.8.9.1.2 Other Mitigation Opportunities***

Other mitigation opportunities can be applied to federal and non-federal Project components. The BLM-PFO may not require mitigation on non-federal Project components.

- Coordination in writing an adaptive management strategy with WGFD, the Operator, and the affected land and livestock owners.
- Include a step-wise approach in any adaptive management strategy to identify critical triggers which would in turn initiate focused management strategies.

Additional mitigation stipulations for short-term activities are identified in an MOA for Wildlife Mitigation between WGFD and Cimarex (Appendix B). This MOA is intended to provide financial resources for three specific mitigation objectives to be undertaken as they relate to the proposed Project, and include elk damage prevention, elk monitoring/research, and elk habitat enhancement. Specific stipulations identified in this MOA as they relate to short-term construction activities include:

- carpool or bussing of work crews during interior plant construction (between November 15 and April 30) to reduce vehicle disturbance to wildlife;
- maintaining locked gates at private land crossings to prevent unauthorized access;
- prohibiting dogs at the construction site;
- limiting routine visits to well sites on crucial winter range to times when big game are typically bedded (i.e., mid-day) to reduce disturbance and stress to wildlife;
- using remote sensing technology to reduce daily/weekly truck trips to well sites; and
- installing mufflers on all compressor engine/exhaust stacks to reduce noise levels to 49 dBA and using best and practical efforts to ensure compressor engines/exhaust stacks meet a noise level of 10 dBA (with a standard deviation of +/- 3 dBA) above ambient background noise at the lease line fenced perimeter.

Additional habitat enhancement actions are identified in the MOA, and include $350,000. This fund would be maintained for up to 10 years as needed with a goal of maintaining an annual account balance of up to $100,000. The geographic area for elk habitat enhancement would be expected to cover all occupied elk transitional and winter range in the RBPA Hunt Area 94, and South Piney Hunt Area. However, documented movements of radio-collared elk may more closely define the area.

In addition to the mitigation identified above and mitigation opportunities described in Section 4.1, the following additional mitigation measure would be applied to all alternatives:

- a 7-foot-high wildlife-proof fence would be used around the perimeter of the 8.0-acre substations.

4.8.9.2 Monitoring

*4.8.9.2.1 BLM-Required Monitoring**

BLM-required monitoring only applies to BLM action/authorizations associated with the proposed Project.

- The percentage of native winter range elk observed in the Riley Ridge Winter Range Complex would maintain a five-year running average of 40%, which is the five-year running average between 2003 and 2009 (Emmerich 2009b); a five-year average was selected due to the range and variability in the percent of native winter range elk observed in the Riley Ridge Winter Range Complex. In order to monitor the five-year running average, the Operator would be required to continue the current collared elk study for five years post-construction.

*4.8.9.2.2 Other Monitoring Opportunities***

Other monitoring opportunities can be applied to federal and non-federal Project components. The BLM-PFO may not require mitigation on non-federal Project components. Additional monitoring opportunities may include:

- using existing and future monitoring data which is presently being collected as part of the MOA between the WGFD and Cimarex, to be integrated in an adaptive management plan that identifies triggers for which to prevent potential displacement of elk from the RBPA and encourage continued use of the Riley Ridge Winter Range Complex;
- if exemptions are granted for migratory bird standard stipulations, weekly nest monitoring could take place along construction routes and in advance of construction activities to identify nests that could be disturbed or lost due to construction activities; and
- monitoring of sensitive reptile and amphibian populations, particularly within and adjacent to stream crossings.

* BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the proposed Project, as identified in Chapter 2.

** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal Project components.

4.9 LIVESTOCK AND RANGE RESOURCES

4.9.1 Impact Criteria

Criteria for assessing impacts to livestock and grazing include two categories of potential impacts: those that would result in a reduction in AUM in the allotments affected, or those that would result in increased risk for brucellosis infections.

4.9.1.1 Reduction in AUMs

Adverse impacts to grazing allotments would be defined as the loss of permitted AUMs resulting from the construction and operation of the Project. Impacts to rangeland health and grazing allotments could result from implementation of the action alternatives from short-term loss of available forage as a result of construction-related disturbance. Impacts would vary in intensity depending upon the acres of vegetation and soil disturbance, reclamation success, weed control, and success of rangeland improvements. Direct impacts would include loss of forage due to vegetation crushing or removal, damage to vegetation monitoring plots, and range improvements such as stock water tanks and wells. The potential for animal/vehicle collisions would increase in proportion to the increased number of construction vehicles traveling through allotments. Cattle guards and gates could be damaged by drill rigs that are too wide/heavy, leading to added maintenance and unwanted mixing of livestock.

Indirect impacts may include reclamation failures, loss of function of rangeland improvements, and loss of palatability of vegetation from road dust. Increased pressure from wildlife species displaced during construction and operation of the Project could result in fewer resources for livestock. Indirect impacts could include loss of access to watering and trailing areas, and the potential contamination of stock wells. Animal mortality could result from the introduction of toxic plant species; however, standard treatments for noxious/non-native weeds would be appropriate to minimize this risk.

Significant adverse impacts to grazing allotments in the RBPA would result from any one grazing allotment losing its ability to comply with the Standards for Healthy Rangelands and Guidelines due to the construction and operation of the Project.

4.9.1.2 Brucellosis

A significant adverse impact to livestock would be any documented case of elk commingling with any nearby herd of cattle during February through May when brucellosis could be transmitted, if caused indirectly by Project activities. Criteria for significant impacts for elk have been established for the EA with potential indirect effects on cattle, as discussed in Section 4.8.1. In the event that elk significance criteria are exceeded, there is the potential for increased commingling of elk with cattle herds, thus indirectly increasing the risk of brucellosis spread to cattle herds, as well as other forms of elk damage to livestock operations.

The impacts of a brucellosis outbreak in Sublette County would be immediate and significantly adverse to the cattle industry. In the event that a second case of brucellosis would be discovered in a Wyoming herd between June 30, 2008, and June 30, 2010, the following actions would occur. Wyoming would be downgraded from class-free to class-A status, all bovine animals would be required to test negative for brucellosis prior to interstate

transport, except for those animals moving directly to slaughter or to quarantined feedlots, or those from a certified brucellosis-free herd (APHIS 2004). After one year of testing following positive identification of brucellosis, with no additional cases, Wyoming could reapply for class-free status (Wyoming Department of Agriculture [WYDA] 2009).

In the event that a single case of brucellosis would be discovered in a Wyoming herd after June 30, 2010, and Wyoming has maintained its class-free status, the following actions would occur. Wyoming may retain its class-free status if the following conditions are met within 60 days of the identification of the infected animal. The affected herd must be immediately quarantined, tested, and depopulated. An epidemiological investigation must be performed and confirm that brucellosis has not spread from the affected herd. All adjacent herds that have had contact with the affected herd must also be epidemiologically tested and placed under an approved herd management plan (APHIS 2004).

Four factors could contribute to the risk associated with transfer of the disease into cattle as a result of the Project:

- Incidence of the disease in the elk frequenting the RBPA.
- The probability of infected elk discharges occurring in areas frequented by cattle.
- The density of cattle herds in the areas being frequented by elk during late winter or early spring when an infected cow elk could be expected to abort and leave infected discharges.
- The likelihood of Project activities altering the cattle or elk use patterns such that it leads to commingling of the species beyond the existing background risk.

The incidence of the disease in the local elk herd is very low. Recent testing of elk in the RBPA in winter 2008/2009 resulted in 1 of 42 elk testing positive (2%) for brucella antibodies (Smith 2009, personal communication). Barbenknecht et al. (2007) found that spontaneous abortions typically occur in elk from February to May, creating a possible pathway for cross-contamination should any cattle be present in the area.

Currently there have been no studies documenting the commingling of elk and cattle during the highest disease transmission period, either in the RBPA or in Wyoming, other than at elk feedgrounds. Nor are there existing studies documenting the transmission rate of brucellosis between elk and cattle (Cook 2009, personal communication). The impact criteria for brucellosis being transmitted to livestock would be proportional to the number of increased contacts between species, both spatially and temporally, as a result of Project activities.

4.9.2 No Action Alternative

Under the No Action Alternative, BLM would not take action on the Cimarex applications for ROWs or APDs, including the Williams application for an additional pipeline ROW. There would be no impacts on livestock and range resources from BLM actions with No Action. However, several non-federal actions would likely occur on private and state lands with this alternative, as identified in Chapter 2. Construction of facilities such as the M&HRF and HLF would occur and a transmission line and pipelines would likely be constructed on private and

state lands, but acres of disturbance and affected allotments is unknown at this time. Gas production wells would be drilled entirely on State of Wyoming land, but disturbance information is not available as the exact locations of the well pad, or pads, is not known at this time.

It is anticipated that the effects of No Action on livestock and range resources would be similar to the Project impacts described in Alternative 2; the impacts of any non-federal actions would be outside BLM jurisdiction and ability to modify or change. Table 2-1 indicates that more than 860 acres of assumed disturbance under No Action; however, only the 43 acres of disturbance for the M&HRF and HLF are confirmed.

The most serious short-term impact to livestock from No Action would be the potential disruption and displacement of elk due to construction activity and noise on private land, as indicated for Alternative 2 in Tables 4-33 through 4-35. Without federal timing stipulations, construction activity and noise may affect elk use of crucial winter range, parturition areas, and migration corridors, potentially leading to elk displacement or increased commingling with cattle herds. Since the No Action Alternative ROW locations, construction schedule, and private cattle grazing practices are unknown, the level of risk of these changes occurring as a result of No Action is uncertain.

4.9.3 Alternative 1

4.9.3.1 Impacts of BLM Actions with Alternative 1

Of the 16 allotments identified as overlapping with the RBPA (see Section 3.10), only 6 allotments would be affected by Alternative 1, as shown in Table 4-36. BLM impacts under Alternative 1 would result in an estimated initial disturbance of 638.1 acres to affected allotments. After reclamation there would be an estimated long-term disturbance of 22.8 acres to these allotments. There is a potential for the reduction of approximately 75.5 total AUMs to grazing allotments within the RBPA from short-term vegetation loss, and 2.8 total AUMs once reclamation is successful. The majority of short-term surface disturbance (approximately 346.7 acres) under the Proposed Action would occur in the North LaBarge Common allotment. Individual allotment acres affected by BLM actions are shown in Table 4-36.

11140 **Table 4-36. Acres of Disturbance and AUMs Affected for Grazing Allotments in the RBPA.**

Disturbance Type	Beaver Creek Individual	Beaver Creek Meadow Individual	LaBarge Unit Individual	North LaBarge Common	South Piney Place Meadows	South Piney Ranch Individual	South Piney Individual
Allotment AUMs	**129**	**20**	**274**	**19398**	**39**	**92**	**82**
ALTERNATIVE 1							
Impacts of BLM Actions							
Total short-term disturbance (acres)	50.4	82.0	90.0	346.7	15.4	53.6	0.0
Short-term AUMs affected	7.0	0.8	11.7	50.0	0.9	5.1	0.0
Total after reclamation (acres)	1.3	2.3	2.5	14.4	0.6	1.6	0.0
Long-term AUMs affected	0.2	0.0	0.3	2.1	0.0	0.1	0.0
Impacts of Non-federal Actions							
Total short-term disturbance (acres)	0.0	0.0	0.0	7.4	0.0	0.0	0.0
Short-term AUMs affected	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Total after reclamation (acres)	0.0	0.0	0.0	7.4	0.0	0.0	0.0
Long-term AUMs affected	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Total long-term AUMs affected with Alternative 1	**0.2**	**0.0**	**0.3**	**3.1**	**0.0**	**0.1**	**0.0**
ALTERNATIVE 2							
Impacts of BLM Actions							
Total short-term disturbance (acres)	0.0	0.0	0.0	152.4	0.0	15.5	0.0
Short-term AUMs affected	0.0	0.0	0.0	22.0	0.0	1.5	0.0
Total after reclamation (acres)	0.0	0.0	0.0	8.4	0.0	0.0	0.0
Long-term AUMs affected	0.0	0.0	0.0	1.2	0.0	0.0	0.0
Impacts of Non-federal Actions							
Total short-term disturbance (acres)	0.0	0.0	0.0	11.0	0.0	3.1	18.42
Short-term AUMs affected	0.0	0.0	0.0	1.6	0.0	0.3	0.9
Total after reclamation (acres)	0.0	0.0	0.0	7.4	0.0	0.0	0.55
Long-term AUMs affected	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Total long-term AUMs affected with Alternative 2	**0.0**	**0.0**	**0.0**	**2.3**	**0.0**	**0.0**	**0.0**

Disturbance Type	Beaver Creek Individual	Beaver Creek Meadow Individual	LaBarge Unit Individual	North LaBarge Common	South Piney Place Meadows	South Piney Ranch Individual	South Piney Individual
ALTERNATIVE 3							
Impacts of BLM Actions							
Total short-term disturbance (acres)	43.5	49.7	54.2	302.2	11.4	38.4	0.0
Short-term AUMs affected	6.0	0.5	7.1	43.6	0.7	3.6	0.0
Total after reclamation (acres)	0.0	2.7	0.0	14.2	0.6	0.0	0.0
Long-term AUMs affected	0.0	0.0	0.0	2.0	0.0	0.0	0.0
Impacts of Non-federal Actions							
Total short-term disturbance (acres)	0.0	0.0	0.0	7.4	0.0	0.0	0.0
Short-term AUMs affected	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Total after reclamation (acres)	0.0	0.0	0.0	7.4	0.0	0.0	0.0
Long-term AUMs affected	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Total long-term AUMs affected with Alternative 3	**0.0**	**0.0**	**0.0**	**3.1**	**0.0**	**0.0**	**0.0**
ALTERNATIVE 4							
Impacts of BLM Actions							
Total short-term disturbance (acres)	30.6	46.4	50.9	240.7	6.2	28.7	0.0
Short-term AUMs affected	4.2	0.5	6.6	34.7	0.4	2.7	0.0
Total after reclamation (acres)	0.0	0.0	0.0	8.4	0.0	0.0	0.0
Long-term AUM affected	0.0	0.0	0.0	1.2	0.0	0.0	0.0
Impacts of Non-federal Actions							
Total short-term disturbance (acres)	0.0	0.0	0.0	7.4	0.0	0.0	0.0
Short-term AUMs affected	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Total after reclamation (acres)	0.0	0.0	0.0	7.4	0.0	0.0	0.0
Long-term AUMs affected	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Total long-term AUMs affected with Alternative 4	**0.0**	**0.0**	**0.0**	**2.3**	**0.0**	**0.0**	**0.0**

If current stocking rates are maintained, the loss of palatable forage in the allotments would likely lead to a short-term reduction in AUMs within affected allotments unless continued monitoring indicates otherwise. Long-term total AUMs for the Pinedale Resource Management Area may not be affected due to reclamation success and adaptive management options. Available forage would be reduced during drilling and construction phases, but would be reclaimed as soon as feasible for the production phase. A long-term loss of forage would occur due to construction of the HLF, utility poles, and two-track roads that remain in place during operation. The well pads that would be used have been previously cleared of vegetation. Re-occupancy of these well pads for the additional source gas and acid-gas injection well would remove all grasses, forbs, and shrubs that were established through the interim reclamation process following the drilling of the initial well in the early- to mid-1980s. Consequently, the livestock forage provided through the interim reclamation would not be available until new vegetation is re-established after the interim reclamation process that would follow drilling the source gas and injection wells.

As indicated in Section 4.8.4, BLM actions under Alternative 1 would not result in impacts to the Piney elk herd resulting in displacement or increased probability of commingling with cattle in the RBPA. Therefore, no increased risk of brucellosis in area cattle is anticipated as a result of BLM actions with Alternative 1.

4.9.3.2 Total Project Impacts with Alternative 1

The total short-term disturbance to grazing allotments represents approximately 1.5% of the total grazing allotment area in the RBPA. Initial disturbance to affected grazing allotments for Alternative 1 would be 645.5 total acres from both BLM and non-BLM actions. There is a potential for the reduction of approximately 76.5 AUMs to grazing allotments within the RBPA from short-term vegetation loss. After reclamation is considered complete there would be a reduction of approximately 3.9 AUMs to affected grazing allotments. Alternative 1 would result in the greatest amount of initial disturbance compared to the other alternatives.

Under all alternatives, cattle grazing would continue throughout the duration of the Project. The current total number of AUMs in the Pinedale Resource Management Area would be maintained unless monitoring indicates a need for adjustment (BLM 2008b). Adaptive management strategies would be used to adjust current levels of AUMs permitted in the RBPA allotments. If mitigation is insufficient to maintain the current levels of livestock grazing, a reduction in grazing in industrialized areas could become necessary to comply with the Standards for Healthy Rangelands and Guidelines (BLM 2008a).

WGFD and Cimarex have already initiated an MOA to address potential damages to cattle and livestock ranchers from the construction and operation of the M&HRF (see Appendix B). These measures include monitoring of elk movements using radio telemetry to determine if the elk are indeed becoming displaced onto surrounding grazing lands, and allow for livestock ranchers to submit claims for compensatory damages to crops. These measures may partially mitigate the indirect effects of elk displacement on livestock operations.

The potential exists for disruptions to livestock management actions. Dust from roads could also impact livestock, reducing the palatability of adjacent vegetation, increasing the threat of health issues such as dust pneumonia. There is also potential for damage to range

improvements from the movement of heavy trucks, drilling equipment, and heavy construction equipment.

Disturbance of soils, vegetation, and increased vehicle activity would increase the introduction, establishment, and spread of undesirable non-native/noxious weed species if mitigating controls are not enacted. This can reduce forage availability and animal weight gains, in addition to affecting trail routes and overall animal health. Proper reclamation of disturbed sites would help reduce these potential impacts. Potential short-term impacts to AUMs on the grazing allotments within the RBPA are presented in Table 4-36.

Reseeding of allotments with perennial forage grasses would occur within the next growing season. Revegetation of the allotments is dependent on many factors including soil moisture, precipitation, soil type, and a number of other environmental correlates. Revegetation is expected to commence immediately following construction. No long-term reduction in quality of current grazing allotments would be expected, as long as an appropriate seed mix is used for interim reclamation. Successful interim reclamation would replace forage removed from short-term disturbances. Reclamation of short-term disturbance would likely compensate for a portion of the forage lost. However, this is dependent on commitment by the Operator for successful reclamation and weed control.

As indicated in Section 4.8.4, under Alternative 1, the Project would not result in impacts to the Piney elk herd producing displacement or increased probability of commingling with cattle in the RBPA. Therefore, no increased risk of brucellosis in area cattle would occur as a result of BLM actions with Alternative 1.

A review of Table 3-22 indicates that none of the allotments in the RBPA begin grazing prior to May 15, and the latest grazing date for any individual allotment is November 15 of a given year. Since elk parturition is finished and elk move out of the RBPA and into higher elevation areas by May, and the season of elk migration back into the RBPA begins at approximately November 15, the opportunity for cattle to be present in time and space while elk may be feeding and birthing is very low. In addition, restrictions on construction activities on federal lands during elk migration, winter grazing, and parturition would tend to further reduce the likelihood of Project activities causing an increase in commingling.

Due to the incidence of the disease in the elk herd of the RBPA, the number of confirmed cases of brucellosis in Wyoming over the past decade, and the elk and cattle management measures currently in effect through timing restrictions on cattle grazing and on construction activities, the likelihood of a new case of brucellosis occurring in a local cattle herd as a result of Project activities is very low with Alternative 1 and other action alternatives.

Long-term impacts would result from conversion of range resources to industrial sites. After interim reclamation, total disturbance would be reduced to 21.85 acres on allotments within the RBPA. Long-term impacts could also occur from operational noise and disturbance at the M&HRF disrupting elk migrations and increasing indirectly the risk of brucellosis infection in RBPA cattle herds.

Most of the adverse impacts to livestock and grazing could be mitigated or avoided using an adaptive management strategy coordinated by WGFD and the Operator, and the affected land and livestock owners (see Appendix B). With the implementation of a comprehensive step-wise adaptive management strategy, adverse impacts to cattle would not be significant.

4.9.4 Alternative 2

4.9.4.1 Impacts of BLM Actions with Alternative 2

Of the 16 allotments identified as overlapping with the RBPA (see Section 3.10), only 3 allotments would be affected by Alternative 2, as shown in Table 4-36. BLM impacts under Alternative 2 would result in an estimated initial disturbance of 167.9 acres to affected allotments. After reclamation there would be an estimated long-term disturbance of 8.4 acres to these allotments. There is a potential for the reduction of approximately 23.4 AUMs to grazing allotments within the RBPA from short-term vegetation loss, and 1.2 AUM once reclamation is successful. The majority of surface disturbance (approximately 152.4 acres) under the Proposed Action would occur in the North LaBarge Common allotment. Individual allotment acres affected by BLM actions are shown in Table 4-36.

As indicated in Section 4.8.5, BLM actions under Alternative 2 would not result in impacts to the Piney elk herd that would result in displacement or increased probability of commingling with cattle in the RBPA. Therefore, no increased risk of brucellosis in area cattle is anticipated as a result of BLM actions with Alternative 2.

4.9.4.2 Total Project Impacts with Alternative 2

The total disturbance in grazing allotments represents approximately 0.5% of the total land area of the grazing allotments within the RBPA. Initial disturbance to affected grazing allotments for Alternative 2 would be 200.4 total acres for both BLM and non-BLM actions. The short-term impacts from increasing brucellosis risk factors would be somewhat different with Alternative 2, compared to Alternative 1. The noise and disturbance from construction of the M&HRF and drilling would be similar in both alternatives and could affect elk migration and behavior. However, Alternative 2 would also have ROW construction on private land to the north of normal migration corridors. This disturbance could tend to keep elk movements to the south and away from private land in the South Fork of Piney Creek.

There is a potential for the reduction of approximately 26.2 AUMs to grazing allotments within the RBPA from short-term vegetation loss. After interim reclamation, total disturbance from BLM and non-BLM actions would be reduced to 16.3 acres on allotments within the RBPA. Long-term impacts could also occur from operational noise and disturbance at the M&HRF continuing to disrupt elk migrations, indirectly increasing the risk of Brucellosis infection in RBPA cattle herds. Alternative 2 results in the least amount of surface disturbance compared to the other alternatives. As indicated in Section 4.8.5, under Alternative 2, Project impacts to the Piney elk herd resulting in displacement or increased probability of commingling with cattle in the RBPA are not anticipated. Therefore, no increased risk of brucellosis in area cattle is anticipated as a result of Alternative 2.

As with Alternative 1, most of the adverse impacts to livestock and grazing could be mitigated or avoided using an adaptive management strategy coordinated by WGFD and the

Operator, and the affected land and livestock owners (see Appendix B). With the implementation of a comprehensive adaptive management strategy, adverse impacts to cattle would not be significant.

4.9.5 Alternative 3

4.9.5.1 Impacts of BLM Actions with Alternative 3

Of the 16 allotments identified as overlapping with the RBPA (see Section 3.10), only 6 allotments would be affected by Alternative 3, as shown in Table 4-36. BLM impacts under Alternative 3 would result in an estimated initial disturbance of 499.3 acres to affected allotments. After reclamation there would be an estimated long-term disturbance of 17.5 acres to these allotments. There is a potential for the reduction of approximately 61.4 AUMs to grazing allotments within the RBPA from short-term vegetation loss, and 2.0 AUMs once reclamation is successful. The majority of short-term surface disturbance (approximately 302.2 acres) under Alternative 3 would occur in the North LaBarge Common allotment. Individual allotment acres affected by BLM actions are shown in Table 4-36.

As indicated in Section 4.8.6, BLM actions under Alternative 3 impacts to the Piney elk herd resulting in displacement or increased probability of commingling with cattle in the RBPA are not anticipated. Therefore, no increased risk of brucellosis in area cattle is not anticipated as a result of BLM actions with Alternative 3.

4.9.5.2 Total Project Impacts with Alternative 3

Modified design features for Alternative 3 include the collocation of pipelines to reduce surface disturbance. Other design features include the boring of Spring Creek and Beaver Creek to reduce impact to wetland and riparian resources. Total acres of grazing allotments impacted represents less than 1.1% of the total land area of the grazing allotments within the RBPA. The majority of initial surface disturbance (approximately 309.5 acres) would occur in the North LaBarge Common allotment. Initial disturbance to grazing allotments for Alternative 3 would be 506.7 acres. There is a potential for the reduction of 62.5 AUMs to grazing allotments within the RBPA from short-term vegetation loss.

As indicated in Section 4.8.6, under Alternative 3, the Project impacts to the Piney elk herd resulting in displacement or increased probability of commingling with cattle in the RBPA are not anticipated. Therefore, no increased risk of brucellosis in area cattle is anticipated as a result of Alternative 3.

After interim reclamation, total disturbance from the Project would be reduced to 24.9 acres on allotments within the RBPA. As with Alternative 1, most of the adverse impacts the livestock and grazing could be mitigated or avoided using an adaptive management strategy coordinated by WGFD and the Operator, and the affected land and livestock owners (see Appendix B).

4.9.6 Alternative 4

4.9.6.1 Impacts of BLM Actions with Alternative 4

Individual allotment acres affected by BLM actions are shown in Table 4-36. Of the 16 allotments identified as overlapping with the RBPA (see Section 3.10), only 6 allotments would be affected by Alternative 4, as shown in Table 4-36. BLM impacts under Alternative 4 would result in an estimated initial disturbance of 403.5 acres to affected allotments. After reclamation there would be an estimated long-term disturbance of 8.4 acres to these allotments. There is a potential for the reduction of approximately 49.1 AUMs to grazing allotments within the RBPA from short-term vegetation loss, and 1.2 AUMs once reclamation is successful. The majority of surface disturbance (approximately 240.7 acres) under Alternative 4 would occur in the North LaBarge Common allotment.

As indicated in Section 4.8.7, BLM actions under Alternative 4 impacts to the Piney elk herd resulting in displacement or increased probability of commingling with cattle in the RBPA are not anticipated. Therefore, no increased risk of brucellosis in area cattle is anticipated as a result of BLM actions with Alternative 4.

4.9.6.2 Total Project Impacts with Alternative 4

Alternative 4 includes the addition of an EGS to supply power to the M&HRF. The addition of the EGS would result in the removal of the transmission lines from the M&HRF and the Chimney Buttes Substation. Total acres of grazing allotments impacted represents about 0.9% of the total land area of the grazing allotments within the RBPA. Initial disturbance to affected grazing allotments for Alternative 4 would be 410.8 acres. The majority of surface disturbance (approximately 248.0 acres) would occur in the North LaBarge Common allotment. There is a potential for the reduction of approximately 50.2 AUMs to grazing allotments within the RBPA from short-term vegetation loss.

As indicated in Section 4.8.7, under Alternative 4, the Project impacts to the Piney elk herd resulting in displacement or increased probability of commingling with cattle in the RBPA are not anticipated. Therefore, no increased risk of brucellosis in area cattle is anticipated as a result of BLM actions with Alternative 4.

After interim reclamation, total disturbance would be reduced to 15.8 acres on allotments within the RBPA. As with Alternative 1, most of the adverse impacts to livestock and grazing could be mitigated or avoided using an adaptive management strategy coordinated by WGFD and the Operator, and the affected land and livestock owners (see Appendix B).

4.9.7 Cumulative Impacts

Livestock grazing in the RBPA includes the combined area of 16 grazing allotments that are either wholly or partially located within the RBPA. Impacts from this and other oil and gas development projects would be similar to the impacts from the Project and include vegetation and soil disturbance associated with construction activities, reclamation, weed control, road construction and use (i.e., dust and animal collisions), and rangeland functionality. Long-term, cumulative impacts would likely include a small net loss in total annual forage production from road construction and other permanently maintained areas. Lower vegetation palatability from dust cover and the threat of health issues such as dust pneumonia could potentially

create more impacts on grazing livestock than the effects associated with direct loss of vegetation.

Establishing a clear link to the indirect effects of the Project would be difficult. A continuous record of elk displacement from historic parturition areas, and commingling with cattle herds would need to be shown for the elk associated with the Riley Ridge Winter Range Complex area and any future cattle infection. This link could be shown using genetic make up of isolates of brucellosis bacteria to determine if that strain was transmitted by an infected elk individual from the Riley Ridge area (Wyoming Brucellosis Coordination Team 2005).

Feedgrounds provide the greatest risk for direct and indirect transmission of the disease between elk due to the higher than average concentrations in the feedgrounds (WGFD 2007a). Finnegan feedground, which is the nearest feedground to the RBPA, had a seroprevalence range from 0% to 33% between 1982 and 2001 (WGFD 2007a). As stated in Section 3.9.1.1, studies have shown that distribution of elk could change significantly from pre-construction patterns. If elk are displaced from native winter ranges, there is the potential for those elk to migrate north and east to private lands. For a more detailed analysis of the prevalence of brucellosis in the Big Piney Elk Herd Unit and the response of elk to construction activities, see Section 4.8.

With each new development in the RBPA, these impacts would be compounded by density of development and could potentially affect the viability of the industry in the region. With proper consultation and stipulations set forth by the responsible agencies, effects of these issues can be minimized in the RBPA. In particular, animal death loss can be minimized through adherence to posted speed limits and an adequate weed reduction and management program.

There is a considerable amount of existing oil and gas infrastructure along the proposed Williams pipeline corridor; however, the proposed pipeline will parallel an existing pipeline for much of its length thus minimizing some of the impacts for new surface disturbance. Impacts to range resources would be short-term in nature as reclamation of disturbance would probably compensate for a portion of the forage lost. However, this is dependent on commitment by the Operator for successful reclamation and weed control.

In addition to the factors mentioned above, the level of impact on livestock would depend on the rate and extent of development in the RBPA. The BLM-PFO currently has no applications for future development; however, current trends show that the level of activity in oil and gas development could double in the foreseeable future. Each allotment would be affected differently. At times, often because of market and production requirements, oil and gas development occurs at a rapid pace and some impacts to grazing animals would be unavoidable during this phase. However, once development is completed, long-term cumulative impacts would be reduced to affects from increased traffic and small-scale activities associated with maintenance of existing facilities. During the production phase livestock grazing would likely return to previous levels of use.

4.9.8 Mitigation and Monitoring Opportunities

In addition to mitigation measures recommended to minimize impacts to vegetation and soils, mitigation measures are recommended to protect range resources. Additional measures could also be applied to protect the resources as needed.

4.9.8.1 Mitigation

*4.9.8.1.1 BLM-Required Mitigation**

BLM-required mitigation only applies to BLM action/authorizations associated with the proposed Project.

- All fences damaged by or removed for construction shall be repaired immediately if livestock are present in that or adjoining allotments, or before the beginning of the next grazing season if livestock are not present at the time the fence is damaged or removed. Alternate fencing may be implemented around facility construction sites on a case-by-case basis.
- Project components shall be sited to avoid range improvements such as stock ponds, guzzlers, and other watering amenities, as well as any range condition monitoring sites/trend plots.
- Fugitive dust dispersion from roads to adjacent vegetation would be controlled by enforcing a 35 mph or lower speed limit on BLM-controlled roads, by watering, and/or by the use of other BLM-approved dust suppressants.
- Interim reclamation for well pads and final reclamation for the Project-related ROWs would be implemented no later than the first growing season following the completion of individual Project components. Seed mixtures would be designed to re-establish predisturbance vegetation composition.
- To reduce the potential for animal/vehicle collisions a speed limit of 35 mph or lower would be established for BLM-controlled roads. Posted speed limits would be based on the engineering design speed for the road, but in no case would exceed 35 mph.

*4.9.8.1.2 Other Mitigation Opportunities***

Other mitigation opportunities can be applied to federal and non-federal Project components. The BLM-PFO may not require mitigation on non-federal Project components.

- An adaptive management strategy aimed at preventing the occurrence of indirect effects that might lead to increased risk factors in the spread of brucellosis to cattle could be implemented by the WGFD in coordination with BLM, the Operator, and the affected land and livestock owners.
- This adaptive management strategy would serve to identify critical triggers which would in turn initiate focused management strategies.
- Cattle herd management plans could be developed for allotments that overlap parturition areas to have a turn-in date of June 1 to create a temporal barrier between elk and cattle.

- Measures to prevent elk displacement could be implemented by WGFD.

With implementation of both a step-wise adaptive management strategy to prevent elk displacement and decrease the risk of disease transfer to cattle, and the MOA with WGFD and all of its provisions for monitoring and mitigating possible livestock damages from elk, the long-term and indirect impacts to cattle operations in the RBPA would be reduced to a level that is not significant.

4.9.8.2 Monitoring

*4.9.8.2.1 BLM-Required Monitoring**

None identified.

*4.9.8.2.2 Other Monitoring Opportunities***

Monitoring of brucellosis in feedgrounds and within wildlife populations could be identified by WGFD as part of an overall adaptive management strategy

* BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the proposed Project, as identified in Chapter 2.

** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal Project components.

4.10 HEALTH AND SAFETY

4.10.1 Impact Criteria

Impact criteria for the analysis of the Project are discussed in terms of general hazardous materials and the special consideration of health and safety risks from accidental exposure to toxic hydrogen sulfide gas.

Any direct or indirect contamination of a person, their clothing, wildlife, or the physical and natural environment surrounding the RBPA with hazardous materials would be considered an adverse impact. Adverse impacts would occur in the RBPA if product misuse or an accident resulted in the uncontrolled release of hazardous materials into the environment that would threaten public, livestock, and/or wildlife safety.

Potential health and safety hazards associated with the Project include all activities related to the development of natural gas production wells, a waste gas injection well, the natural gas and helium transmission pipeline, and power and communication transmission lines. Relative risks associated with any potential hazard can be evaluated and plotted according to both the consequence and probability within a risk matrix (see Table 4-37). The risks can be ranked according to levels of acceptability, ranging from acceptable to unacceptable. Tasks or duties which would fall into an undesirable or unacceptable category of risk would require some type of mitigation to reduce the potential hazard or to lower an event frequency of occurrence.

Table 4-37. Risk Matrix with Consequence and Probability Rankings.

Probability	Consequences			
	Negligible	**Marginal**	**Critical**	**Catastrophic**
Expected	Undesirable	Undesirable	Unacceptable	Unacceptable
High	Moderately Acceptable	Undesirable	Undesirable	Unacceptable
Moderate	Acceptable	Moderately Acceptable	Undesirable	Unacceptable
Low	Acceptable	Acceptable	Moderately Acceptable	Unacceptable
Rare	Acceptable	Acceptable	Moderately Acceptable	Undesirable

The EPA has defined risk to be the chance of harmful effects to human health or to ecological systems resulting from exposure to or contact with an environmental stressor with a stressor being any physical, chemical, or biological entity that can induce an adverse response (EPA 2008b). Even though active implementation of regulations or mitigation measures may reduce Project risk, they can never eliminate all risk linked to the Project. The total risk, R, for a project is the summation of all hazards that have been defined for the project. The total risk may be defined by the equation:

$$R = \sum h.$$

The risk to the employees, contractors, and the general public is measured in terms of the likelihood or probability of an accident or failure of a system and the severity of the consequences of an accident. A hazard (h) can be defined as the likelihood or probability (p) of something occurring multiplied by the related severity of consequence (c) of the hazard in the event that something occurred (Ozog 2002). The consequences of a hazard may be defined qualitatively as:

- Catastrophic – could result in death, permanent disability, or severe environmental damage.
- Critical – could result in permanent disability, injuries, hospitalization, moderate environmental damage.
- Marginal – could result in injury, occupational illness, minor environmental impact.
- Negligible – could result in injury or illness without loss of workday, minor environmental impact.

Portions of the proposed Project occupational activities would be temporary in nature while other activities would extend throughout the LOP. The LOP has been estimated to be 40 years. Well drilling, pipeline, power transmission line, and facilities construction would be temporary in nature. The generation, storage, and disposal of hazardous substances from these activities would be limited to each specific portion of the Project. Other activities such as the transmission of electrical energy through the transmission lines, and the transport of natural gas through the pipeline would extend throughout the LOP. The risk related to a possible

release of H_2S present within the Madison Formation requires the analysis of the risk which is directly related to the production of the gas stream. Possible releases of H_2S and levels of exposure based upon concentrations of hazardous substances would be based on BLM Onshore Order 6 and analysis of H_2S radius of exposure, and a modeled radius of exposure that includes site-specific wind and topographic dispersal factors. The risk factor would be based on H_2S concentration, volume of H_2S source, and release rate from source.

The consequence of failure (CoF) is the level of damage or harm experienced by a receptor such as a human or animal from a failure (Muhlbauer 2006). Receptor injury or damage is dependent upon the duration and intensity of exposure as well as the receptor‘s sensitivity to the hazardous substance.

The American Petroleum Institute (API) and BLM Onshore Order No. 6 (1991) provide mathematical methods for calculating the radius of exposure (ROE) for releases of H_2S. The ROE can be used to determine potential areas of exposure to H_2S and provide emergency response planning to toxic releases.

Based on the risk matrix in Table 4-37, and the toxicity of H_2S shown in Table 4-38, any accidental H_2S release outside the ~~"a~~cceptable" or ~~"m~~oderately acceptable" range, would be considered a significant impact. A second criteria of significant impact would be any H_2S release(s) capable of reaching human residence(s) or other human occupancy sites and/or resulting in wildlife or livestock mortality.

Table 4-38. Hydrogen Sulfide Physical Effects at Specified Concentrations.

Concentrations (ppm)	Physical Effects
0.13	Minimal perceptible odor.
10	Obvious and unpleasant odor. OSHA Permissible Exposure Limit (PEL) (8-hour exposure).
15	OSHA Short-term Exposure Limit (15-minute exposure).
100	Impairs the sense of smell in 3 to 15 minutes. Immediately dangerous to life and health.
500	Dizziness, breathing stops in a few minutes. Needs prompt artificial respiration.
700	Unconscious quickly. Death would result if not recued promptly.
1000	Unconscious immediately, followed by death within minutes.

*Table obtained from ConocoPhillips EP Lower 48 Health, Safety, and Environmental Handbook (2006).
ppm = parts per million

In addition to potential impacts from H_2S release, impacts can be associated with all of the hazards occurring during construction, operation, and maintenance of the facilities. The risk is the summation of all of the hazards for every activity, with each having a likelihood or probability of an accident or failure of a system and the severity of the consequences of an accident. The result would be a level of acceptance regarding the activities ranging from acceptable to unacceptable.

Injury and fatality related rates for job classes would be initiated. Job classes for the RBPA have different rates of injury or fatality risk. Transportation ingress and egress from the RBPA on existing and upgraded roads also have risk associated with their use. Increased travel resulting from the Project would increase the risk. Tables 4-39 and 4-40 describe injury and fatality rates for the types of jobs that would occur in the RBPA .

Table 4-39. Fatality Rates for Job Classifications.

Job Class	Type of Action Required	Fatality Rate (per 100 employed)	Event Frequency per Year
Construction Workers	Federal and Non-federal	0.010	1.03E-4
Oil & Gas Workers	Federal and Non-federal	0.016	1.64E-4
Power and Communication Line Construction	Federal	0.029	2.91E-4
Natural Gas Pipeline Operation	Federal	0.002	2.0E-5
All Occupations, National Average	Federal and Non-federal	0.004	3.7E-5

Table 4-40. Injury Rates for Job Classifications.

Job Class	Type of Action Required	Injury Rate (per 100 employed)	Event Frequency per Year	Injury Rate w/ Days Lost	Event Frequency per Year
Heavy Construction	Federal and Non-federal	4.9	4.9E-2	2.6	2.6E-2
Oil & Gas Pipeline Construction	Federal	2.5	2.5E-2	1.5	1.5E-2
Power and Communication Line Construction	Federal	4.9	4.9E-2	2.9	2.9E-2
Natural Gas Pipeline Operation	Federal	2.0	2.0E-2	0.7	7.0E-3
Electrical Power Transmission and Distribution	Federal and Non-federal	4.9	4.9E-2	2.1	2.1E-2
Oil and Gas Drilling	Federal	4.6	4.6E-2	2.8	2.8E-2
Truck Driving	Federal and Non-federal	5.7	5.7E-2	3.5	3.5E-2

4.10.2 Impacts Discussion

The No Action Alternative and all other alternatives under consideration in this EA would include new industrial facilities, drilling activities, and other new sources of risk to health and safety. There would be no difference between the alternatives, and therefore the impacts are evaluated in this section for all alternatives.

The risk to health and safety has been evaluated based on possible uncontrolled spills or release of hazardous substances, explosions, or fires caused by the construction or operation of the proposed Project. The risk to the public is measured in terms of the likelihood of an accident or an event and the severity of the consequences of the event.

Spills and accidental contact with hazardous materials can be cleaned-up and decontaminated; however, physical effects of a hazardous substance may be harmful, unpredictable, and may persist in the environment. Prevention of such events through the application of safety measures and BMPs are preferred.

Project design features, including forpipeline construction and operation would include corrosion protection, weld inspections and pipeline burial. These measures have been successful in reducing the number of fatality, injury, and property value loss events occurring yearly (USDOT 2008a).

4.10.3 Risks to Health and Safety Associated with Hydrogen Sulfide

H_2S, or sour gas, is a by-product of natural gas production. This hazardous substance is a toxic, colorless, flammable, and corrosive gas. Exposure to relatively small concentrations of H_2S can result in serious injury or death (see Tables 4-39 and 4-40). H_2S is heavier than air and therefore would travel close to the ground surface upon release. In a pure or highly concentrated state, the gas is highly flammable and may flare back to the leak source if ignited. However, the source gas from the Madison Formation is a mixture with a high concentration of CO_2, a non-flammable gas, therefore H_2S fires are not anticipated. When burned, H_2S produces SO_2, which is also very toxic. H_2S, if exposed to normal steel casing and pipe, would actively corrode material and cause structural failure of equipment.

An uncontrolled H_2S release could pose a threat to any person exposed at toxic concentration levels. Those levels would be dependent upon existing conditions at the point of release as well as the amount of material released. Appendix D provides the Cimarex Emergency and Contingency Plan designed to address such an event. In addition, Appendix E provides a model of the expected dispersal of H_2S under different weather conditions and leak volumes.

Based on the intrinsic H_2S hazards, Cimarex has made several commitments to implement advanced design features and protocols to reduce risks to employees and the public, many of which are provided in Appendix D. Some of the voluntary and mandated safety measures include

- location of sour gas facilities in areas with positive air movement, high average wind speed, and predictable wind direction;
- use of a permanent locked gate and warning signs to keep the public out of high risk areas;
- use of special non-corrosive materials in all sour gas areas;
- installation and use of an advanced electronic H_2S leak detection and monitoring system;

- installation and use of automatic emergency shut-down valves if leakage is detected;
- audible sirens and visual warning systems at numerous locations;
- personnel working in the M&HRF or at the sour gas wells, flowlines, and acid gas injection well would carry personal H_2S sensors and emergency equipment;
- well flare lines and ignition system, remote controlled choke and mud-gas separator equipment; and
- underground fiber optic system that would allow real-time communication with Big Piney emergency responders.

Well development operations within known H_2S producing formations such as the Madison Formation require the implementation of safety standards to reduce the potential for injury or death from exposure to harmful air pollutants and/or explosive conditions. A well blowout, which is the uncontrolled release of H_2S from the formation through the well annulus, is extremely dangerous to well derrick workers and any other nearby people and wildlife. According to available data the probability of well blowouts is extremely low (Cornwell and Martinsen 1994). Accordingly, a spill, release, or blowout would most likely be an isolated event and limited to a single site.

To assist in understanding the potential flow of an accidental release of H_2S into the environment from any of the potential sources of gas, dispersion model developed by both the EPA Office of Emergency Management and the National Oceanic and Atmospheric Agency (NOAA) Office of Response and Restoration was used to calculate a ROE for the specific quantity and pressure of H_2S anticipated at the wellhead of the acid gas well. The model is called the Areal Locations of Hazardous Atmospheres (ALOHA) model, and provides model output maps and distances for the ROE and levels of concentration (LOC) of the toxic gas.

Appendix E provides a detailed discussion of the ALOHA model. Because ALOHA is a simple dispersion model not requiring detailed input, it has limitations in predicting actual conditions which may occur under the following environmental conditions:

- very low wind speeds;
- very stable atmospheric conditions;
- wind shifts and terrain steering effects; or
- concentration patchiness, particularly near the release source (EPA and NOAA 2007).

ALOHA also does not account for any particulates or chemical mixing or impacts associated with terrain at the release site. Because of the limitations of the model, only wind speeds greater than 5 miles per hour (mph) and stable atmospheric conditions were used.

The highest concentration of H_2S associated with the project area is the acid-gas present in the gas line between the M&HRF to the acid-gas injection well. The proposed acid-gas stream would consist of a mixture of CO_2 (94%) and H_2S (6%) being transported to the acid-gas well

in a 6.625-inch-diameter pipeline. The acid-gas would be injected at the well head under a constant pressure of 2,250 psig.

ALOHA model inputs for each successive run for H_2S source information are listed in Table 4-39. The LOC for H_2S is based on values associated with increasing threat levels for biological receptors located within the specific LOC. The expected dispersal distances for at 10, 100, and 500 ppm concentrations are shown by the model and in Table 4-41.

The production and processing of sour gas and the transport and injection of acid gas after processing at the M&HRF would result in a small increased risk of an accidental release of H_2S. The projected LOC from a potential accidental rupture of the acid gas flowline is shown in Table 4-41. Should a sour gas leak occur at the acid gas injection flowline or wellhead, biological receptors within an average of 2.63 miles of the leak would experience a concentration of approximately 10 ppm of H_2S, depending on the conditions at the time of the release, resulting in an unpleasant odor. Evacuation could be required if the leak were to last more than 8 hours.

At distance of 1.04 miles, this leak would have a concentration of 100 ppm, producing conditions immediately dangerous to life and health and requiring evacuation of any personnel in the area. The CoF in this case would be critical, but the probability of occurrence would be extremely rare (less than 0.693/N), resulting in a moderately acceptable risk, as shown in Table 4-41.

The CoF of the same leak would result in even more critical level of exposure to all biological receptors including personnel working within 0.73 mile of the leak. The level of exposure would be unacceptable regardless of its rarity, and exposures to wildlife would be fatal within this distance of a leak. For this reason, all systems would rely on electronic sensors and automatic emergency shut-down in the event of leak detection and numerous remote H_2S sensors with audible sirens would immediately alert all personnel and potentially frighten wildlife away from any detected toxic leak.

Table 4-41. ALOHA Model Output for Climatic Conditions with Levels of Concentration Distance.

Volume of Acid-Gas Release (cf)	Wind Direction	Wind Speed (mph)	Air Temperature (°F)	Atmosphere Stability*	Humidity (%)	Cloud Cover (%)	Level of Concentration Distances (miles)		
							10 ppm	100 ppm	500 ppm
110	W	5	75	B	25	50	2.80	1.30	0.73
110	W	30	75	D	25	50	3.80	1.50	0.64
110	W	5	75	B	50	0	2.80	1.30	0.73
110	W	30	75	D	50	0	3.80	1.50	0.63
55	W	5	75	B	25	50	2.60	1.10	0.61
55	W	30	75	D	25	50	2.90	1.00	0.44
110	W	5	45	B	50	50	2.70	1.30	0.72
110	W	30	45	D	50	50	3.70	1.40	0.62
55	W	5	45	B	25	50	2.60	1.20	0.63
55	W	30	45	D	25	50	2.80	1.00	0.43
110	W	5	0	B	5	50	1.30	0.63	0.36
110	W	30	0	D	5	50	2.80	1.00	0.40
55	W	5	0	B	25	50	1.40	0.66	0.38
55	W	30	0	D	25	50	2.10	0.70	0.27
44	W	30	75	D	25	50	2.70	0.92	0.39
44	W	30	45	D	25	50	2.00	0.64	0.25
44	W	30	0	D	25	50	1.90	0.61	0.24

* B = Unstable; D = Moderately Unstable
°F = degrees Fahrenheit
cf = cubic feet
mph = miles per hour
ppm = parts per million
W = west

4.10.4 Risks to Health and Safety Associated with Other Hazardous Substances

Under all alternatives, hazardous substances would be produced or used, as described in Chapter 2. Risk of environmental and human exposure to hazardous materials from the Project would be associated with drilling and operation of gas wells and acid-gas injection well, natural gas pipeline and transmission line installation and operation, as well as the construction and operation of the M&HRF and HLF. Hazardous chemicals typical of the oil and gas industry are listed in Table 3-24.

The risk associated with the transmission of natural gas through an existing pipeline is statistically very small. The PHMSA records and reports on all incidents and accidents regarding pipeline transmission of natural gas. According to most recent data, a 20-year average for all onshore transmission of natural gas pipelines has averaged two fatalities per year (USDOT 2008a).

Operation of trenching equipment within stream channels during pipeline construction could result in accidental release of hazardous substances such as fuel or fluids. The potential of a hazardous substance reaching a surface water resource would be reduced by implementation of SPCC plans during construction, and boring under all surface water crossings. The boring activity would occur at a distance from the channel, providing a margin of safety for hazardous substance releases, if they were to occur.

An important issue related to the injection of acid-gas is the long-term containment of the waste within the desired depository structure. Maintenance of the structural integrity of the formation is of considerable importance to eliminate the potential of structural leakage to undesirable formations such as overlying aquifers. Injected gas must be held in place by some type of overlying low permeable materials such as shales or evaporates. A cap rock is defined as a lithologic unit capable of impeding upward movement (Nelson et al. 2005). Injected gas may also be held in place within aquifer material which has a very small hydrodynamic gradient, thereby limiting the movement of the gas out of the formation.

Within western Canada, acid-gas injection has been occurring for over 15 years into deep saline aquifers or depleted oil or gas reservoirs. Within that time period, no safety incidents have been reported regarding the injection or release of the gas (Bachu et al. 2008). Acid-gas injection is considered a zero-emission process when all of the recovered waste material is re-injected to the subsurface.

The Project is not anticipated to result in any adverse impacts if the materials are handled according to safety standards outlined for each hazardous substance.

4.10.5 Other Hazards

The number of Project employees, contractors, and the general public potentially exposed to a specific hazard within the RBPA is a function of the population density and the distribution of their respective numbers near the RBPA (Cornwell and Martinsen 1994). Because of the remote nature of and the limited access into the RBPA, the hazards would generally be limited to Project employees and contractors. The possibility of the general public being within the RBPA would be low and would be mostly limited to hikers, hunters, and ranchers

with grazing rights to the area. Road access into the RBPA is controlled by existing locked gates. Potential risks to the general public would be indirect and related to the potential for accidental wildfires, explosions, or releases of hazardous substances. For a hazardous substance to cause a risk, it would need to migrate from the point of release to an exposure point where it would come in contact with human or ecological receptors and result in exposure at levels deemed to cause an adverse health or ecological effects.

Methane releases from natural gas pipeline failure could pose an explosion risk that could result in damage to structures, and injury to people or wildlife. The resulting explosion may occur some distance from the point of the leak. Design features such as corrosion protection, weld inspections, pipeline burial, use of the One-Call location system, and employee training and education program regarding pipeline safety that are typically applied to pipeline construction and operation have been very successful in reducing the number of fatality, injury, and property value loss events occurring yearly (USDOT 2008a). Based on this and the remoteness of the RBPA, the risk of pipeline failure is low.

The helium pipeline would transport product from the processing plant to a helium plant, located southwest of Big Piney. The pipeline safety regulations, listed in CFR 49 Parts 190 to 199 (USDOT 2008b), administer the design, operation, and maintenance of pipelines. Helium is not considered a hazardous substance.

If flammable vapors and gases are released under pressure from within the plant and come in contact with an ignition source, an explosion may occur at the M&HRF. Impacts of an explosion are expressed in terms of a sudden increase in pressure above ambient pressure levels, resulting in a blast or shock wave. This shock wave, if large enough, may cause damage to ancillary equipment and structures as well as personnel within the plant from direct contact with a blast wave as well as secondary contact with flying shrapnel from shock wave damaged equipment and structures.

The risk from human-caused fires would increase as a result of the Project construction activities, the presence of fuels, storage tanks, natural gas pipelines, processing plant, and related equipment. In the event of a fire there is a potential that a pipeline or well fire could spread to adjacent public and private lands. In the event of a fire, from either human or natural causes, property damage would most likely be limited to construction- or production-related equipment and range resources. Given the limited public use and presence in the RBPA, the risk to the public would be minimal. There would be a small increase in risk to local fire suppression personnel associated with the proposed Project.

Because of the electrical power requirements necessary to operate the gas processing plant and ancillary facility, a 230-kV overhead power line would be constructed for the Proposed Action. As the power lines are located approximately 70 to 100 feet overhead, public contact with the high-voltage lines would be very unlikely. The health and safety aspects related to the overhead power lines would primarily affect workers directly involved in construction and maintenance activities associated with the power line. According to the USDL-BLS (2008a), electrical power line construction has an accidental death rate that is significantly higher than heavy construction (see Table 4-39). The injury rate (USDL-BLS 2008b) for the electrical power line construction workers is similar to other heavy construction activities.

Electric and magnetic fields (EMF) are produced by any device that consumes or conducts electricity such as electrical transmission and distribution lines. Because of the limited population within the RBPA and the fact that no permanent residents live within 1 mile of the proposed power line, the risk of health effects from EMF would be negligible.

According to Huck (2007), AC current can induce corrosion of nearby pipelines and could result in pipeline failure and associated health and safety impacts. There are existing technologies available to mitigate electrically-induced corrosion. Note: methods used to mitigate DC-induced corrosion do not work with and may also inhibit methods employed to mitigate AC-induced corrosion.

4.10.6 Cumulative Impacts to Health and Safety

The RBPA is located within the much larger Big Piney-LaBarge area, which is the combination of multiple oil and gas exploration and development operations within the region. The Project would increase the total volume of hazardous substances within the RBPA as well as the Big Piney-LaBarge area but the general type of hazardous materials would not be much different than what already exists within the region. Oil and gas development within the region is expected to double over the 40-year LOP. Human activity associated with industrial development and employment within the RBPA would increase, and would include personnel who are trained in the handling of hazardous substances. Due to existing oil and gas development in the RBPA, most of these hazardous materials and their risks are likely to already be present, but would increase as a result of the Project. However, little or no increase in risk to the health and safety is expected as a result of the incremental change introduced by the Project.

Additional risks to health and safety of livestock and ranch workers could occur as a result of the proximity and access of these activities to this Project and other future oil and gas development. The incremental risk for other receptor organisms such as livestock or big game would also increase due to cumulative effects of future foreseeable activities. However, since industrial sites with the potential to contain hazardous materials would be fenced, gated, or equipped with livestock grating, any incremental cumulative risk of direct contact with hazardous substances by cattle or ranch workers would be minimal over the LOP.

With appropriate design features such as structural engineering analysis of infrastructure, or offsite monitoring, and remote shutdown capabilities, the Project is not anticipated to result in adverse impacts to health and safety.

4.10.7 Mitigation and Monitoring Opportunities

4.10.7.1 Mitigation

With the implementation of mitigation measures such as employee training, emergency contingency and SPCC plans, and appropriate signage and access restrictions to the RBPA, the risk to the health and safety of workers and contractors would be limited. Risk to the general public who may be present in the RBPA would be minimal.

11752 *4.10.7.1.1 BLM-Required Mitigation**

11753 All federal and state laws pertaining to the handling, storage, generation, or disposal of any
11754 hazardous substance or waste would be applied. BLM required mitigation measures include
11755 the following:

11756 • The Operator would coordinate emergency response planning with Sublette County
11757 and provide documentation regarding compliance with federal hazardous material
11758 regulations. Developed standards of operation would ensure that minimum standards,
11759 specifications, and regulations are implemented during Project design and
11760 construction, as well as during process operations.

11761 • Current MSDSs for all hazardous substances would be maintained and readily
11762 available on site. SARA Title III, also known as the Emergency Planning and
11763 Community Right-to-Know Act (EPCRA), requires that all chemicals present at the
11764 facility greater than the Threshold Planning Quantity (TPQ) be included on a list
11765 supplied to local response agencies or that all MSDSs be submitted to the emergency
11766 response agencies.

11767 • An SPCC plan would be developed to handle all oils within the RBPA in a safe
11768 manner by trained employees and contractors. The SPCC plan would also outline all
11769 methods necessary to retain and cleanup any oils when a release occurs.

11770 • Cimarex would conduct all drilling and operations of sour gas facilities in accordance
11771 with BLM Onshore Order 6.

11772 • Access to the multi-well pad would be strictly limited to authorized personnel
11773 equipped with emergency equipment. Persons in the area, and personnel working at
11774 the sour gas wells, flowlines, and acid gas injection wells would carry personal H_2S
11775 sensors and emergency equipment.

11776 *4.10.7.1.2 Other Mitigation Opportunities***

11777 All federal and state laws pertaining to the handling, storage, generation, or disposal of any
11778 hazardous substance or waste would be applied to any non-federal action. Other mitigation
11779 measures could include the following:

11780 • An emergency contingency plan would be developed in coordination with the Sublette
11781 County emergency response personnel to coordinate emergency situation response and
11782 reduce risks to the general public.

11783 • During construction and operations of the Project, all employees would have training
11784 to ensure safe handling, storage, and disposal of hazardous substances in accordance
11785 with the manufacturer‘s label and with the corresponding MSDS.

11786 • Any drilling activities proposed at depths or locations where the H_2S is thought to
11787 exist would follow strict safety guidelines outlined in documents such as API
11788 *Recommended Practices for Drilling and Well Servicing Operations Involving*
11789 *Hydrogen Sulfide* (API 2001).

11790 • In addition to following all applicable state regulations, the construction, operation,
11791 and maintenance of the M&HRF would follow guidelines outlined in the API

document titled *Recommended Practice for Oil and Gas Producing and Gas Processing Plant Operations Involving Hydrogen Sulfide* (API 1995). Included within this document are applicable rules and regulations covering the construction and operation of a processing plant which handles H_2S, the training and safety procedures required for employees, contingency and emergency response planning and operation, as well as plant design and operation.

- Mitigation measures regarding pipeline safety could include signage for pipeline ROW, sufficient burial depth to protect against third-party damage, inspection schedules that at a minimum meet PHMSA standards, and use of materials that would protect against corrosion, especially in pipes and ancillary equipment that would come in contact with sour gas.
- Current MSDSs for all hazardous substances would be maintained and readily available on site. SARA Title III requires that all chemicals present at the facility greater than the TPQ be included on a list supplied to local response agencies or that all MSDS be submitted to the emergency response agencies.
- Other mitigation measures for fire protection would include fire suppression equipment, a no smoking policy, shutdown devices, and other safety measures typically incorporated into gas processing and treatment activities to help minimize the risk of fire.

4.10.7.2 Monitoring

*4.10.7.2.1 BLM-Required Monitoring**

Monitoring of the implementation of BMPs and the requirements of BLM On Shore Order 6 for sour gas operations, including the regular updating of the Emergency and Contingency Plan would be required to assure the safe handling and storage of all hazardous substances and safeguards.

*4.10.7.2.2 Other Monitoring Opportunities***

The presence of any hazardous substance within the RBPA requires the implementation of BMPs to assure the safe handling and storage of all hazardous substances. These implemented BMPs are subject to inspection by federal and state inspectors to insure the proper implementation and maintenance of the mitigation BMPs. Operation of the M&HRF and the EGS site would require the implementation of good housekeeping practices to handle, use, and store all hazardous substances located within the RBPA.

* BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the proposed Project, as identified in Chapter 2.

** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal Project components.

4.11 TRANSPORTATION

This section summarizes the impacts to transportation use and infrastructure that would occur as a result of the Proposed Action and alternatives. Transportation impacts include increased

traffic volumes on primary and secondary highways, and resource and collector roads; an increased need for maintenance of existing roadways; an increase in traffic-related incidents (vehicle accidents and livestock/wildlife-vehicle collisions); and an increase in two-track and off-road vehicle travel. Impacts to transportation within the study area (federal and state highways, county roads, local roads, and Operator-maintained roads that provide access to and within the RBPA) are possible under all of the action alternatives. In general, impacts to transportation use and infrastructure would take place throughout the LOP within each action alternative and impacts would vary in intensity depending on the phase of the Project and the location of Project activities.

4.11.1 Impact Criteria

The following significance criteria have been identified, and represent conditions that could result due to transportation-related activities associated with the Project. Conditions would be considered significant if any of the following occurred:

- An increase in traffic levels on U.S. 189, attributable to the RBPA, that leads to a decrease in the level of service, as defined by the WYDOT.
- An increase in the accident rate between vehicles and livestock or wildlife that is attributable to RBPA-related traffic.
- Increased deterioration and related maintenance costs of area roads beyond those scheduled by the responsible agency.
- Creation of new permanent two-track roads and/or ATV trails resulting from RBPA activities.

4.11.2 No Action Alternative

Direct and indirect impacts would occur to transportation systems as a result of private and state actions under the No Action Alternative. Although the location of some new temporary roads cannot be determined for No Action, all essential Project components would be constructed on private and state land and it is assumed that exiting roads would be used for access whenever possible, with construction of temporary or permanent access roads where necessary. The location of permanent facilities such as the M&HRF, HLF, water injection well is known and would be the same for No Action as for all action alternatives, however, the location of pipelines, transmission lines, and wells is not known. Additional impacts to transportation use and/or infrastructure other than those previously approved for the RBPA would occur.

Table 4-41 shows the activities related to federal Project elements. Impacts would vary depending on the different phases of construction and the location of Project activities. Short-term and long-term direct impacts would include increases in traffic volumes on primary and secondary highways, local roads, and resource/collector roads that provide access to the RBPA. These increases would be caused by movement of Project-related workers, equipment, and materials to and from the RBPA for construction and maintenance operations. Short-term indirect impacts during construction would include increased congestion on roadways, degradation of local road conditions, and an increase in accident rates and wildlife/livestock-

vehicle collisions as a result of increased volumes of traffic. If construction and maintenance activities occurred during or following wet weather conditions, ruts could be created along dirt surface roadways, thus increasing maintenance requirements.

The M&HRF would be constructed and then operated 24 hours per day, 365 days per year and maintained by a crew of approximately 10 personnel on site during day shifts. The facility would be accessed and operated year-round which would include a snow control plan that would include recommendations for improved winter access. An HLF would be constructed just northwest of the CR 134 (Big Piney-Calpet Road)/U.S. 189 intersection and would also be operated 24 hours per day, year-round and maintained by a crew of approximately 10 personnel. After construction activities are complete, vehicular traffic would decrease substantially, but there would be ongoing, long-term vehicular activity related to continued facility operations of the M&HRF and HLF. The long-term impacts of the relatively limited and dispersed traffic would not likely cause substantial deterioration of the roads or increases in accidents.

After construction activities are complete, vehicular traffic would decrease substantially; further vehicular activity would be related to periodic maintenance of the AAM&WS, transmission lines, and pipelines. The long-term impacts of the relatively limited and dispersed traffic would not likely cause substantial deterioration of the roads or increases in accidents. However, the Operator would be responsible for upgrading and maintaining improved and unimproved roads in the RBPA; fiscal effects related to roads are expected to be minimal.

It is anticipated that the vast majority of increased traffic would be generated from communities along the U.S. 189 corridor, including Big Piney and Marbleton, and along county roads accessing private land where new ROW facilities are likely to be located under the No Action Alternative. These roads could include, from north to south, SH 350 (Middle Piney Road), CR 151 (South Piney Road), CR 134 (Big Piney-Calpet Road), and CR 315. These roads would experience a localized increase in traffic that would vary by intensity and locality depending on the different phases of construction and operation for each of the BLM-related components of the Proposed Action.

Overall, approximately 28 months of continuous construction is anticipated to complete all No Action components of the Project. Drilling and construction of many of the components and facilities would take place concurrently. As many as 355 construction workers may be working during certain periods of intensive construction, although they would be dispersed among various locations throughout the RBPA. Additional drilling and minor construction activity would continue for approximately two additional years as the final wells are drilled and completed, involving crews of approximately 25 persons working primarily at the well pads. Following construction, wells, pipelines, and transmission line, and other infrastructure would receive regularly scheduled inspection and maintenance.

Additional traffic would include approximately 300 truckloads that would transport pipe, steel, equipment, building materials, and other miscellaneous construction materials from out-of-state. Drill rigs and certain other items of heavy equipment would be transported to the RBPA and remain within the RBPA until their relevant work is completed. Materials and

supplies would be delivered on an as-needed basis. Drilling and completion crews would commute to the RBPA daily unless rig crew quarters were established in the RBPA or vicinity. Other contractors and vendors would commute on an intermittent, as-needed basis.

Although a complete analysis is not possible since Project ROW is not certain with No Action, an estimate of the increase in ADT associated with peak construction activities can be made based on the limited roads available for traffic use. The No Action Alternative would increase traffic by less than 1 percent compared with current traffic levels and would be dispersed throughout the RBPA. During this phase, vehicle traffic would include heavy equipment and heavy and light-duty trucks.

Based on these assumptions and estimates and regular road maintenance carried out by Cimarex, the incremental increase in area traffic associated with the proposed Project would not cause substantial deterioration of level of service for U.S. 189 or SHs 350 and 235 or any other county, BLM resource, local, and collector roads in the transportation study area for the proposed Project. Because the Project traffic would cause a relatively small increase and would be of short duration, it would not be likely to cause a measurable increase in accident rates on highways and roads within the study area.

4.11.3 Alternative 1

4.11.3.1 Impacts of BLM Actions with Alternative 1

Direct and indirect impacts would occur to transportation systems as a result of BLM actions with Alternative 1. Effects on transportation would be very similar to those described for the No Action Alternative, although impacts would occur from BLM-related Project activities in Alternative 1, as shown in Table 4-42.

Table 4-42. Length of Time and Numbers of Heavy Equipment Loads and Additional Traffic Required for Completing each Project Element.

Project Element	Length of Time	Number of Heavy Equipment Loads/Year	Additional Traffic Associated with Project Element/Year	Maximum Number of Vehicle Trips/Year
Gas and Injection Wells Drilling and Completion (six wells)	Drilling: 138 days/year for 4 years Completion: 25–35 days/year for 4 years	110–120	20–30	150
Ambient Air Monitoring and Weather Station	4 weeks	2–5		2–5
Transmission Line Construction	22 weeks	150–200		150–200
Pipeline Construction (Cimarex Natural Gas Pipeline, Helium/fiber Optic, Williams Pipeline)	36 weeks	150–200		150–200

As with No Action Alternative, approximately 28 months of continuous construction is anticipated to complete all BLM-related components of the Proposed Action. Table 4-41 shows the activities related to federal Project elements, including the length of time to complete each Project element, the number of heavy equipment loads, and additional traffic associated with each element. Additional traffic would include approximately 300 truckloads. Drilling and construction of BLM Project components would take place concurrently, and would be dispersed among various locations throughout the RBPA. Additional drilling and minor construction activity would continue for approximately two additional years as the final wells are drilled and completed, involving crews of approximately 25 persons working primarily at the well pads. Following construction, wells, pipelines, and transmission line, and other infrastructure would receive regularly scheduled inspection and maintenance.

Alternative 1 would use 23 miles of existing BLM roads with ROWs. The Project would use existing upgraded and two-track roads for access to all proposed pipeline and overhead transmission line ROWs, all production and injection wells, and the AAM&WS. Some existing road segments may require maintenance such as minor spot upgrading and ditching to maintain positive drainage away from the travel way. Public hazard warning signs would be placed on public roads, and existing locked gates. Access road initial maintenance would take place concurrently with the construction of other Project components. Road closure for initial road maintenance is not anticipated. Following is a brief description of additional transportation issues associated with each Project element.

- Wells would be accessed from U.S. 189 by taking CR 134 and several other county, collector, and unimproved roads leading to the west end of the RBPA. Flowlines with associated service circuits would be installed along existing roadways from the gas wells to the M&HRF and injection wells. These facilities would use personnel associated with drilling and completion activities and would not be expected to increase construction travel significantly.
- The AAM&WS would be located approximately 500 feet west of the proposed natural gas well pads, and similar roads for accessing the well pads would be used to access the AAM&WS.
- A helium dry gas pipeline is proposed to transport crude helium from the M&HRF to a HLF to be constructed on private land south of Big Piney, Wyoming, near the intersection of CR 134 (Big Piney-Calpet Road) and U.S. 189. The proposed crude helium and commercial natural gas pipelines may be located in overlapping or adjacent ROWs.
- A natural gas sales pipeline is proposed as part of the Proposed Action to transport processed natural gas from the M&HRF to a delivery point generally east of the plant at the Hare‘s Ear Compressor Station, approximately 7 miles west of Big Piney. Pipeline construction would use adjacent or overlapping ROWs wherever possible, and the fiber optic line and helium pipeline would share the same trench.
- A 230-kV three-phase power line would be constructed from the high-voltage substation located within the M&HRF to the Chimney Butte Substation located south of Calpet Road (CR 134), near U.S. 189. No permanent access road would be

maintained within the ROW. The authorized ROW would be used to reach pole locations and pulling/tensioning and guard structures inaccessible by existing roads. BLM estimates that overland transmission line ROW across public lands would attract unauthorized OHV use, resulting in long-term development of a two-track road disturbance. Any two-track roads or ATV trails created in conjunction with the development/construction of Project components would be closed and reclaimed immediately upon completion of that Project component. Seeding would be completed in the next seeding season. The Project proponent would implement procedures to preclude future use on the closed and reclaimed roads and trails.

- Snow fencing would be installed adjacent to specific access roads and well pads. The personnel would travel from local communities to the plant site daily.

Upon completion of construction activities, Cimarex would conduct maintenance and necessary upgrades on access roads to return them to a working condition similar to or better than the original condition. When maintenance causes damage to existing roads, restoration procedures following completion of repair work would be similar to those during construction.

ADT would be substantially higher during the active drilling period. Traffic would be highest through 2012, the year in which all drilling, construction, and field development activities would cease. Under the assumptions used for this analysis, proposed BLM-related action ADT would cease after 2012, except for maintenance on the pipelines and transmission line. Peak ADT during drilling and construction would depend on the number of vehicles working on various Project elements on any given day. To assess the range in vehicles that could be traveling on roads leading to and throughout the RBPA, the total number of vehicles associated with all BLM-related Project elements was compared to the total yearly traffic expected along U.S. 189. Results are shown in Table 4-43.

Table 4-43. Contribution of Project-Related Traffic to Annual Traffic Volumes Recorded along U.S. 189.

Project Element	Maximum Number of Vehicle Trips/Year	Percent of U.S. 189 Total Traffic Volume/Year[1]	
Drilling and Construction Phases		**Jct. SH 350**	**Jct. SH 235**
Gas and Injection Wells Drilling and Completion (6 total wells)	150	0.007%	0.02%
Ambient Air Monitoring and Weather Station	2–5	0.0002–0.00009%	0.0002–0.0005%
Transmission Line Construction	150–200	0.007–0.009%	0.015–0.021%
Pipeline Construction (Cimarex Natural Gas Pipeline, Helium/fiber Optic, Williams Pipeline)	150–200	0.007–0.009%	0.015–0.021%

[1] Calculated by multiplying the average daily traffic volume by 365 days; projected yearly volume at Jct. SH 350 is 2,168,100 and projected yearly volume at Jct. SH 235 is 945,350.

The ADT associated with peak construction activities would increase traffic by less than 1 percent compared with current traffic levels and would be dispersed throughout the RBPA. During this phase, vehicle traffic would include heavy equipment and heavy and light-duty trucks. Based on these assumptions and estimates and regular road maintenance carried out by Cimarex, the incremental increase in area traffic associated with the proposed Project would not cause substantial deterioration of level of service for U.S. 189 or SHs 350 and 235 or any other county, BLM resource, local, and collector roads in the transportation study area for the proposed Project. Because the Project traffic would cause a relatively small increase and would be of short duration, it would not be likely to cause a measurable increase in accident rates on highways and roads within the study area.

After construction and reclamation are complete, equipment and vehicular traffic would significantly decrease and would only take place during regular inspection and maintenance. Although heavy truck traffic would increase, the Operator would be responsible for constructing and maintaining new and improved roads in the RBPA. As a result, no fiscal effects related to roads are anticipated. Under Alternative 1, no new roads would be constructed, thus there would be no new access to sensitive resource areas.

4.11.3.2 Total Project Impacts with Alternative 1

Along with the direct and indirect impacts that would occur to transportation systems as a result of BLM actions in Alternative 1, there would be additional impacts related to other Project components.

Table 4-44 shows the activities related to additional Project elements, including the length of time to complete each Project element, the number of heavy equipment loads, and additional traffic associated with each element. The same 23 miles of existing roads consisting of BLM, state, and private ROWs would be used to access the M&HRF and HLF.

Table 4-44. Length of Time and Numbers of Heavy Equipment Loads and Additional Traffic Required for Completing each Project Element.

Project Element	Length of Time	Number of Heavy Equipment Loads/Year	Additional Traffic Associated with Project Element/Year	Maximum Number of Vehicle Trips/Year
Methane and Helium Recovery Facility Construction and Operation	Construction: 1 year, 6 months Operation: year-round for life of project	200–400	2–3 trips/day	930–1,495
Helium Liquefaction Facility Construction and Operation	Construction: 4 months Operation: year-round for life of project	50–80	2–3 trips/day	780–1,175

To assess the range in vehicles that could be traveling on roads leading to and throughout the RBPA, the total number of vehicles associated with the additional Project elements was compared to the total yearly traffic expected along U.S. 189. Results are shown in Table 4-45.

Table 4-45. Contribution of Project-Related Traffic to Annual Traffic Volumes Recorded along U.S. 189.

Project Element	Maximum Number of Vehicle Trips/Year	Percent of U.S. 189 Total Traffic Volume/Year[1]	
Drilling and Construction Phases		**Jct. SH 350**	**Jct. SH 235**
M&HRF Construction and Operation	200–400	0.009–0.02%	0.02–0.04%
Helium Liquefaction Facility Construction and Operation	50–80	0.002–0.004%	0.005–0.008%
Operation Phase			
M&HRF Construction and Operation	930–1495	0.04–0.07%	0.1–0.2%
Helium Liquefaction Facility Construction and Operation	780–1175	0.04–0.05%	0.08–0.1%

[1] Calculated by multiplying the average daily traffic volume by 365 days; projected yearly volume at Jct. SH 350 is 2,168,100 and projected yearly volume at Jct. SH 235 is 945,350.
M&HFR = Methane and Helium Recovery Facility

The ADT associated with additional peak construction activities would not significantly increase traffic compared with current traffic levels and that traffic would be dispersed throughout the RBPA. Based on these assumptions and estimates, the incremental increase in area traffic associated with the additional Project construction components would not cause substantial deterioration of level of service for U.S. 189 or SHs 350 and 235 or any other county, BLM resource, local, and collector roads in the transportation study area for the proposed Project, nor is it likely to cause a measurable increase in accident rates on highways and roads within the study area.

4.11.4 Alternative 2

4.11.4.1 Impacts of BLM Actions with Alternative 2

Traffic volumes and road use throughout the RBPA would only be impacted as a result of the following federal actions:

- Drilling of the four production wells and the acid gas injection wells and installation of the utility corridor.
- Installation of the AAM&WS.
- A 1.3-mile section of natural gas pipeline that crosses federal lands in order to access the Williams Hare‘s Ear compressor station.
- Installation of the Williams Trunk E loopline.

12063 4.11.4.2 Total Project Impacts with Alternative 2

12064 Traffic volumes and use throughout the RBPA during construction and maintenance would be
12065 similar to Alternative 1; however, traffic would be more concentrated along roads in the
12066 northern portion of the RBPA, specifically CRs 111 and 142. There would be 2.2 more miles
12067 of the Cimarex natural gas pipeline, 4.5 more miles of the 230-kV electrical transmission line,
12068 and 3.7 more miles of the helium pipeline that would need to be constructed compared to
12069 Alternative 1. Despite those differences, transportation impacts would be similar to those of
12070 Alternative 1 for each of the Project elements, resulting in no significant impacts to
12071 transportation.

12072 **4.11.5 Alternative 3**

12073 4.11.5.1 Impacts of BLM Actions with Alternative 3

12074 Impacts would be similar to those in Alternative 1.

12075 4.11.5.2 Total Project Impacts with Alternative 3

12076 Traffic volumes and use throughout the RBPA during construction and maintenance would be
12077 similar to the Proposed Action; however, the natural gas, helium, and fiber optic lines would
12078 occupy the same trench. Both Spring Creek and Beaver Creek would be bored. Despite those
12079 differences, transportation impacts would be similar to those of Alternative 1 for each of the
12080 Project components.

12081 **4.11.6 Alternative 4**

12082 4.11.6.1 Impacts of BLM Actions with Alternative 4

12083 Impacts of BLM actions would be similar to those in Alternative 1 except that the
12084 transmission line would not be constructed, so the number of heavy equipment loads, and
12085 vehicle trips per year, would drop by 150 to 200 during construction and there would be no
12086 maintenance traffic. Table 4-46 describes the traffic and equipment loads that would result
12087 with the implementation of Alternative 4. Additionally, there would be little incentive or
12088 opportunity for unauthorized OHV use and no resulting two-track road development with
12089 Alternative 4.

12090 4.11.6.2 Total Project Impacts with Alternative 4

12091 Traffic volumes and use throughout the RBPA during construction and maintenance would be
12092 similar to the Proposed Action. Additional construction trips would be necessary to complete
12093 the electrical generation station, but the trips and loads required for construction of the
12094 transmission line in the Proposed Action would no longer be necessary. In addition, without
12095 the transmission line, there would be little incentive or opportunity of unauthorized OHV use,
12096 and no resulting two-track road development with Alternative 4.

Table 4-46. Length of Time and Numbers of Heavy Equipment Loads and Additional Traffic Required for Completing each Project Element.

Project Element	Length of Time	Number of Heavy Equipment Loads/Year	Additional Traffic Associated with Project Element/Year	Maximum Number of Vehicle Trips/Year
Gas and Injection Wells Drilling and Completion (six wells)	Drilling: 138 days/year for 4 years Completion: 25–35 days/year for 4 years	110–120	20–30	150
Ambient Air Monitoring and Weather Station	4 weeks	2–5		2–5
Cimarex Natural Gas Pipeline Construction and Fiber Optic Line	36 weeks	150–200		150–200
Access Road Initial Maintenance	3–8 weeks	70–120		70–120
Methane and Helium Recovery Facility Construction and Operation	Construction: 1 year, 6 months Operation: year-round for life of project	200–400	2–3 trips/day	930–1,495
Helium Liquefaction Facility Construction and Operation	Construction: 4 months Operation: year-round for life of project	50–80	2–3 trips/day	780–1,175

4.11.7 Cumulative Impacts

The cumulative impacts study area for transportation includes the highways and local/industrial roads adjacent to and within the proposed Project corridor. Cumulative impacts from traffic resulting from this Project in combination with other regional projects and overall regional growth could be significant if the BLM, the State of Wyoming, and/or Sublette and Lincoln counties could not adequately achieve land use planning objectives for transportation. Development of the Project in the area would cause an increase in traffic and movement of heavy equipment for a short duration. Increased traffic would result in an increased potential for public traffic hazards and other safety and road maintenance concerns. Existing major highways and BLM roads may be adequate to handle anticipated increases in traffic volume and size; however, combined with previously authorized and foreseeable future activities there is a potential that these roads may not maintain existing roadway conditions and safety. The costs of maintaining county and local roads would be borne, to some extent, by the Operator through road maintenance and repair as part of the Project and through tax payments.

4.11.8 Mitigation and Monitoring Opportunities

All existing roads would be maintained by the Operator and would be left in a condition equal to or better than their condition prior to Project construction. The following sections describe measures Cimarex could use to reduce impacts to roads, the transportation network, the traveling public, air quality, soils, vegetation, wildlife, livestock grazing, and recreation.

4.11.8.1 Mitigation

*4.11.8.1.1 BLM-Required Mitigation**

- The Operator would jointly develop and submit for BLM approval road maintenance and use agreements designating road development, maintenance, and use requirements. These agreements could identify responsibilities for necessary preventative and corrective road maintenance throughout the LOP. Maintenance responsibilities could include, but not be limited to, blading, gravelling or aggregate-surfacing, cleaning ditches and drainage facilities, dust abatement, noxious weed control, culvert maintenance and repair, or other requirements.
- The Operator would implement the resource, mitigation, and monitoring measures found in the Transportation Plan.
- All development activities along approved ROWs would be restricted to areas authorized in the approved ROW; however, ROW widths could be minimized where feasible.
- The Operator would implement fugitive dust control measures on primary access roads and heavily used resource roads.
- The Operator would deliver and store equipment and bulk supplies on well pads prior to seasonal stipulation periods to the extent feasible to reduce traffic.
- Where feasible, the Operator would develop a computer-assisted field automation of well sites to reduce traffic to each site.
- Any two-track roads or ATV trails created in conjunction with the development/construction of Project components would be closed and reclaimed immediately upon completion of that Project component. Seeding would be completed in the next seeding season.
- The Project proponent would implement procedures to preclude future use on the closed and reclaimed roads and trails.
- In consultation with BLM and WGFD, the Operator would install gates as appropriate and supply other needed material in crucial winter range and sage-grouse concentration areas to encourage compliance with traffic restrictions. After construction, the BLM would maintain the gates. Gate keys would be managed by the BLM. Gate closures would be consistent with traffic restrictions. Proponents would assist BLM with signage on or near the gate explaining the traffic restrictions.

12152 *4.11.8.1.2 Other Mitigation Opportunities***

12153 • Workers traveling to similar work sites within the RBPA could car pool and/or use
12154 buses from communities of origin to the field to minimize commuting traffic.

12155 • When practical and feasible, the Operator would maximize the use of temporary fresh
12156 water pipelines during late spring, summer, and early fall from water wells to active
12157 drill sites to decrease water hauling needs.

12158 • The Operator would comply with existing federal, state, and county requirements and
12159 restrictions to protect road networks and the traveling public.

12160 • Special arrangements would be made with the WYDOT to transport oversize loads to
12161 the RBPA. Otherwise, load limits would be observed at all times to prevent damage to
12162 existing road surfaces.

12163 • The Operator would coordinate the transportation routes and scheduling of service
12164 contractors to minimize the amount of traffic associated with year-round development.

12165 • Contractors and employees would be required to comply with all posted speed limits.

12166 4.11.8.2 Monitoring

12167 *4.11.8.2.1 BLM-Required Monitoring**

12168 • The Operator could jointly develop and submit for BLM approval road maintenance
12169 and use agreements designating road development, maintenance, and use
12170 requirements. These agreements could identify responsibilities for necessary
12171 preventative and corrective road maintenance throughout the LOP. Maintenance
12172 responsibilities could include, but not be limited to, blading, gravelling or aggregate-
12173 surfacing, cleaning ditches and drainage facilities, dust abatement, noxious weed
12174 control, culvert maintenance and repair, or other requirements.

12175 • All roads used to access the wells, pipelines, and other facilities would be maintained
12176 in their current condition or better. Continuous inspection would be performed, and
12177 preventative maintenance measures would be taken on a biannual basis. These
12178 measures may include grading, cleaning drainage structures, ensuring erosion control
12179 and slope stabilization, and closing roads during periods of excessive soil moisture.

12180 • As part of normal operational winter maintenance, the Operator would plow roads the
12181 minimum amount necessary to allow safe navigation. Plows would provide breaks in
12182 snow-piled berms along the road margins (knockouts) to allow free movement of
12183 wildlife across roads.

12184 *4.11.8.2.2 Other Monitoring Opportunities***

12185 None identified at this time.

12186 * BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the
12187 proposed Project, as identified in Chapter 2.

12188 ** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project
12189 components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal
12190 Project components.

4.12 SOCIOECONOMIC RESOURCES AND ENVIRONMENTAL JUSTICE

4.12.1 Impact Criteria

Impacts to socioeconomic resources would result from the effects of construction dollars and workers on local economy and social conditions. The potentially affected area includes Sublette and Lincoln counties, located in western and southwest Wyoming. These counties were chosen for analysis because the Project elements for all action alternatives are located in these counties where potential impacts would most likely be realized.

Socioeconomic resources would be affected directly and indirectly from such sources as:

- Project-related employment and income;
- population changes associated with in-migrating Project-related or indirect workers and their families that exceed the capacity of local infrastructure;
- changes in demand for housing and public infrastructure/services that exceed existing local inventory;
- changes in the revenues and expenditures (fiscal characteristics) of affected local governments; and
- adverse changes in social conditions and quality of life.

Short-term effects to socioeconomic resources would generally occur during the construction phase of the Project, while longer-term effects would occur during the Project operations phase. Impacts would be significant if the affected communities and local government experienced an inability to cope with these changes, such as substantial housing shortages, fiscal problems, or breakdown in social structures and quality of life. Indirect effects from implementation of any of the alternatives could result if this Project served as a stimulus for other major industrial, commercial, or residential growth in Sublette or Lincoln counties.

4.12.2 No Action Alternative

Under the No Action Alternative, BLM would not take action on the application for ROWs or drilling. However, it is assumed that Cimarex would proceed under the No Action Alternative which includes constructing and operating all essential Project components on private and state land. As a result, impacts to socioeconomic resources would occur.

4.12.2.1.1 Population

Table 4-47 shows the results of an analysis of the existing population base within 150 miles of the Project site. This distance was used because that is generally considered the maximum distance a construction worker is willing to travel to a project site.

Table 4-47. Population Centers within 150 Miles of the RBPA.

Residential Area (city/town)	2007 Estimated Population	Approximate Road Distance from the RBPA (miles)
Big Piney	476	3
Marbleton	919	3.5
Daniel	118	26
Pinedale	2,043	40
LaBarge	446	18
Kemmerer	2,427	65
Diamondville	656	64
Frontier	N/A	63
Granger	146	100
Lyman	1,990	123
Fort Bridger	410	120
Green River	12,072	135
Rock Springs	19,659	145
Total Estimated Population	**41,362**	

Source: State of Wyoming 2008a.

4.12.2.1.2 Employment, Housing, and Infrastructure

Short-term impacts of No Action would include the influx of approximately 189 to 355 temporary workers for drill rigs and the construction of transmission lines, pipelines, and other facilities. Construction and operation of the M&HRF, HLF, and other components would add between 29 and 38 permanent employees for facility operation and maintenance. Any hired non-resident employees may temporarily relocate to Sublette County during the construction phase. However, some portion of Project-related jobs would be filled by existing residents of the study area. The more local persons are hired (rather than non-local persons), the lower the likelihood of population increases due to Project employment. Approximately 41,000 people reside near the RBPA.

4.12.2.1.3 Taxes, Revenues, and Public Services/Infrastructure

Actions proposed to occur as a result of No Action would contribute additional revenue to the state and local communities as well as provide other economic benefits. Direct benefits would result from material procurement for construction of the transmission line and subsurface infrastructure and associated sales taxes on those materials. Indirect benefits would include increased spending from increased oil and gas production, as well as increased lodging taxes from non-resident workforce spending on hotels and motels. Mineral severance and property taxes on production would also grow indirectly as a result of increased industrial activity in the oil and gas industry.

Local communities such as Pinedale, Marbleton, and Big Piney would benefit from the economic activity generated by the purchase of services, manufactured goods, and equipment from local businesses. The majority of spending would occur in Sublette County. Spending on materials purchased within Sublette County would be subject to sales tax; a small percentage

of these revenues would be distributed back to the local economy. Other state and local tax payments and fees would be incurred as a result of the implementation of the BLM actions.

Effects on the tax base with No Action is likely to be similar to Alternative 2, and would not result in significant impacts.

4.12.2.1.4 Quality of Life/Social Structures

Sublette County has been experiencing social change for the past decade due to oil and gas development in the area. The non-resident regional workforce has increased since 1998; with this workforce expansion, Sublette County has experienced substantial increases in traffic accidents and arrests (Jacquet 2005). Additionally, there is a reported decrease in retail and entertainment businesses locally over the same time period because the cost of living is so high and retail and entertainment jobs tend to pay below the median income (Jacquet 2005). The result is that the quality of life for residents in Sublette County has been changing as the influx of non-local residents change the regional lifestyle.

Given this change, Sublette County has invested in its infrastructure to accommodate an expanding permanent and temporary population. Although new developments, including implementation of the action alternatives, would be largely consistent with existing social structures in the area, it is possible that increases in temporary population could indirectly raise the cost of living (including housing) due to higher demand, and may increase pressure on some social services. However, as stated, much of the workforce is anticipated to originate from the local communities, which would reduce net in-migration of non-resident workers. Any non-resident workers that would be hired would likely temporarily reside in the local communities with demands on local services returning to existing levels once Project construction is complete.

Therefore, implementation of the No Action Alternative would not be expected to result in any long-term, identifiable impacts to social conditions or structures. Additionally, there would be no anticipated reductions in either AUMs or cancellation of federal or state lease agreements associated with the actions proposed to occur on public lands. Therefore, implementation of any of the Project components proposed to take place on public lands would not have a direct, long-term impact on the social conditions and quality of life for the current residents of Sublette County, as the county has changed over the past decade and is now able to absorb a temporary increase in population.

4.12.3 Alternative 1

4.12.3.1 <u>Impacts of BLM Actions with Alternative 1</u>

All employment associated with construction of BLM components would be temporary, but could still necessitate additional housing needs where current demand is high. Demands for services would likely experience an increase, but that increase would be temporary and unlikely to adversely impact the quality of life of the communities surrounding the RBPA.

4.12.3.1.1 Population

.According to the State of Wyoming Economics Analysis Division, there were approximately 41,000 people residing within 150 miles of the RBPA in 2007. Given typical commuting

distances for construction workers, this existing population could supply a substantial portion of employment needs, thereby reducing an increase in the temporary and permanent population in the local area.

4.12.3.1.2 Employment, Housing, and Infrastructure

Short-term impacts of BLM actions would include the influx of approximately 124 to 160 temporary workers for drill rigs and the construction of transmission lines, pipelines, and other facilities under the BLM jurisdiction, as shown in Table 4-48. Since these Project components do not require consistent attention and operation after initial construction, Project components on federal lands would not add any additional long-term employment to the area and is therefore in compliance with the identified impact criteria.

Table 4-48. Projected Employment Associated with No Action and Alternatives 1, 2, and 3.

Project Element	Construction Employment	Permanent Employment
BLM Actions		
Air Quality Monitoring Station	10–20	0
Gas and Injection Wells (5)	24–30	0
Transmission Line	10–20	0
Helium and Natural Gas Pipelines (including Williams Extension) (uses the same crew)	75–100	0
Fiber Optic Line	5–10	0
Added Employment from BLM Actions	124–180	0
Private/State Actions		
Helium Liquefaction Facility	15–25	10–12
Methane and Helium Recovery Facility	50–150	15–20
Corporate Office (Big Piney)	0	4–6
Added Employment from Non-federal Actions	65–175	29–38
Project Total	**189–355**	**29–38**

4.12.3.1.3 Taxes, Revenues, and Public Services/Infrastructure

Actions proposed to occur on federal lands would contribute additional revenue to the state and local communities as well as provide other economic benefits. Direct benefits would result from material procurement for construction of the transmission line and subsurface infrastructure and associated sales taxes on those materials. Indirect benefits would include increased spending from increased oil and gas production, as well as increased lodging taxes from non-resident workforce spending on hotels and motels. Mineral severance and property taxes on production would also grow indirectly as a result of increased industrial activity in the oil and gas industry.

Based upon projected production of 620 bcf and current methane pricing, the State of Wyoming would gain approximately $32.1 million over the life of the wells. Additionally, although not considered a federal action, helium production is a connected action under this

Alternative and is estimated to produce 17 bcf, which would generate estimated revenues of $8.5 million (federal royalties) over the expected life of the wells.

Local communities such as Pinedale, Marbleton, and Big Piney would benefit from the economic activity generated by the purchase of services, manufactured goods, and equipment from local businesses. The majority of spending would occur in Sublette County. Spending on materials purchased within Sublette County would be subject to sales tax; a small percentage of these revenues would be distributed back to the local economy. Other state and local tax payments and fees would be incurred as a result of the implementation of the BLM actions.

4.12.3.1.4 Quality of Life/Social Structures

Sublette County has been experiencing social change for the past decade due to oil and gas development in the area. The non-resident regional workforce has increased since 1998; with this workforce expansion, Sublette County has experienced substantial increases in traffic accidents and arrests (Jacquet 2005). Additionally, there is a reported decrease in retail and entertainment businesses locally over the same time period because the cost of living is so high and retail and entertainment jobs tend to pay below the median income (Jacquet 2005). The result is that the quality of life for residents in Sublette County has been changing as the influx of non-local residents change the regional lifestyle.

Given this change, Sublette County has invested in its infrastructure to accommodate an expanding permanent and temporary population. Although new developments, including implementation of the action alternatives, would be largely consistent with existing social structures in the area, it is possible that increases in temporary population could indirectly raise the cost of living (including housing) due to higher demand, and may increase pressure on some social services. However, as stated, much of the workforce is anticipated to originate from the local communities, which would reduce net in-migration of non-resident workers. Any non-resident workers that would be hired would likely temporarily reside in the local communities with demands on local services returning to existing levels once Project construction is complete.

Therefore, implementation of federal actions under Alternative 1 would not be expected to result in any long-term, identifiable impacts to social conditions or structures. Additionally, there would be no anticipated reductions in either AUMs or cancellation of federal or state lease agreements associated with the actions proposed to occur on public lands. Therefore, implementation of any of the Project components proposed to take place on public lands would not have a direct, long-term impact on the social conditions and quality of life for the current residents of Sublette County, as the county has changed over the past decade and is now able to absorb a temporary increase in population.

4.12.3.2 Total Project Impacts with Alternative 1

4.12.3.2.1 Population

Construction and operation of the non-federal Project components would add between 65 and 175 temporary workers when construction is at its peak, and between 29 and 38 permanent employees for facility operation and maintenance. This would result in a Project total of approximately 355 temporary workers to the region during peak construction times. Any hired

non-resident employees may temporarily relocate to Sublette County during the construction phase. However, some portion of Project-related jobs would be filled by existing residents of the study area. The more local persons are hired (rather than non-local persons), the lower the likelihood of population increases due to Project employment. As shown in Table 4-47, a 150-mile radius from which to draw a potential workforce was used to quantify a potential local workforce. The results show that approximately 41,000 people reside near the RBPA.

The provision of adequate and reliable power to the region could enable additional commercial, industrial, and residential growth to the county, thereby indirectly increasing population in the region. Sublette County is already amongst the fastest growing counties in the nation.

4.12.3.2.2 Employment, Housing, and Infrastructure

Table 4-48 provides a summary of projected Project-related employment needs. As stated, the major source of employees for the Project would originate from the existing population base in Sublette County, and to a lesser extent, in Lincoln County in the town of LaBarge. Implementation and construction of any of the action alternatives would result in a range of 189 to 355 construction workers to be present within the 17-mile RBPA corridor during certain periods of intensive construction. Once started, construction of all essential components of the Project would take approximately 22 months to complete. The construction period may be extended to account for seasonal stipulations. Drilling and construction of many of the interrelated Project components and facilities would take place concurrently. Once construction of essential elements is complete, construction activity would be dispersed among various locations in the 17-mile Project corridor. Additional drilling and minor construction activity involving crews of 24 to 30 persons would continue for approximately two years after plant start-up and testing, as the final wells are drilled and completed along with the M&HRF.

The temporary construction workforce is expected to come from both local and non-local sources. The proportion of local versus non-local workers is currently not known and cannot be projected with a high level of accuracy at this time. It is expected that existing housing facilities in most of the local smaller towns such as LaBarge and Big Piney would not be able to accommodate all in-migrating workers. As such, construction workers seeking temporary residence in the area would likely extend into the bigger towns of Big Piney, Pinedale, Kemmerer, and Green River. Non-resident workers would likely occupy non-traditional housing (i.e., hotels and camp trailers) during their stay and due to the temporary nature of the work, it is unlikely their families would accompany them. Direct impacts to housing supply and demand would be expected in the communities where the temporary workforce would reside.

Depending on where the workforce stays and the duration of those stays, it is expected that the temporary workforce would reduce the total amount of available housing. Housing supply growth in the area has historically lagged behind population growth by roughly 50% (Jacquet 2005) in large part because new home construction costs are restrictively expensive in the region for most median wage earners. An influx of potential residents and workers as a result of increased industrial and commercial growth in the region could further, though indirectly, increase the existing housing shortage.

Although no quantitative analysis regarding the potential impacts on property value was conducted for this Project, it is unlikely that any of the action alternatives would adversely impact property values within the RBPA, especially the eastern portion of the RBPA. It is unlikely because the RBPA contains very few private residences. Most residences within the 17-mile Project corridor are located at the eastern portion of the corridor where infrastructure currently exists, including overhead transmission lines and U.S. 189. However, while average housing sales prices have increased 200.2% since 1998 in Sublette County, there is the potential for the action alternatives to affect the property values of the few private residences in the rest (central and western portions) of the Project corridor. However, an assessment of potential impacts is not known at this time. Previous research results on this topic are wide ranging, as some studies report no effects on property values, while other studies report very small effects, and other studies report serious effects on property value (Seesholtz 2004). However, the level, duration, and context of potential impacts would vary according to the proximity of the residence in relation to the any of the Project elements; the following statements are typical for a Project as described in the action alternatives:

- properties directly adjacent to any element in the Project corridor are more likely to be affected;
- impacts to property values, if any, generally decrease over time; and
- the overall reduction in property values for single-family residential properties is typically 2% to 10% (Kroll and Priestly 1992).

These statements also apply to Alternative 2, which would locate the majority of Project elements on various pieces of private land. Private land potentially available for housing and industrial siting is concentrated in the valley along the eastern portion the RBPA, including CR 350, CR 151, and CR 235, all of which are adjacent to U.S. 189 and private land along the valley floor.

4.12.3.2.3 Taxes, Revenues, and Public Services/Infrastructure

A Special Land Use Permit has been obtained from the State of Wyoming for an M&HRF to be constructed and operated by Cimarex. The M&HRF would occupy approximately 10 acres within a total of approximately 34 acres of state land. The lease would be for a 50-year term at a rental rate of $19,000 per year adjusted annually by 2.7% to offset inflationary pressure. The lease would also be subject to a rental review every five years.

The proposed M&HRF would consist of seven buildings at a projected cost of $40,000,000 to construct. Construction and substantial portions of the M&HRF would be performed off-site in fabrication shops in Midland, Texas, and Pocatello, Idaho. The modular components would be transported to the proposed site on state land and assembled. Assembly would take place following approval of the state lease as well as all other agency approvals.

Within the Riley Ridge Unit, there are 640 acres of state land, 40 acres of fee land, and 9,100 acres of federal land. The location of the M&HRF within the Riley Ridge Unit on either state, federal, or fee lands would have no affect on the natural gas royalties received by the State of Wyoming. The state‘s share of the unit production is approximately 6.54% on methane and helium sales following production and processing. The state would also receive 50% of the

12437 royalties generated from methane production on the federal lands. The state would not realize
12438 revenue from helium produced from federal lands.

12439 Based upon projected production of 620 bcf and current methane pricing, the State of
12440 Wyoming would gain approximately $32.1 million over the life of the M&HRF. Additionally,
12441 helium production is estimated to be 17 bcf and would generate estimated revenues of $8.5
12442 million over the expected life of the M&HRF.

12443 Communities such as Pinedale, Marbleton, and Big Piney would benefit from the economic
12444 activity generated by facility assembly, the purchase of services, manufactured goods, and
12445 equipment from local businesses. The majority of spending would be expected to occur in
12446 Sublette County. Spending on materials purchased within Sublette County would be subject
12447 to sales tax; a small percentage of these revenues would be distributed back to the local
12448 economy. Other state and local tax payments and fees would be incurred as a result of the
12449 implementation of the Project components.

12450 Sublette County, and to a lesser extent Lincoln County, may experience a very small increase
12451 in the demand for public services and infrastructure. But it is projected that any such
12452 increased demand would be paid for by tax revenues directly and indirectly related to the
12453 proposed Project. County or other jurisdiction responsibilities for the provision of services
12454 and infrastructure therefore would not be substantially affected by the Project and would be in
12455 compliance with the identified impact criteria.

12456 In addition to these costs, the WGFD also estimated emergency feeding costs associated with
12457 displaced elk from native winter range as a result of development activity. Based on data from
12458 the WGFD elk feedground program, emergency feeding operation costs for the closest elk
12459 feedground to the Riley Ridge area has averaged $132 per elk since 2003 (Smith 2008). Based
12460 on the past three-year average of approximately 200 elk in the Riley Ridge elk herd,
12461 emergency feeding operation costs if 50% of the Riley Ridge elk herd was displaced would be
12462 approximately $13,200, and $26,400 if 100% of the herd was displaced (Smith 2008).

12463 *4.12.3.2.4 Quality of Life/Social Structures*

12464 Short-term employment from construction of non-federal actions is expected to increase
12465 demand for non-traditional housing units (i.e., motels) in Sublette and Lincoln counties more
12466 than for traditional housing. Compared to the rest of the state, Sublette County already
12467 experiences local workforce shortages and a high cost of living. Increases in temporary
12468 population could indirectly increase the cost of living (including housing) in the area.

12469 As previously stated, the non-resident regional workforce has increased since 1998; with this
12470 workforce expansion, Sublette County has experienced substantial increases in traffic
12471 accidents and arrests (Jacquet 2005). Additionally, there is a reported decrease in retail and
12472 entertainment businesses locally over the same time period because the cost of living is so
12473 high and retail and entertainment jobs tend to pay below the median income (Jacquet 2005).
12474 The result is that the quality of life for residents in the county has been changing as the influx
12475 of non-local residents change the regional lifestyle.

New developments, including implementation of the action alternatives, would be consistent with existing social structures in the area. It is not expected that any of the alternatives would result in any identifiable impacts to social conditions or overall quality of life. Additionally, there are no anticipated reductions in either AUMs or cancellation of federal or state lease agreements associated with the proposed M&HRF.

4.12.4 Alternative 2

4.12.4.1 Impacts of BLM Actions with Alternative 2

Impacts of federal land actions with this alternative would be limited to the well drilling operations and construction and installation of the AAQMS and portions of the pipelines and fiber optic line that fall on federal land. Table 4-49 shows the added employment associated with federal land action under Alternative 2. Employment needs would be further offset by the fact that the pipeline and fiber optic line workers would be used for the non-federal construction component as well.

Table 4-49. Projected Employment Associated with Alternative 2.

Project Element	Construction Employment	Permanent Employment
BLM Actions		
Air Quality Monitoring Station	10–20	0
Gas and Injection Wells (5)	24–30	0
Williams Pipeline	75–100	0
Fiber Optic Line	5–10	0
Added Employment from BLM Actions	114–180	0
Private/State Actions		
Helium Liquefaction Facility	15–25	10–12
Methane and Helium Recovery Facility	50–150	15–20
Corporate Office (Big Piney)	0	4–6
Transmission Line	10–20	0
Helium and Natural Gas Pipelines (shared with federal actions)	75–100	0
Added Employment from Non-federal Actions	75–195	29–38
Project Total	**189–375**	**29–38**

4.12.4.2 Total Project Impacts with Alternative 2

Only the location, and hence land ownership, of some Project components would change with Alternative 2, compared with Alternative 1. The factors affecting socioeconomics such as population, employment, housing, taxes, revenues, and public services, and quality of life and social structures would be similar among the two alternatives. Two factors that would distinguish potential socioeconomic impacts of Alternative 2 lies in the amount of private land that would be leased in order to implement this alternative. Exact ROW location and construction methods and a whole host of other issues would be defined in private leases. BLM would have no jurisdiction over private ROW areas or the measures imposed by landowners. And private landowners, rather than the federal government, would receive lease

revenues for the LOP. Reductions in private landowner grazing could be expected as a short-term adverse impact with Alternative 2.

No adverse socioeconomic impacts would be anticipated from implementation of Alternative 2, making this alternative in compliance with the identified impact criteria.

4.12.5 Alternative 3

4.12.5.1 Impacts of BLM Actions with Alternative 3

Socioeconomic impacts of federal actions with Alternative 3 would be the same as for Alternative 1, since both alternatives have the same Project components and locations.

4.12.5.2 Total Project Impacts with Alternative 3

Total socioeconomic impacts with Alternative 3 would be the same as for Alternative 1, since both alternatives have the same Project components and locations.

4.12.6 Alternative 4

4.12.6.1 Impacts of BLM Actions with Alternative 4

Impacts from federal actions would be similar to those described in Alternative 1, but because the transmission line would not be constructed under this alternative, there would be a slight reduction (10 to 20 workers) in the temporary workforce. The elimination of these temporary workers also entails a slight reduction in the temporary population (if these workers are non-residents), demand for additional housing services, as well as sales tax revenue for the county and state.

4.12.6.2 Total Project Impacts with Alternative 4

Potential socioeconomic impacts of Alternative 4 would include a reduction in specialized high-voltage transmission line labor force, since only a short transmission line is proposed between the M&HRF and EGS and the transmission line on federal lands is entirely eliminated. Alternative 4 would also require an increase in specialized work force for the construction of an EGS. The number of anticipated workers for the EGS is approximately the same as required for the transmission line as described in Alternatives 1, 2, and 3. Therefore, the overall actual number of construction workers and long-term Project employees would be roughly the same as these alternatives. As such, anticipated impacts from implementation of Alternative 4 would not exceed the identified impact criteria for socioeconomics.

4.12.7 Cumulative Impacts

The amount of oil and gas activity within the RBPA is expected to double in the reasonably foreseeable future. As such, socioeconomic conditions in the region could be cumulatively affected by past, present, and future projects that contribute to the economy, increase employment (temporarily or permanently), increase the demand for public services, change tax revenue, and/or change the perceived quality of life or social structures. The Project would contribute incremental effects to existing and future oil and gas developments, such as the Big Piney-LaBarge Infill Project, and other industrial, commercial, and residential development on private land, leading to increased population, supply and demand on housing and employment, and increased taxes and revenues to governments. Local communities would

experience the beneficial economic effects of more consumption of local goods and services, and increased sales tax revenues. Actual impacts would depend on the number and size of future energy projects and the rate of other industrial, commercial, and residential development. Action alternatives associated with this Project would not add to any significant adverse cumulative social and economic impacts of energy development in the region.

4.12.8 Mitigation and Monitoring Opportunities

4.12.8.1 Mitigation

*4.12.8.1.1 BLM-Required Mitigation**

Refer to the Pinedale RMP, Appendix 3, for BLM-required mitigation.

*4.12.8.1.2 Other Mitigation Opportunities***

To reduce the potential for adverse housing or social/quality of life effects, it is recommended that the Project proponent develop and implement an effort to support local hiring to the extent practicable.

4.12.8.2 Monitoring

*4.12.8.2.1 BLM-Required Monitoring**

Refer to Pinedale Field Office Oil and Gas Development Social and Economic Monitoring Plan developed by Dr. Robert Winthrop. Monitoring reports will be submitted to the BLM and cooperating agencies annually.

*4.12.8.2.2 Other Monitoring Opportunities***

None.

* BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the proposed Project, as identified in Chapter 2.

** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal Project components.

4.13 RECREATION RESOURCES

The primary management goal for recreation resources for the PFO is to provide substantial personal, community, economic, and environmental benefits to local residents and visitors through recreational uses of the public lands. Objectives to this goal include maintain or enhance the health and viability of recreation-dependent natural resources and settings within the planning area; promote commercial competitive events and organized group activities where appropriate and compatible with natural resource management objectives; and manage SRMAs to provide for current and future recreation opportunities (BLM 2008b). The potentially affected area includes Sublette County, located in western Wyoming. Lincoln County was not included in this recreation analysis because only a small portion of the proposed Williams Pipeline Extension (approximately 3 miles) occurs in Lincoln County. Because of the fluid mineral development in the area, recreation use is less than in other areas with similar recreation setting and opportunities.

4.13.1 Impact Criteria

Short-term impacts to recreation would be considered significant if the proposed Project development:

- precludes the recreation use of the area surrounding the RBPA or result in violation of the BLM PFO RMP or other land use plan recreation objectives;
- results in construction noise and disturbance on hunting and other public land recreators such that it precludes use for dispersed hunters using public lands or the recreation experience of individuals around the RBPA;
- affects the visual character of the area such that it adversely degrades the recreation experience of dispersed hunters, fisherman, and other recreators using public lands; or
- diminishes the quality of the recreational experience of individuals visiting the Lander Road located near the RBPA due to presence of industrial facilities such as transmission line, power poles, and M&HRF.

4.13.2 No Action Alternative

Under the No Action Alternative, BLM would not take action on the Cimarex applications and impacts to recreation would not occur as a result of BLM actions. The RBPA would continue to be managed under ERMA direction, where hunting and OHV use are the primary recreational activities. Current restrictions on motorized travel within the RBPA would continue under the No Action Alternative.

Non-federal actions are likely to occur under the No Action Alternative implementing major Project components, as described in Chapter 2.

Since all Project facilities would be constructed on private and state land with the No Action Alternative, several important adverse impacts could occur to the recreational experience in the Big Piney area. Such impacts are difficult to quantify since the location and visual quality of this alternative is unknown. However, it is likely to be similar to Alternative 2, which also includes many facilities on private and state land.

Impacts of No Action could include noise created from temporary and limited construction activities as a result of the installation of natural gas and helium pipelines and temporary visual impacts from the added presence of drill rigs and the M&HRF on Riley Ridge. Indirect impacts to recreation would include increased traffic in localized areas within the RBPA during construction activities and the potential for wildlife displacement and impacts to hunting activities if construction occurs around hunting seasons.

Although the RBPA does not include any developed recreation sites, the area does contain a section contributing to the Lander Road Historic Trail, which some people may use to have a high-quality recreational and/or cultural experience. Impacts to these experiences within the RBPA would be similar to those described in Alternative 2, would be limited to the visual setting of the area, and would not directly impact the Lander Road Historic Trail.

Recreators would not be precluded from engaging in activities on federal lands in the RBPA, but may be affected by those non-federal actions. Any change in the quality of recreation experience on BLM lands as a result of the effects of non-federal actions would be speculative and outside of BLM jurisdiction and ability to modify or change.

4.13.3 Alternative 1

4.13.3.1 Impacts to BLM Actions with Alternative 1

Direct impacts to recreation on BLM, private, and state lands with all the action alternatives would be similar among activities such as big and small game hunting, fishing, snowmobile/OHV use, cross-country skiing, and back-country activities such as snowshoeing. Impacts include noise created from construction activities and visual impacts from the added presence of the transmission line, and associated powers poles across the landscape. Indirect impacts to recreation would include increased traffic in localized areas within the RBPA during construction activities and the potential for wildlife displacement and impacts to hunting activities if construction occurs around hunting seasons.

4.13.3.1.1 Big and Small Game Hunting

Public lands within the RBPA are managed for hunting purposes. As such, impacts to hunting activities could include disruption of game animals, restricted access to hunting areas, a diminished overall hunting experience and recreational setting due to presence of work activity and physical appearance of the transmission line and power poles.

In the short-term, hunting activities may be disrupted if construction of the action alternatives coincides with the hunting season (September through November) between 2009 and 2010. Construction noise may prevent game species from inhabiting the area, subsequently diminishing the availability of these species for hunters. Hunting activities may also be temporarily impacted due to increased traffic resulting from heavy load construction equipment traveling throughout the RBPA. In addition, the hunting experience may be impacted due to the added presence of human activity, increased probability of human interaction, and an overall altered natural environment typically appreciated by hunters.

Long-term impacts associated with implementation of the action alternatives to hunting and camping activities would include an increase in the likelihood of human interactions, an increase in the sights and sounds associated with the human environment, and creating an environment that appears less natural than existing conditions, all of which can contribute to a diminished hunting experience. Anecdotal evidence indicates that as industry activity increases through the development of more roads, wells, pipelines, and related projects, it is becoming more challenging for private outfitters to attract clients during the fall hunting seasons due to the general perception that no big game animals would be located in these industrialized areas.

As a result of these potential short- and long-term impacts, displaced hunters would likely disperse elsewhere within the PFO, thus increasing human interaction in these areas. However, public lands within the RBPA would continue to be managed and open to hunting activities. As such, Project components proposed to take place on public lands would not preclude recreation activities from occurring within the RBPA.

12655 **4.13.3.1.1.1 Total Project Impacts with Alternative 1**

12656 Additional disruption to hunting activities in the RBPA as a whole would be similar to
12657 impacts on BLM lands, extending to private and state lands in the RBPA. Most notably,
12658 additional impacts to hunting would occur on the state land where the M&HRF would be
12659 located and could include the loss of game animals in and around this area because of an
12660 increase in human presence and activity, restricted access to hunting lands near the state land
12661 parcel, a diminished overall hunting experience and recreational setting due to presence of
12662 work activity, and physical appearance of the transmission line, power poles, and M&HRF.
12663 Compared against the impact criteria, Project components proposed within the RBPA may
12664 impact the recreation experience, but would not prevent people from engaging in recreation
12665 activities in the RBPA.

12666 *4.13.3.1.2 Fishing*

12667 **4.13.3.1.2.1 Impacts of BLM Actions with Alternative 1**

12668 As previously stated, there are no public access fishing locations in the RBPA. As such, no
12669 significant impacts are anticipated.

12670 **4.13.3.1.2.2 Total Project Impacts with Alternative 1**

12671 Any potential fishing access points to regional streams and tributaries are located on private
12672 land where access requires permission of the land owner. However, because it is expected that
12673 some fishing does take place in the RBPA, an impact analysis on the fishing recreation
12674 experience was conducted.

12675 Impacts to fishing on private lands under the action alternatives may occur during active
12676 construction phases, primarily from temporary noise disturbances, and increased vehicle
12677 traffic. Upon proposed Project completion, impacts to the fishing experience on private lands
12678 in the RBPA would be limited to a change in the natural setting due to the presence of the
12679 proposed M&HRF, gas wells, and transmission line and power poles which may add a new
12680 vertical element to the landscape that did not exist before. The degree of these impacts
12681 depends on the location of the fishing access point in proximity to a Project element. The
12682 closer the access point is to a Project element, the more diminished the recreation experience
12683 would be. No physical constraints to fishing activities would occur; however, in locations
12684 where minimal disturbance exists, the presence of the transmission line and power poles
12685 would be more visible. However, due to the location of the proposed transmission line and
12686 distance of the M&HRF accessible fishing spots, proposed Project components would not
12687 preclude recreators from engaging in fishing activities in the RBPA. Nor would the added
12688 visual presence of transmission poles adversely impact the recreation experience to a point
12689 where it prevents fishing activities since most of the power poles would likely be out of sight
12690 from these fishing areas.

12691 *4.13.3.1.3 Snowmobile/OHV Use*

12692 **4.13.3.1.3.1 Impacts of BLM Actions with Alternative 1**

12693 Snowmobile and OHV use on BLM public lands in the RBPA is limited to existing trails and
12694 roads and is subject to seasonal closures. Because actions under Alternative 1 would use
12695 existing access roads in the RBPA for construction and operation activities, there may be
12696 short-term impacts to snowmobiles/OHV use within the BLM public ROW in the RBPA.

These impacts would include an increase in the overall volume of motorized vehicle traffic due to construction equipment entering and exiting the roadways. This would be most visible during the construction phase and has the potential to inhibit free movement on existing roads currently enjoyed by snowmobiles/OHV users on BLM public roads since construction vehicles generally drive at a slower pace than OHVs.

4.13.3.1.3.2 Total Project Impacts with Alternative 1

Snowmobile and OHV use on non-federal roads would be limited to CR 134, which would be used as the main road to access to the BLM road up to the M&HRF; impacts to snowmobile and OHV use would increase negligibly. Other non-federal roads would not be impacted since Project-related construction equipment would only use public access roads in the RBPA. During construction, CR 134 would experience an increase in traffic, most notably construction vehicles, which may slow down overall traffic on CR 134. CR 134 is also used as an access road to CR 235, which provides recreators with access to lands south and west of the RBPA, including the Bridger-Teton National Forest.

Once construction of the major Project components is complete, the BLM public access roads in the RBPA would continue to realize an increase in traffic over existing conditions due to daily facility operations. However, this degree of change likely would not be significant and therefore not preclude snowmobile/OHV activities on existing BLM public roads and trails, nor access to other areas for recreation.

4.13.3.1.4 Cross-country Skiing/Back-country Activities

4.13.3.1.4.1 Impacts of BLM Actions with Alternative 1

The extent of potential impacts to cross-country skiing and other back-country activities such as snowshoeing depends primarily on the location of ski tracks and snowshoe trails within the RBPA. Because no formal groomed trails are offered in the RBPA, it is difficult to fully assess the location of likely cross-country ski tracks and snowshoe trails. Since this information is not known, there is the potential for development activities to interfere with these types of activities where the locations may potentially overlap or be near the proposed transmission alignment or any other Project component. Additionally, where these activities take place in the RBPA, the recreation experience would be degraded due to an increase in noise, human activity, construction equipment, and the presence of additional infrastructure, such as the transmission power poles, in the RBPA which adds a new vertical element to the landscape that did not exist before. However, as stated, the degree of impact would depend on the location and proximity of the ski tracks and trails to a Project component. As such, it is not anticipated that implementation of proposed Project components would preclude cross-country skiing or other types of back-country activities from taking place in the RBPA.

4.13.3.1.4.2 Total Project Impacts with Alternative 1

Total Project impacts to cross-country skiing and other back-country activities, including those activities that take place on private and state lands, would be similar to the impacts described in the section above and would only add incrementally to those impacts.

12736 *4.13.3.1.5 Cultural Setting from the Lander Road*

12737 **4.13.3.1.5.1 Impacts of BLM Actions with Alternative 1**

12738 The degree of impact to the recreational and/or cultural setting due to changes in the visual
12739 environment depends on the road's proximity to a Project component, intensity of road use,
12740 and existing infrastructure within the landscape. Public lands around the Lander Road Historic
12741 Trail currently contain sporadic infrastructure including energy development (such as wells),
12742 roads, and some residential development along the valley floor. As such, the recreational
12743 and/or cultural experience provided by the Lander Road Historic Trail within the RBPA
12744 already results in an altered natural setting.

12745 No direct impacts to the Lander Road Historic Trail would occur from implementation of
12746 Project components proposed to take place on public lands. Impacts to the cultural setting
12747 from the Lander Road Historic Trail from federal activities would include an altered natural
12748 setting due to the change in viewable landscape from the Lander Road Historic Trail. As such,
12749 a visual analysis was conducted from a strategic high point location on the Lander Road
12750 Historic Trail. More information about the visual analysis as it relates the Lander Road
12751 Historic Trail can be found in Section 4.14 of this EA.

12752 From this point on the Lander Road Historic Trail, the closest line of sight distance to the
12753 proposed transmission line would be approximately 3.7 linear miles located on the viewer's
12754 left. At this distance, transmission line construction equipment, traffic, human activity,
12755 lighting, dust, and associated surface disturbance would likely be visible in the short term
12756 from the Lander Road Historic Trail. In the long term, the transmission line and
12757 approximately three poles would be slightly visible as power poles are located on or adjacent
12758 to a visible ridgeline. These poles would be visible as vertical contrasting lines to the
12759 horizontal valley landscape and may affect the cultural setting provided by the Lander Road
12760 Historic Trail due to a change in setting. However, due to the varying distances and the
12761 background variation of the natural landscape of the entire transmission line, the prominence
12762 of the transmission line would be absorbed by the landscape and its size reduced by the
12763 distance. As such, the impacts to the cultural setting of the Lander Road Historic Trail would
12764 be minor and limited, with some new disturbances and infrastructure visible on a ridgeline. To
12765 the west, the transmission line is largely obscured behind the natural undulating topography,
12766 but would briefly re-emerge at an approximate line of sight distance of 4.5 miles from the
12767 high point on the Lander Road Historic Trail. Due to this distance, the transmission line
12768 alignment would not attract the casual observer's attention from the Lander Road Historic
12769 Trail at this location even for sensitive cultural visitors. Thus, the identified impact criterion
12770 for the Lander Road Historic Trail is not exceeded.

12771 **4.13.3.1.5.2 Total Project Impacts with Alternative 1**

12772 Additional impacts to the cultural setting from the Lander Road Historic Trail from non-
12773 federal Project components under Alternative 1 would be limited to the M&HRF. As stated;
12774 however, based on the a visual study conducted from a high point on the Lander Road
12775 Historic Trail, the M&HRF would be located at a distance of approximately 8.2 linear miles.
12776 At this distance, the M&HRF would be too far to attract the attention of a person at this point
12777 on the Lander Road Historic Trail and therefore would not diminish the quality of the
12778 recreational experience to visitors of the Lander Road Historic Trail.

However, impacts to the Lander Road Historic Trail from Project components on federal land would be limited to a slight change in the visual environment. However, the transmission line alignment would not attract the causal observer‘s attention from the Lander Road Historic Trail due to natural terrain that absorbs the visibility of the transmission poles.

4.13.4 Alternative 2

4.13.4.1 Impacts of BLM Actions with Alternative 2

Impacts include noise created from temporary and limited construction activities as a result of the installation of a 1.3-mile segment of the natural gas pipeline as it crosses federal lands to the Hare‘s Ear compressor station and temporary visual impacts from the added presence of drill rigs. Indirect impacts to recreation would include increased traffic in localized areas within the RBPA during construction activities and the potential for wildlife displacement and impacts to hunting activities if construction occurs around hunting seasons.

4.13.4.2 Total Project Impacts with Alternative 2

The closest line of sight distance between the high point on a contributing section of the Lander Road Historic Trail and the proposed transmission alignment would be approximately 2.5 linear miles. Due to the private land location of the proposed transmission line on the valley floor, most of the transmission line would be completely obscured by the natural undulating topography of the RBPA. Under this alternative, the only location where the transmission line and power poles would be visible is on the far west side of the RBPA, at an approximate distance of 7.5 miles. From this distance, the transmission line would not attract the casual observer‘s attention from the Lander Road Historic Trail and therefore would not change the existing visual character of the area or impact the recreation experience offered by the Lander Road Historic Trail.

From KOP 2, the closest line of sight distance to the M&HRF would be approximately 8.2 linear miles on the viewer‘s right. As with the impacts described above, the M&HRF would not attract the attention of the casual observer from the Lander Road Historic Trail due to the distance from the M&HRF to KOP 2 and therefore is in compliance with the identified impact criteria.

4.13.5 Alternative 3

4.13.5.1 Impacts of BLM Actions with Alternative 3

Impacts to the recreational and/or cultural experience provided by the Lander Road Historic Trail under Alternative 3 would be similar to those stated under Alternative 1. The closest line of sight distance to the transmission alignment would be approximately 3.7 linear miles. From this viewing distance, transmission line construction equipment and associated surface disturbance would likely be visible in the short term. In the long term, the transmission line and approximately three poles would be slightly visible as power poles are located on or adjacent to a visible ridgeline. These poles would be visible as vertical contrasting lines to the horizontal valley landscape and may affect the cultural setting provided by the Lander Road Historic Trail due to a change in setting. However, due to existing development, most notably oil and gas wells within the direct viewshed of the contributing section of the Lander Road

Historic Trail, resulting impacts from implementation of Alternative 3 would not degrade the overall recreational experience.

4.13.5.2 Total Project Impacts with Alternative 3

Impacts to recreation from non-federal Project components under Alternative 3 would be similar as described under Alternative 1.

4.13.6 Alternative 4

4.13.6.1 Impacts of BLM Actions with Alternative 4

Under Alternative 4, impacts to recreation resources on federal lands would be temporary and due to installation of subsurface facilities and well drilling operations. Impacts include noise created from construction activities that could impact hunting activities if construction occurs around hunting seasons. Indirectly, increased traffic in localized areas within the RBPA during construction operations and the increased potential for wildlife displacement could also occur. Once installation is complete, additional impacts to the recreation experience may occur from the remaining scar on the land from the trench line which would be seen as an unnatural linear contrast between the brown top soil and the surrounding vegetation. However, this impact would be temporary in nature, and the recreation experience on federal lands would return to existing conditions once reclamation of the trench line is complete.

4.13.6.2 Total Project Impacts with Alternative 4

Impacts to the recreational experience provided by the Lander Road Historic Trail from non-federal Project components would be negligible. Under Alternative 4, the closest line of sight distance to the proposed EGS from a high point on the Lander Road Historic Trail would be approximately 8.2 linear miles. From this distance, potential visibility of the M&HRF and EGS to the casual observer would be minimal to none from the viewer on the Lander Road Historic Trail and the intervening topography. Therefore, Project components under Alternative 4 would not exceed identified impact criteria. In addition, due to existing development, most notably oil and gas wells within the direct viewshed of the contributing section of the Lander Road Historic Trail, resulting impacts from implementation of Alternative 4 would not degrade the overall recreational experience.

4.13.7 Cumulative Impacts

It is anticipated that future oil and gas development within the RBPA, including the Williams pipeline area, could double over the current infrastructure. As such, the existing recreation setting and quality of recreation experiences within the RBPA could be cumulatively affected by the incremental changes brought about by implementation of the Project which adds to the existing and future oil and gas developments, such as the Big Piney-LaBarge Infill Project and industrial, commercial, and residential development. The effects of these activities would contribute to increased population, and increased pressure on the existing recreation activities and public lands. These combined effects may lead to adverse impacts from reduced overall recreation experience for many users. The magnitude, scope, and duration of actual impacts would depend on the number and size of future energy projects and the rate of development.

4.13.8 Mitigation and Monitoring Opportunities

Most impacts to recreation activities from implementation of the action alternatives would be limited to the visual setting and Project-related noise, which consequently can impact the recreation and/or cultural experience in the RBPA.

4.13.8.1 BLM-Required Mitigation*

The Operator will restrict OHV activity by employees and contract workers to the immediate area of authorized activity or existing roads and trails.

4.13.8.2 Other Mitigation Opportunities**

A potential mitigation measure to reduce potential impacts to the recreation experience includes limiting or eliminating construction activities during periods of big-game migrations through the RBPA. Also, Project activities should seek to retain a natural setting as much as possible; blending or disguising appropriate Project components, such as gas wells and M&HRF, with the surrounding natural environment is also a potential mitigation measure. This can be achieved through painting appropriate structures a BLM-approved color as indicated in the BLM VRM Manual 8431. Mitigation measures are discussed further in the visual resource analysis section of this EA, Appendix D—Visual Impact Study, and in Appendix 3 of the 2008 ROD - Mitigation Guidelines and Operating Standards Applied to Surface Disturbing Activities.

4.13.8.3 BLM-Required Monitoring*

Within 6 months of completion of construction of the Project components (except for drilling operations), Cimarex would meet with BLM PFO to determine the feasibility of implementing a study of post-construction effects on recreation use in the RBPA.

4.13.8.4 Other Monitoring Opportunities**

None.

* BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the proposed Project, as identified in Chapter 2.

** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal Project components.

4.14 VISUAL RESOURCES

4.14.1 Impact Criteria

Environmental consequences to visual resources address potential impacts to the scenic qualities of the RBPA. Impacts to visual resources includes activities or changes to the land, form, vegetation, and structures that create the unique physical settings and scenic qualities of the area, and potential for these impacts is discussed in this section.

The BLM is required to manage all uses and future development activities to be consistent with an area's VRM class as established in the RMP (BLM 2008b). The BLM must consider, at the site-specific activity level, all uses proposed for an area within a given VRM class and

determine if those uses would be consistent with the objectives for that class. Impacts to visual resources would be considered significant if the proposed Project does not conform to the designated VRM classifications or management goals contained in the Revised PFO RMP for the RBPA. Potential impacts are based on visual simulations described in Appendix D, Visual Impact Study.

Visual resources would be affected directly and indirectly from such sources as:

- exceeding VRM Objectives as set forth in BLM Manual H-8410-1;
- apparent change to the casual observer, from a natural landscape to an industrialized appearing landscape in areas visible from public roads/highways, residential areas, and the Lander Road Historic Trail; and
- types of structures used, including form, line, color, and texture, and contrast against the natural landscape

The methodology used to determine impacts to visual resources uses the BLM Contrast Rating Process which includes a combination of GIS analysis, field surveys, visual simulations, and BLM contrast rating process, as described in Appendix D. The purpose of the VRM management system is to define a process for applying a level of objectivity and consistency to the assessment and management of visual resources, and to reduce the subjectivity associated with evaluating landscape visual quality.

To create the visual simulations, four KOPs were selected by the Interdisciplinary Team as appropriate for assessing the existing environmental aesthetic, as well as evaluating changes to the visual quality of the landscape. The KOPs for assessing impacts to visual resources for the proposed Project are located on the northern side of the RBPA in areas with high scenic quality, visual sensitivity, and experience the most public use. Eleven KOPs were identified, of which four were photographically simulated to represent the landscape should any of the action alternatives be implemented. The visual simulations and potential impacts of all action alternatives at the four KOPs as well as the remaining seven potential KOP locations are detailed in the Visual Impact Study, attached as Appendix D of this document, as well as in Table 4-50. The analysis presented here contains a summary of potential impacts from each of the four simulated KOPs.

Table 4-50. Comparison of Visual Contrast Ratings by Alternative and Affected Areas.

KOP	Location	Contrast Rating			
		Alternative 1	Alternative 2	Alternative 3	Alternative 4
KOP 1	Intersection of County Road (CR) 142 and the Lander Road, looking southwest	Moderate to Weak	Moderate to Weak	Moderate to Weak	None
KOP 2	Contributing section of the Lander Road, looking southwest	Weak	Weak	Weak	Weak to None
KOP 3	SH 350 approximately 6.5 miles west of U.S. 189, looking due south	Weak	Strong to Moderate	Weak	None
KOP 8	Approximately 0.25 mile south of the intersection of the Lander Road on CR 142, looking southwest	Moderate to Weak	Moderate	Moderate to Weak	Moderate to Weak

The simulated KOPs include:

1. KOP 1 – Intersection of CR 142 and the Lander Road Historic Trail, looking southwest (simulation of the proposed M&HRF and transmission line). This KOP is located on private land.
2. KOP 2 – Contributing section of the Lander Road Historic Trail, looking southwest (simulation of the proposed M&HRF and transmission line). This KOP is located on VRM Class III land.
3. KOP 3 – SH 350 approximately 6.5 miles west of U.S. 189, looking due south (simulation of the proposed transmission line). This KOP is located on VRM Class III land.
4. KOP 8 – CR 142, looking southwest (simulation of the proposed M&HRF and proposed transmission line). This KOP is located on private land.

Within the RBPA, VRM Class II areas are most sensitive to visual impacts while VRM Class IV allows for a high level of change and major modification of the existing landscape.

4.14.2 No Action Alternative

Under the No Action Alternative, BLM would not take action on the Cimarex application for ROWs or drilling. There would be no effects on visual resources from BLM actions with No

Action. However, several non-federal actions would likely occur on private and state lands with the No Action Alternative, as identified in Chapter 2. Construction of facilities such as the M&HRF and HLF would occur. A transmission line and pipelines would likely be constructed on private land, but the location of these facilities is unknown.

The results of No Action on visual resources would be similar to Project impacts described for Alternative 2. The visual impact of any non-federal actions would be outside of BLM jurisdiction and ability to modify or change. Because the proposed transmission line, pipelines, and fiber optic line would be located of private and state lands, there would be no overlap of any VRM-classified BLM lands. The Williams pipeline component would not be constructed with the No Action Alternative.

Under the No Action Alternative, the entire transmission line would be located on private and state lands and therefore the visible elements of the Project would not have any VRM required management objectives, standards, or stipulations.

The transmission line would potentially be in the foreground of travelers along SH 350 if it is parallel to this route. As such, the transmission poles would be within the viewer‘s direct line of sight. The vertical power poles contrast with the horizontal landscape and would attract the attention of the casual observer. Horizontal lines of the electric cables would be visible at these distances. The transmission line and power poles would not exceed the height of the background ridges, which would reduce the transmission line‘s overall level of contrast.

Under the No Action Alternative, the M&HRF would likely be visible from KOP 8 in the background. Due to the size of the facility and angle of view, five buildings of the approximately 130,000-square-foot facility would be visible to the casual viewer. Because the land in which the M&HRF would be located is lower than the eastern ridgeline in front of the facility, only the upper portions of the taller buildings‘ flare stack, steel monopoles, and rooflines of the M&HRF would be apparent at a distance of 8 miles or more, and therefore not strongly out of place.

VRM consistency is not applicable for this alternative because all proposed projects and associated facilities are located on either state or private land. Therefore, the identified impact criteria would not be exceeded.

4.14.3 Alternative 1

4.14.3.1 Impacts of BLM Actions with Alternative 1

4.14.3.1.1 Electrical Transmission Line

The proposed 230-kV power line would be constructed aboveground on H-frame structures. Typical structures would be approximately 70 to 100 feet tall, located at intervals of 500 to 1,000 feet. The H-frame poles would be made of wood that would vary from light to dark brown in color depending on the wood. Therefore, the individual tones of brown may vary from pole to pole in the RBPA. Angles in the transmission line would require a guyed triple-pole configuration for reinforcement.

In addition to the wooden H-frame poles and guyed triple pole, several steel monopoles would be placed at designated locations. These locations include one monopole located near the M&HRF, one monopole located at the eastern portion of the RBPA near CR 235, four monopoles located between the HLF and Chimeny Butte Substation, and 12 monopoles located consecutively at an approximate distance of 6 miles west from CR 235, near the Beaver Creek crossing on the Milleg property. Unless another appropriate design is chosen, the steel monopoles would range from 80 to 100 feet tall, and be approximately 2 to 4 feet in diameter at ground level, and embedded 20 to 25 feet below the surface with crushed rock backfill, with or without steel culverts, depending on soil properties, or mounted with anchor bolts on top of concrete footings up to approximately 35 feet deep. Steel culverts and concrete footings can vary in diameter from 4 to 10 feet depending on design requirements. No guy lines will be utilized on the steel pole sections. Steel monopoles would be Core-Ten weathering steel or dull galvanized steel.

The construction of the transmission line would follow a general sequence with structure site clearing and grading, pole pad construction, hole auguring, and pole setting, followed by conductor cable installation and tensioning. At each pole site, leveled areas (pads) are needed to facilitate the safe operation of large equipment, which would be rectangular in shape and approximately 150 feet (width of the ROW) by 175 feet (along the ROW). The pads would be cleared of vegetation to accommodate surveying, vehicle and heavy equipment safety, and conductor clearance. After line construction, all pads would be graded and reseeded to mitigate surface and visual disturbance.

4.14.3.1.2 Pipelines

The proposed crude helium pipeline would be buried at a minimum depth of 3 feet and a maximum depth of 8 feet to top of pipe. The permanent width of the helium pipeline ROW would be 50 feet, with a 50-foot adjacent ROW for temporary access and staging.

Construction and placement of the proposed natural gas pipeline and fiber optic transmission system would share the same trench, thereby minimizing surface disturbance. The pipeline and fiber optic lines would be buried at a minimum depth of 3 feet and a maximum of 8 feet to top of pipe. The permanent width of the ROW would be 50 feet, with a 50-foot adjacent ROW for temporary access and staging. The crude helium pipeline and natural gas sales pipelines may be located in overlapping or adjacent ROW to minimize surface disturbance.

Under Alternative 1, approximately 176.8 acres of VRM Class II and Class III BLM lands would overlap the proposed Project components, as shown in Table 4-51. The largest overlap would occur from the proposed transmission line with the alignment occurring in 34.8 acres within VRM Class II and 43.2 acres within VRM Class III managed areas, for a total of 78.0 acres overlapping VRM-classified lands. Temporary crushing of vegetation within this 150-foot-wide ROW would cause temporary, short-term visual impact along the proposed alignment. The greatest visual impact from vegetation disturbance would be at each structure site, where 150- by 175-foot leveled pads are needed to facilitate the safe operation of large equipment. The pads would be cleared of vegetation only to the extent necessary for surveying, vehicle and heavy equipment safety, and conductor clearance. Cleared areas would be graded and reseeded.

Table 4-51. Surface Disturbance by VRM Class for Alternative 1.

Project Component	Acres		
	VRM Class II	VRM Class III	Total VRM Class II and III Overlap
Well Pad 17-34	5.5	0.0	5.5
Raw Gas Flowlines	1.9	0.0	1.9
Ambient Air Monitoring and Weather Station	3.8	0.0	3.8
In-line Pulling and Tensioning Sites (with poles)	1.1	0.9	2.0
Pulling and Tensioning Sites at Dead Ends	0.0	0.0	0.0
Transmission Line (with Poles) – 150-foot disturbance (75 feet on either side of center line)	34.8	43.2	78.0
Natural Gas & Fiber Optic Line	0.0	0.1	0.1
Helium, Natural Gas, and Fiber Optic Line	26.3	24.2	50.5
Helium and Fiber Optic Line	0.0	15.2	15.2
Williams Pipeline - Federal	0.0	19.8	19.8
Williams Pipeline - State/Private	0.0	0.0	0.0
Grand Total	**73.4**	**102.5**	**176.8**

4.14.3.1.3 KOP 1

KOP 1 is approximately 14 road miles from the town of Big Piney at the intersection of CR 142 and the Lander Road Historic Trail. The KOP has a southwest orientation towards the western portion of the proposed transmission line. Using a 55-degree field of vision, approximately 34.8 acres of the proposed transmission line overlap VRM Class II. The closest line of sight distance to the transmission alignment would be approximately 1.2 linear miles. From this viewing distance, transmission line construction equipment and associated surface disturbance would likely be visible in the short term.

In the long-term, approximately five wooden H-frame transmission poles would be visible by travelers in the foreground along CR 142 and the Lander Road Historic Trail. From this KOP, several of the transmission poles would attract the attention of the casual observer by adding a vertical element to the skyline that contrasts with the horizontal lines of the natural landscape. This new vertical element can impact the recreational and/or cultural experience of the Lander Road Historic Trail by further altering the natural setting of the area. These power poles may also attract the attention of some motorists on CR 142 as well. To the west, the transmission line and power poles become obscured by rolling hills in the foreground and are out of sight.

The contrast rating for this alternative from KOP 1 is moderate to weak. The portion of transmission line that would be visible from this KOP would be located on VRM Class II lands. The transmission line would represent a new, unnatural vertical element to the landscape that would attract the attention of the casual observer, especially the vertical powerpoles that skyline the horizon. As such, this portion of the transmission line would not meet the VRM II objectives and therefore exceeds the impact criteria.

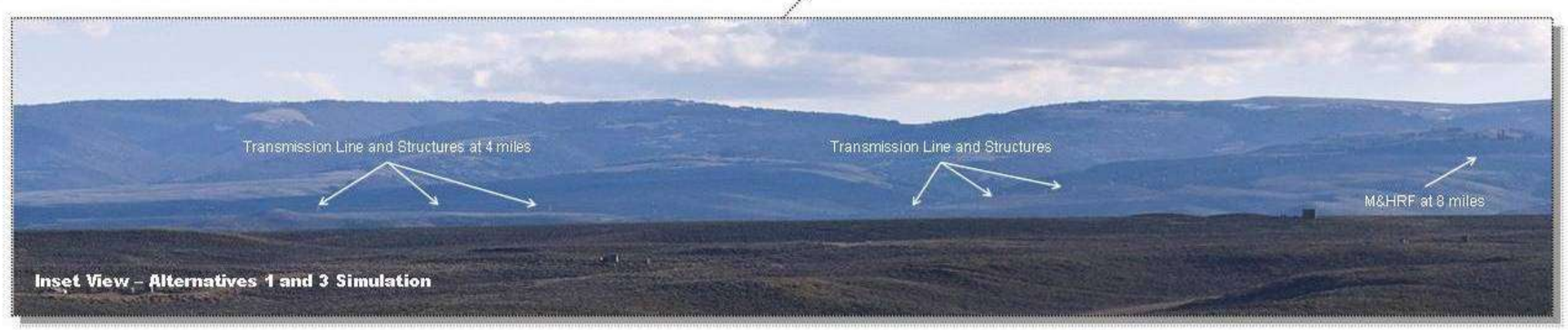
4.14.3.1.4 KOP 2

KOP 2 represents the southwest view of visitors to the Lander Road Historic Trail. It is located on a contributing section of the Lander Road Historic Trail approximately 10 linear miles west of U.S. 189. This KOP represents the view of cultural tourists that follow the Lander Road Historic Trail and other recreators as they travel through a VRM Class II area for approximately 6.5 miles. Contrast would result from vertical elements of the H-frame poles and cleared vegetation in the ROW. However, the closest line of sight distance to the proposed transmission line would be approximately 3.7 linear miles located on the viewer‘s left. In the middleground, (at a distance of more than 3 miles), transmission line construction equipment, traffic, human activity, lighting, dust, and associated surface disturbance would likely be visible in the short term. In the long term, the transmission line and approximately three poles would be slightly visible as power poles are located on or adjacent to a ridgeline in the middleground. These poles would be slightly visible as vertical contrasting lines to the horizontal valley landscape. However, due to the distance and the background variation of the natural landscape, the prominence of the transmission line would be largely absorbed by the landscape and size reduced by the distance. As such, the impacts to scenic quality for cultural visitors and hikers would be minor and limited, with some new disturbances and infrastructure visible on a ridgeline. To the west, the transmission line would be obscured behind the natural undulating topography, but would then briefly reemerge at an approximate line of sight distance of 4.5 miles from the KOP. From here, the transmission line would be obscured again by natural topography, and then reappear at a distance of more than 7 miles. Due to this distance, it is unlikely that the alignment would be visible to visitors to the Lander Road Historic Trail at this KOP location. The contrast rating from KOP 2 for this alternative is weak due to distance of the structures from the viewer such that even for sensitive cultural visitors, the impact would be minimal (Photograph 4-1). Thus, the identified impact criteria would not be exceeded.

4.14.3.1.5 KOP 3

KOP 3 is approximately 6.5 road miles from the town of Big Piney on SH 350 and simulates the view of residents, ranchers, and visitors accessing the Bridger-Teton National Forest to the west. The KOP is located on VRM Class III lands, and has a due south orientation towards the location of a mid-section of the proposed transmission line. The closest line of sight distance to the proposed transmission line would be approximately 2.5 linear miles and the farthest viewing distance would be approximately 3.0 miles. From these viewing distances, transmission line construction equipment, construction activity, and associated surface disturbance would likely be visible in the short term.

In the long term, approximately 17 transmission poles would be visible by travelers in the foreground to middleground along SH 350 for approximately 2.5 miles. From this location, 11 visible poles would be wooden H-frames and the remaining 6 visible poles would be steel monopoles. Several of the wooden H-frame transmission poles on the viewer‘s left would exceed the heights of the natural terrain and skyline the horizon. The backlighting of the sky would attract the attention of the casual observer adding a vertical element to the skyline that contrasts with the horizontal lines of the natural landscape.



Photograph 4-1. Visual Simulation of Alternatives 1 and 3 from KOP 2 at approximately 4 to 8 miles to the M&HRF.

As stated, the six visible steel monopoles would be either Core-ten or dull galvanized steel. If the Core-ten material is used, the steel monopoles would blend with the natural background terrain because Core-ten is a rust/ brown color, with little to no reflective properties. Despite being taller than the H-frame wooden poles, the steel monopoles, between 80 to 100 feet, would not exceed the height of the ridgeline located behind this portion of the transmission line. If the dull galvanized steel is used, the steel monopoles would be visible, even at a distance of 3.0 miles because the gray color would contrast with the natural background terrain. Although visibility would be reduced due to dull galvanized steel‘s lack of reflective properties, it would be viewed as a vertical contrast against the natural terrain.

The transmission poles become less visible as the view moves to the west. As the terrain elevation lowers, the transmission poles fall below the background ridgelines, thereby diminishing the visibility of the poles by obscuring the vertical elements. Due to this low visibility, Alternatives 1 and 3 are not expected to have an adverse impact on travelers since they would be moving at a high rate of speed. The contrast rating from KOP 3 for this alternative is weak.

4.14.3.1.6 KOP 8

KOP 8 simulates the view of local residents, travelers, and recreators accessing BLM lands. KOP 8 is approximately 12 road miles west of U.S. 189 on CR 142. The KOP has a southwest orientation towards the western portion of the proposed transmission line. The closest line of sight distance would be approximately 3.1 miles to the proposed transmission alignment. From this viewing distance, it is possible that transmission line construction equipment and associated surface disturbance would be visible in the short term.

In the long term, approximately five pole locations would be visible to the casual observer in the foreground/middleground and would add a contrasting vertical element to the landscape. However, they would not dominate the landscape because the power poles in this view are located below the ridgeline, thereby eliminating the potential for contrast with the sky, and the dark colors of the natural background which reduces their visibility.

Overall contrast rating is moderate to weak and the change to the existing natural setting would be low.

4.14.3.2 Total Project Impacts with Alternative 1

In addition to the impacts described above, additional impacts from the following actions are anticipated.

4.14.3.2.1 M&HRF

The facility would consist of seven buildings spread over approximately 10 acres on a 34-acre parcel of state land. The buildings would vary in height from approximately 15 to 40 feet that would be visible from various locations throughout the RBPA. All buildings would be metal painted a BLM-accepted environmental color that blends with the surrounding landscape, except for structures that require hot or cold insulation and subsequent metal cover and structures that require safety coloration to comply with OSHA regulations. These structures would generally be stainless steel.

A smokeless emergency flare stack approximately 100 feet high would temporarily emit flames that would be visible, particularly at night.

4.14.3.2.2 KOP 1

From KOP 1, the M&HRF would be approximately 3.1 linear miles to the southwest. The proposed M&HRF would be completely obscured by the undulating topography as well as a grove of aspen and conifer trees located directly northeast (and in the line of sight) of the proposed M&HRF. This grove of vegetation would remain in the RBPA to obscure the M&HRF. Therefore, the identified impact criteria would not be exceeded.

4.14.3.2.3 KOP 2

From KOP 2, the closest line of sight distance to the M&HRF would be approximately 8.2 linear miles on the viewer‘s right. Due to this distance, it is unlikely that the M&HRF would be visible to visitors to the Lander Road at this KOP location and is therefore in compliance with the identified impact criteria.

4.14.3.2.4 KOP 3

From KOP 3, the M&HRF would be approximately 10 miles to the west. At this distance, the M&HRF would not be visible and is therefore in compliance with the identified impact criteria.

4.14.3.2.5 KOP 8

The KOP has a southwest orientation towards the location of the M&HRF. The closest line of sight distance would be approximately 5.3 miles from the M&HRF.

At this distance, the M&HRF would be visible from KOP 8 in the background. Due to the size of the facility and angle of view, five buildings of the approximately 130,000-square-foot facility would attract the casual viewer‘s attention. Because the land on which the M&HRF would be located is lower than the eastern ridgeline in front of the facility, only the upper portions of the taller buildings flare stacks, steel monopole, and rooflines of the M&HRF would be apparent. Light, evenly textured gravel surfaces of the parking and driving areas would be occluded by the intervening terrain. The structure of the facility would not conform to the basic elements of form and texture and therefore would provide a low to moderate level of contrast against the background landscape that would draw the attention of the casual observer. However, at this distance, the Project elements would not dominate the landscape and is therefore in compliance with the identified impact criteria. Overall contrast rating is moderate to weak.

4.14.4 Alternative 2

4.14.4.1 <u>Impacts of BLM Actions with Alternative 2</u>

Under Alternative 2, impacts to visual resources from proposed activities on federal lands would be temporary due to installation of subsurface pipelines proposed on approximately 1.3 miles of federal lands in the RBPA, 12.7 miles of proposed subsurface pipeline in the Williams Pipeline Expansion Area, and the presence of a drill rig required for the proposed wells. Short-term impacts would include visible construction equipment, increased traffic along existing roads, additional human activity, lighting, fugitive dust, a drill rig, and

associated surface disturbance. Although temporary, visual disturbances from the 12.7-mile subsurface Williams Pipeline Expansion Area would be longer in duration than the 1.3-mile subsurface pipeline in the RBPA simply because it would take longer to install a longer pipeline. Once installation is complete for both areas, a visual impact would persist due to the remaining scar on the land from the trench line on these portions of federal lands, which would be seen as an unnatural linear contrast between the light brown topsoil and the surrounding vegetation. However, this impact would be temporary in nature, and the visual environment from federal lands would return to existing conditions once reclamation of the trench line is complete. Visual impacts from the drill rig would also be temporary and would be observed seasonally during the drilling phases over the first four years of the Project. Due to the size of the rig and the proximity of the proposed well locations to each other, only one rig would be on site at any given time.

Under Alternative 2, approximately 97.1 acres of VRM-classified BLM lands would overlap the proposed Project components (Table 4-52). Because the proposed transmission line, pipelines, and fiber optic line would be located of private and state lands, there would be no overlap of any VRM-classified BLM lands. As such, the largest overlap would occur from the proposed Williams pipeline with the alignment occurring in approximately 19.8 acres within VRM Class II and 70.4 acres within VRM Class III managed areas, for a total of 90.2 acres overlapping VRM-classified lands. Development associated with the proposed Williams pipeline would have minimal adverse impacts to the visual resource since the proposed area currently consists of intensive oil and gas development, which has greatly altered the natural landscape. In addition, the viewers in this area largely consist of oil and gas employees that are accustomed to and expect to see infrastructure and therefore are not considered sensitive viewers under the VRM classifications. Although the area does contain VRM designations, the area is not heavily used by the public looking for an unaltered natural setting or a visually appealing experience. Therefore, no KOPs were designated in the Williams Pipeline Area.

Table 4-52. Surface Disturbance by VRM Class for Alternative 2.

Project Component	Acres		
	VRM Class II	VRM Class III	Total VRM Class II and III Overlap
Natural Gas Pipeline (1.3-mile segment to Hare's Ear Compressor)	0.0	6.1	6.1
Williams Natural Gas Pipeline Expansion Loop - Federal	19.8	70.4	90.2
Williams Natural Gas Pipeline Expansion Loop - State/Private	0.0	0.8	0.8
Grand Total	**19.8**	**77.3**	**97.1**

4.14.4.2 Total Project Impacts with Alternative 2

4.14.4.2.1 KOP 1

Under this alternative, the proposed 21.7-mile transmission line would be located on private and state lands, and therefore would not have any VRM classifications. However, an analysis was conducted on all KOPs for alternative comparison purposes (Table 4-52).

The closest line of sight distance to the proposed transmission line would be approximately 1 linear mile. From this viewing distance, transmission line construction equipment and associated surface disturbance would likely be visible in the short term in the foreground and middleground.

In the long term, approximately eight transmission poles would be visible by travelers in the foreground along CR 142 and the Lander Road Historic Trail. From this location, several of the transmission poles would be apparent in the foreground due to the wooden vertical poles contrasting against the landscape. However, the natural landscape and vegetation would provide an effective background by absorbing the visible power poles that do not exceed the varying heights of the ridgelines, thereby reducing their visibility. Proposed power poles that exceed the varying heights of the ridgelines would be visible. These poles are located on a ridge top and would add a vertical element to the skyline that contrasts with the horizontal ridgelines and can not be absorbed by the background sky. Impacts to the skyline against the horizon and would impact the recreational and/or cultural experience of the Lander Road Historic Trail by further altering the natural setting of the area.

Contrast would be related to vertical poles and structures and horizontal wires crossing the landscape. The contrast rating for this alternative from KOP 1 is moderate to weak. However, VRM consistency is not applicable for this alternative because all transmission facilities in Alternative 2 are located on either state or private land.

The closest line of sight distance to the M&HRF would be approximately 3.1 linear miles. As stated, the proposed M&HRF would be completely obscured by the undulating topography as well as a grove of aspen and conifer trees located directly northeast (and in the line of sight) of the proposed M&HRF. This grove of vegetation would remain in the RBPA to obscure the M&HRF.

Contrast would be related to vertical poles and structures and horizontal wires crossing the landscape. The contrast rating for this alternative from KOP 1 is moderate to weak. However, VRM consistency is not applicable for this alternative because all proposed projects and associated facilities are located on either state or private land. Therefore, the identified impact criteria would not be exceeded.

4.14.4.2.2 KOP 2

Under Alternative 2, the entire proposed 21.7-mile transmission line would be located on private and state lands and therefore the visible elements of the Project would not have any VRM required management objectives, standards, or stipulations.

The closest line of sight distance to the proposed transmission alignment would be approximately 2.5 linear miles located on the viewer‘s left. Due to the private land location of

the proposed transmission line on the valley floor, most of the transmission line would be completely obscured by the natural undulating topography of the RBPA. Under this alternative, the only location where the transmission line and power poles would be visible is on the far west side of the RBPA, at an approximate distance of 7.5 miles. From this distance, the transmission line would not be visible to the casual observer on the Lander Road Historic Trail and therefore would not change the existing landscape to a more industrialized setting. The contrast rating from KOP 2 for this alternative is weak due to distance of the structures from the viewer and the intervening topography such that the impact would be minimal (Photograph 4-2).

From KOP 2, the closest line of sight distance to the M&HRF would not attract the casual observer‘s attention from the Lander Road Historic Trail at this KOP location and therefore is in compliance with the identified impact criteria.

4.14.4.2.3 KOP 3

From this KOP, Alternative 2 would be in the foreground of travelers along SH 350 for approximately 1 mile. The transmission line would parallel the route at a distance of approximately 0.7 to 1.1 linear miles located on the viewer‘s left. From this KOP, all the transmission poles (approximately six poles) in the viewer‘s direct line of sight would be visible. The vertical power poles contrast with the horizontal landscape and would attract the attention of the casual observer. Horizontal lines of the electric cables would be visible at these distances. However, the poles would not dominate the landscape because no skylining would occur and the natural landscape provides a background against the power poles. The transmission line and power poles would not exceed the height of the background ridges, which would reduce the transmission line‘s overall level of contrast. The contrast rating from KOP 3 for this alternative is strong to moderate. As such, due to the close proximity of the transmission line to the KOP location, the foreground view may change to a less natural setting to one that is more industrialized with the addition of the transmission line. Mitigation techniques that can be applied to this alternative relative to this KOP are outlined in Section 4.14.8.

From KOP 3, the M&HRF would be located approximately 10 miles to the west. At this distance, the M&HRF would not be visible and therefore is in compliance with the identified impact criteria.

Photograph 4-2. Visual Simulation of Alternative 2 from KOP 2 at approximately 8 miles to the M&HRF.

4.14.4.2.4 KOP 8

The proposed transmission alignment would be approximately 0.8 linear mile located on the viewer's left. From this distance, approximately 12 pole locations aligned up the hillside in the middleground would be visible to the casual observer. Contrast related to the transmission alignment would be greater due to proximity of the transmission line to the viewers. Poles and wires would be visible from this location and draw the eye diagonally across the landscape. Under Alternative 2, the contrast rating is moderate to weak. Similar to KOP 3 under Alternative 2, due to the close proximity of the transmission line to the KOP location, the foreground view may change to a less natural setting to one that is more industrialized with the addition of the transmission line. Mitigation techniques that can be applied to this alternative relative to this KOP are outlined in Section 4.14.8.

The KOP has a southwest orientation towards the location of the M&HRF. The closest line of sight distance would be approximately 5.3 miles from the M&HRF. At this distance, the M&HRF would be visible from KOP 8 in the background. Due to the size of the facility and angle of view, five buildings of the approximately 130,000-square-foot facility would be visible to the casual viewer. Because the land in which the M&HRF would be located is lower than the eastern ridgeline in front of the facility, only the upper portions of the taller buildings flare stacks, steel monopole, and rooflines of the M&HRF would be apparent. Light, evenly textured gravel surfaces of the parking and driving areas would be occluded by the intervening terrain. The structure of the facility would not conform to the basic elements of form and texture and would therefore provide a low to moderate level of contrast against the background landscape that would draw the attention of the casual observer. However, at this distance, the Project elements would not dominate the landscape and therefore is in compliance with the identified impact criteria. Overall contrast rating is moderate.

4.14.5 Alternative 3

4.14.5.1 Impacts of BLM Actions with Alternative 3

Under Alternative 3, a segment of the BLM ROW for the transmission line would be located in Sections 14 through 18, T29N, 113W, following the primary access road and drainage of Spring Creek. This alternative alignment of the transmission line would place it south of a ridgeline and within undulating terrain, thereby decreasing the number of electrical poles visible from the South Piney valley and KOPs located there on BLM lands, as compared to Alternative 1. For the local landowner, however, this BLM action alternative would result in more intense long-term impacts since it would be adjacent to the access road and to a summer cabin located along Beaver Creek. This area of the Alternative 3 transmission line segment lies behind a locked gate making it inaccessible to the public. Access to the area is limited to approved gas industry employees and commercial equipment accessing the M&HRF, local ranchers with grazing interests in the area, and a local rancher who uses an existing cabin for summer residence. As with Alternative 1, impacts to the private residential users of the summer cabin would include visibility of the transmission line. Under Alternative 1 the transmission line would lie approximately a half mile south of the cabin, while under Alternative 3, the line would be located approximately a half mile north of the cabin along an existing improved road in an area that currently lacks other human-made structures.

Under Alternative 3, the natural gas, helium, and fiber optic lines would follow a similar alignment as with Alternative 1, but would share a pipeline trench for approximately 9 miles, rather than requiring two parallel ROW trench. The pipelines would also be bored under two creeks rather than trenching, in order to reduce surface disturbance. This would decrease the visual disturbance from vegetation removal, compared with Alternative 1.

Under Alternative 3, approximately 171.6 acres of VRM Classes II and III BLM lands would overlap the proposed Project components (Table 4-53). The largest overlay would occur from the proposed transmission line with the alignment occurring in approximately 46.9 acres within VRM Class II and 37.6 acres within VRM Class III, for a total of 84.5 acres overlapping VRM Classes II and III lands.

Table 4-53. Surface Disturbance by VRM Class for Alternative 3.

Project Component	Acres		
	VRM Class II	VRM Class III	Total VRM Class II and III Overlap
Natural Gas Wells and Acid Gas Well	5.5	0.0	5.5
Ambient Air Monitoring and Weather Station	4.4	2.7	7.1
Cimarex Gas Pipeline	11.7	10.3	22.0
Cimarex Transmission Line	46.9	37.6	84.5
Helium Pipeline and Fiber Optic Line	11.7	18.0	29.7
Utility Corridor (Buried electrical and fiber optic lines, gas Flowlines and/or sour gas injection line)	2.9	0.0	2.9
Williams Pipeline	0.0	19.9	19.9
Grand Total	**83.1**	**88.5**	**171.6**

Temporary crushing of vegetation within this 150-foot-wide ROW would cause temporary, short-term visual impact along the proposed alignment. The greatest visual impact from vegetation disturbance would be at each structure site, where 150- by 175-foot leveled pads are needed to facilitate the safe operation of large equipment. The pads would be cleared of vegetation only to the extent necessary for surveying, vehicle and heavy equipment safety, and conductor clearance. Cleared areas would be graded and reseeded.

As a result of the design features in the BLM actions with Alternative 3, this alternative would have less of a visual impact as compared to Alternative 1 and would result in negligible short-term and long-term impacts to the visual resource (Table 4-53).

4.14.5.2 Total Project Impacts with Alternative 3

Under Alternative 3, the non-federal components of the M&HRF and HLF would be the same as for Alternative 1. The total Project would result in adverse visual impacts to one landowner, but overall impacts to sensitive viewsheds and visual resource values in the area would be negligible due to placement of overhead transmission lines in a less visible location.

4.14.6 Alternative 4

4.14.6.1 Impacts of BLM Actions with Alternative 4

Under Alternative 4, impacts to visual resources from BLM actions would be temporary due to installation of subsurface pipelines and well drilling operations. Impacts include short-term visibility of construction equipment, increased traffic along existing roads in the RBPA, additional human activity, lighting, fugitive dust, and associated surface disturbance. Since this alternative does not include transmission lines and structures on BLM ROW, long-term impacts to visual resources from BLM actions would be eliminated. However, once installation is complete, a short-term visual impact would persist from a scar on the land from the trench line which would be seen as an unnatural linear contrast between the brown topsoil and the surrounding vegetation. The total VRM Classes II and III overlap for Alternative 4 would occur for 98.6 acres, as shown in Table 4-54. However, this impact would be temporary in nature, and the visual environment from federal lands would return to existing conditions once reclamation of the trench line is complete.

Table 4-54. Surface Disturbance by VRM Class for Alternative 4.

Project Component	Acres		
	VRM Class II	VRM Class III	Total VRM Class II and III Overlap
Well Pad 17-34	5.5	0.0	5.5
Raw Gas Flowlines	1.9	0.0	1.9
AAM&WS	3.8	0.0	3.8
Natural Gas and Helium Pipeline and Fiber Optic Line (from M&HRF to Natural Gas Line Tie-in)	26.3	24.2	50.5
Helium & Fiber Optic Line	0.0	15.2	15.2
Natural Gas Pipeline (from Tie-in Point to Hare's Ear Compressor)	0.0	0.0	0.0
Williams Pipeline - Federal	0.0	19.8	19.8
Williams Pipeline - State/Private	0.0	0.0	0.0
Grand Total	**37.6**	**59.4**	**96.8**

Note: Numbers may not add up due to rounding
AAM&WS = Ambient Air Monitoring and Weather Station
M&HRF = Methane and Helium Recovery Facility

4.14.6.2 Total Project Impacts with Alternative 4

Under Alternative 4, Cimarex proposes to construct and operate an EGS on 7 acres of state land near the M&HRF. The proposed station would contain three generators to power the station, each approximately 62 feet long, 15 feet wide, and 20 feet tall. The generators would either be housed in a building that would be approximately 200,000 square feet and 35 feet high, or surrounded by sound barriers to reduce noise levels. A new 740-foot access road is also proposed.

There would be no impacted VRM classifications under Alternative 4 because all Project components are located on state land which does not manage for visual resources.

4.14.6.2.1 KOP 1

Located near the proposed M&HRF, from KOP 1, the closest line of sight distance to the site would be approximately 3.1 miles. From this distance, the power station would be located in the middleground distance zone. Similar to the M&HRF, the proposed power generating station would be obscured by the undulating topography and vegetation. As such, the contrast rating is none. VRM consistency is not applicable for this alternative because all proposed projects, associated facilities, and KOP locations are located on either state or private land. As such, identified impact criteria are not exceeded.

4.14.6.2.2 KOP 2

The closest line of sight distance to the proposed EGS from KOP 2 would be approximately 8.2 linear miles. From this distance, the EGS would be located in the background distance zone. As such, potential visibility to the casual observer would be minimal due to this distance from the viewer on the Lander Road Historic Trail and the intervening topography. Therefore, the contrast rating from KOP 2 for this alternative is weak to none and is in compliance with identified impact criteria (Photograph 4-3).

4.14.6.2.3 KOP 3

The closest line of sight distance to the proposed EGS from KOP 3 would be approximately 10.2 linear miles. From this distance, the EGS would be located in the background distance zone and would not be noticed by the casual observer. However, since the orientation of KOP 3 looks due south, the proposed EGS would not be in the viewer‘s line of sight. Therefore, the contrast rating for this KOP is none and the identified impact criteria are not exceeded.

4.14.6.2.4 KOP 8

The closest line of sight distance to the proposed EGS from KOP 8 would be approximately 5.1 linear miles. From this distance, the EGS would be located in the middleground distance zone. Due to the size of the facility, angle of view, and sloping terrain, only the top portion of the EGS and four generator stacks would be visible. The structure of the facility would not conform to the basic elements of form and texture and therefore would provide a low to moderate level of contrast against the background landscape that would draw the attention of the casual observer. However, at this distance, the Project elements would not attract the attention of the casual observer for this alternative because all proposed projects, associated facilities, and KOP location are located on either state or private land.

Photograph 4-3. Visual simulation of Alternative 4 from KOP 2 at approximately 8 miles to the EGS and M&HRF.

4.14.7 Cumulative Impacts

The cumulative impacts study for visual resources includes past, present, and reasonably foreseeable activities in and around the RBPA. These include oil and gas development (such as Tip Top, Jonah, and Anticline gas fields), private land development and ranching, fuel reduction projects, and projects east of the Green River. Past and present activities have altered the visual setting of the RBPA, and reasonably foreseeable activities would further alter it. Degree of alteration varies, depending on the type and intensity of development as does the sensitivity of the viewers in the area. For example, oil and gas operations would have different visual impacts than ranching and grazing or construction of a transmission line.

The amount of oil and gas activity within the RBPA is expected to double in the reasonably foreseeable future. As such, cumulative impacts of all action alternatives would include a reduction in scenic or visual quality along travel routes that pass through BLM-administered public lands, caused by visible surface disturbances from proposed transmission line and M&HRF construction, as well as long-term operations of the proposed facilities. The proposed Project would add to the cumulative impacts of increasing industrialized development in the area, which takes away from the natural, rural, and remote landscape. The impacts would be adverse for visual and scenic quality as landform, color, texture, and linear landscape alterations would persist in the long term in this portion of the RBPA.

A new 230-kV transmission line has been approved for construction in the area located east of U.S. 189 between Big Piney and the Green River, which is northeast of the RPBA. If the Project is approved, these two projects would increase the number of horizontal transmission lines and vertical transmission poles visible from U.S. 189 and the surrounding areas. However, these projects would be viewed in an already intensively developed area near the town of Big Piney and along U.S. 189, where other transmission lines and substations currently exist, and would therefore not be out of context.

4.14.8 Mitigation and Monitoring Opportunities

4.14.8.1 Mitigation

*4.14.8.1.1 BLM-Required Mitigation**

Although VRM class objectives and design considerations have been considered throughout the Project planning process, there are additional mitigation measures specific to projects taking place in VRM Classes II and III areas that are required by the BLM PFO RMP per the 2008 ROD.

Mitigation techniques can include, but are not limited to the following:

- Using BLM-accepted environmental color that blends with the surrounding landscape on any above ground structures, if located on BLM land and not requiring safety coloration;
- burying proposed infrastructure when appropriate;
- locating pipeline ROWs within existing ROWs whenever possible;

- initiating revegetation as soon as possible after disturbance to reduce color and line contrasts from exposed soils;
- retaining rocks, trees, drainage, and other natural features as best as practically possible;
- shaping cuts and fills to appear as natural forms;
- using existing roads;
- stockpiling and reusing topsoil;
- topographic screening, vegetation manipulation, project scheduling, and traffic control procedures will all be employed as deemed appropriate by the BLM to further reduce visual impacts;
- use low-profile tanks wherever visual sensitivity is an issue and/or deemed appropriate mitigation to help maintain the visual integrity and basic characteristics of the landscape.

Within VRM Class IV areas, the BLM and the Operator will use the following measures:

- Use existing topography to screen roads, pipeline corridors, drill rigs, wells, and production facilities from view, where practical.
- Use colors specified by the BLM to blend with adjacent terrain, except for structures that require safety coloration in accordance with OSHA requirements.
- Place new linear facilities within existing corridors when practical.

*4.14.8.1.2 Other Mitigation Opportunities***

Although the proposed location of the M&HRF would be on state land, extensive siting and analysis was conducted by Cimarex to find a location where the facility would be the least visible to those visiting the RBPA. Cimarex considered four possible alternative locations on state lands. Preservation of the view shed of the Piney Creek drainages and their historic western character along with the preservation of the viewshed of the Lander Road Historic Trail were important considerations. As such, the proposed location was chosen for, but not limited to, the following reasons: the area would not require additional access roads; the area is located on a sloping southern slope minimizing exposure to travelers in the RBPA; the proposed M&HRF site is not located in BLM VRM-classified lands; and the location would take advantage of natural screens, using natural topography as much as possible to obscure or screen the proposed transmission line in Alternatives 1 and 3 from view from major public travel corridors.

In addition to the extensive siting, additional potential mitigation measures to reduce long-term visual impacts in the RBPA include the following.

- Avoid straight line-of-sight clearing of vegetation for the construction of the substation areas, access roads, and ROWs; vary the edge of the vegetation removal at the edge of construction where it may cause a strong visual contrast in the landscape.

- Locate power poles below ridgelines whenever practical to prevent skylining.
- Save and store removed vegetation (e.g., sagebrush) for use during reclamation to spread across the planting area to add texture, roughness, and pockets for moisture and organic matter.
- Scarify, or roughen, the surface soils prior to reseeding to create soil pockets for seed and water to collect and increase the success of reclamation and reduce visual contrast from a smooth surface.
- Place dead vegetation on reseeded areas to reduce contrast, provide visual screening, and create microhabitat for wildlife.
- If rock is removed, stockpile for reclamation and redistribute randomly throughout the seeding area as part of interim reclamation.

The following mitigation measures are recommended to reduce the long-term contrast from the addition of buildings and structures associated with the M&HRF.

- Carefully site project elements to use existing topography and terrain to obstruct the view of Project elements through the careful placement of structures behind rolling hills, knolls, and other landscape features.
- Avoid placing structures near ridgelines or where transmission poles may potentially contrast against skylines or other strong contrasts when viewed from important high-traffic view corridors. Consider relocation of transmission poles within the western-most end of the transmission line before entering the M&HRF to reduce contrast with the sky.
- Maintain vegetative and landscape features that may screen the Project from sensitive viewers. Where vegetation must be removed, aggressively revegetate the site using the strategies listed above.
- Reduce the size of gravel areas and allow driving surfaces through appropriate design and through reclamation to conserve or revegetate the areas. Reduce the size of cut and fill from parking areas and access associated with the M&HRF and other structures to reduce the contrast from color and texture of these smooth surfaces.
- Develop a lighting plan that requires shielded lights, minimizes glare and offsite reflections, and stipulates maximum lumens for light structures to reduce night-time visibility.
- Apply appropriate paint to steel monopole instead of using galvanized steel or use lightly sandblasted galvanized steel to reduce reflection.

4.14.8.2 Monitoring

*4.14.8.2.1 BLM-Required Monitoring**

Within 9 months of completion of project construction (except for drilling operations), Cimarex would provide to BLM a post-construction visual analysis comparing the simulated visual impact analysis to the actual effects. Study design and methods would be approved by BLM and would use the existing KOPs.

13510 *4.14.8.2.2 Other Monitoring Opportunities***
13511 None.

13512 * BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the
13513 proposed Project, as identified in Chapter 2.

13514 ** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project
13515 components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal
13516 Project components.

13517 4.15 AIR QUALITY

13518 4.15.1 Impact Criteria

13519 Oil and gas production in Wyoming is a very significant industry, with commensurate
13520 potential air quality impacts. According to the Petroleum Association of Wyoming (2007), in
13521 2007 the state crude oil production was 53.4 million barrels. In 2007, sales of natural gas
13522 totaled 2,254 trillion cubic feet, an increase of 9.5% from 2006. Nationally, Wyoming ranked
13523 fifth in production of crude oil and second in natural gas production during 2007, with 37,700
13524 producing wells. The processing of natural gas is an equally important industry and
13525 contributor to air emissions. Wyoming had 45 operating gas plants in 2007 processing nearly
13526 97% of the state's gas production.

13527 Sublette County is the heart of Wyoming‘s gas production. Industrial oil and gas emissions in
13528 Sublette County have grown to the extent that a persistent trend in high ozone levels now
13529 exists. Consequently, on March 13, 2009, Wyoming‘s Governor Dave Fruedenthal petitioned
13530 the EPA to re-designate the Upper Green River Basin as nonattainment for the 8-hour ozone
13531 standard. This air basin includes all of Sublette County and parts of Lincoln and Sweetwater
13532 counties. The proposed nonattainment area is shown in Figure 4-1 below. The entire RBPA
13533 lies within the proposed nonattainment area.

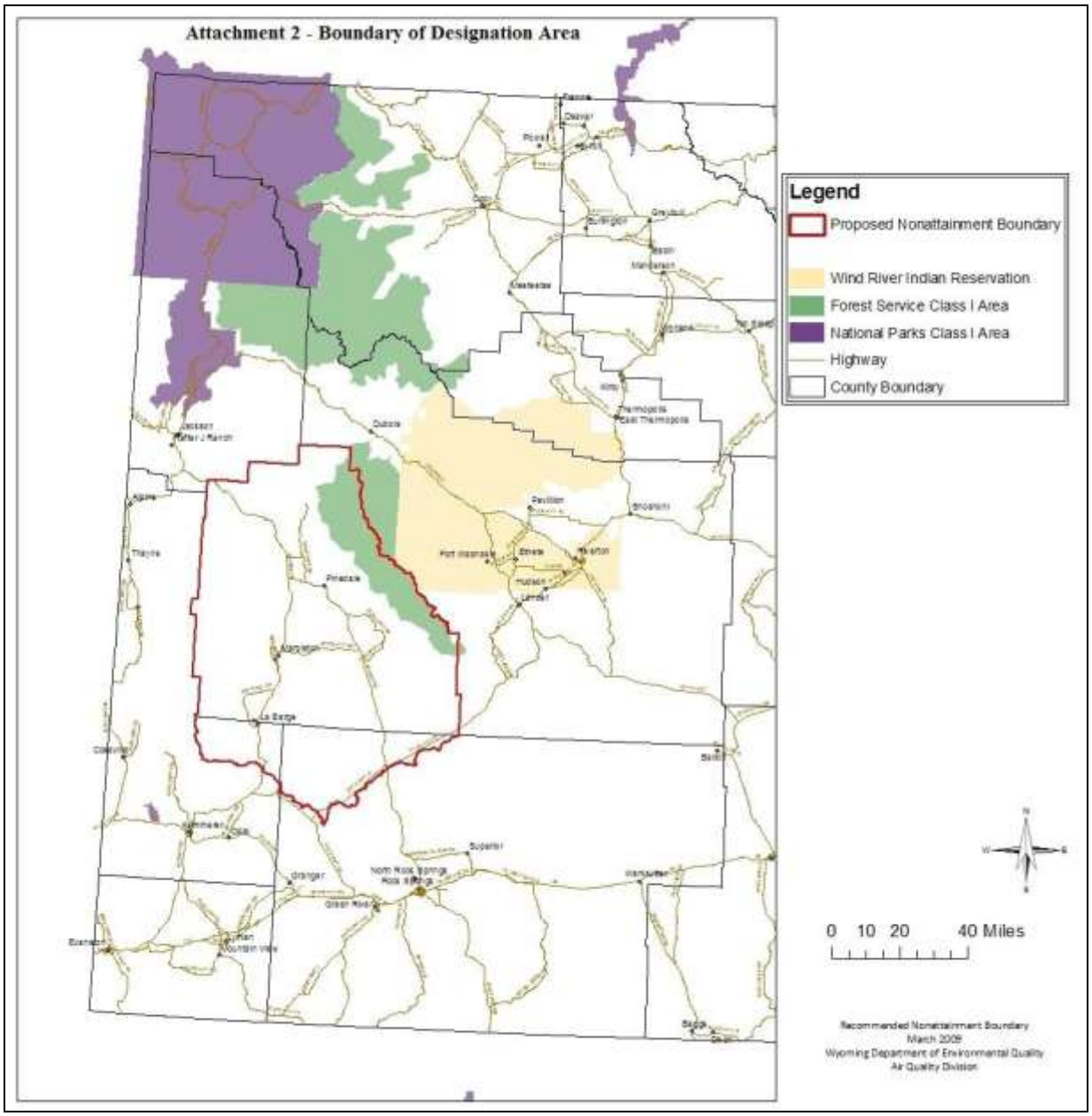


Figure 4-1. Proposed Nonattainment Area for the 8-hour ozone standard.

Source: WDEQ letter to US EPA requesting re-designation signed by Gov. Freudenthal (WDEQ 2009b).

The potential effects of criteria pollutants emissions are the same whether the source is stationary or mobile. Control for stationary sources is delegated to the states by the 1990 Clean Air Act. EPA regulates mobile sources in most of the country (the east and west coasts being an exception because of severe problems there). Most pollution associated with the construction phase would be created by long-haul trucks bringing equipment and supplies from distant areas (e.g., Dallas, Texas). Thus, NO_x emitted by trucks would occur over about 1,000 miles of highway, and the impact would be very dispersed. High levels of ozone have been monitored in Sublette County during winter and spring, with some exceedences of

standards in summer months. This proposed Project's construction would occur in summer. Therefore, construction emissions are evaluated qualitatively for the relative affect they may have on visibility in Class 1 areas and regional ozone formation in southwest Wyoming. Project-related activities would create significant air quality impacts if:

- PSD increments for Class I and Class II areas are exceeded;
- NAAQS or Wyoming AAQS are exceeded;
- increased toxin concentrations are above designated thresholds;
- lifetime incremental increase in cancer risk of one additional person in 1 million from the most likely exposure scenario is exceeded;
- visibility in sensitive areas exceeds 0.5 and 1.0 deciview (dv) change thresholds; or
- for designated sensitive lakes, the acid neutralizing capacity change exceeds 10%.

4.15.1.1 Criteria Pollutants

Ozone is a secondary pollutant formed by the reaction of volatile organic compounds (VOCs) and NO_x in the presence of sunlight. The emissions from mobile sources associated with this Project would include VOCs, NO_x, PM_{10}, CO, and other regulated compounds.

Any of the proposed action alternatives would create emissions that contribute to ozone formation and visibility degradation. Carbon monoxide can be a localized problem near the emission source(s). The proposed well drilling rigs use large diesel engines that create substantial amounts of NO_x and CO. Trenching and driving on dirt roads during construction would create high, but short-lived, PM_{10} emissions. Hauling heavy equipment from manufacturing areas (e.g., Texas) would create substantial NO_x, VOCs, and PM_{10}.

Project-life criteria pollutant emissions include VOCs, NO_x, CO, and PM_{10} emissions. SO_2 could be emitted indirectly if grid power is purchased, since burning coal is the primary source of electricity in Wyoming. Approximately 2,560 tons of SO_2 would be emitted annually to provide grid electric power to the proposed Project. Project-life sources include road dust (from driving to the wells), vehicle exhaust emissions, and those from maintenance equipment such as portable welders. Electricity use would create emissions from either power plants that burn coal, or on-site generation burning natural gas. Table 4-55 shows average emissions from electricity generation using either coal or natural gas. Natural gas has approximately 70% lower NO_x emissions when compared on a megawatt of electricity basis.

Table 4-55. Average Emission Rates in Pounds per Megawatt Energy Produced.

Fuel	NO_x	SO_2	CO_2
Coal	6	13	2,249
Natural Gas	1.7	0.1	1,135

Source: EPA 2009d

The WDEQ has authority to issue permits-to-operate for stationary sources with potential to emit over 100 tons per year. Through this process, WDEQ requires emission controls and operational limits. The WDEQ also regulates emission rates from smaller sources through

more generic rules. WDEQ permit limits are an accepted quantitative impact criteria. The WDEQ has implemented an Interim Permit Policy on Demonstration of Compliance with Wyoming Air Quality Standards and Regulations (WAQSR). Chapter 6, Section 2(c)(ii) for Sources in Sublette County identifies several options for demonstrating compliance, including offsets and ambient ozone modeling. Applicants can also propose alternate demonstrations that meet the Chapter 6, Section 2(c)(ii) requirements. Please note that the Interim Permitting Policy may be superseded by a rule or set of rules, or could be rescinded at a later date. The goal is for overall emission reductions within the southwest Wyoming air basin. EPA has adopted an increasingly stringent set of emission limits for new diesel equipment (Tier 1 through Tier 4). Tier 4 emissions standards, which would result in the manufacture of engines that are 90% cleaner than Tier 1 or older engines, are to be phased-in from 2008 through 2015. It should be noted that the Tier standards require manufacturers to meet certain emission levels for new non-road diesel engines. However, these rules do not preclude operators from using lower Tier level engines with higher emissions well beyond the effective Tier date.

4.15.1.1.1 Construction-phase Emissions

Use of heavy equipment from manufacturing areas (e.g., Texas) would create substantial NO_x, VOCs, and PM_{10}. Typically, mineral PM_{10} from construction does not travel more than about 35 miles from where it is generated. About $1/10^{th}$ of PM_{10} is $PM_{2.5}$, and this fraction can travel farther. To some extent, $PM_{2.5}$ is also formed by the secondary atmospheric reaction of gases like NO_x and SO_x transforming from the gaseous phase to the solid phase. Both ozone and $PM_{2.5}$ can be transported by winds over long distances—sometimes hundreds of miles.

4.15.1.1.2 Climate Change Effects

For purposes of this analysis, climate change effects are assumed directly correlated to the emission of greenhouse gases (GHGs). In 2005, Wyoming produced over 95% of its electric power by burning coal (EPA 2008e). The Riley Ridge plant would require about 45 MW of electricity annually (ION Consulting 2009). Table 4-55 shows average *combustion emissions* of power generated using coal and natural gas. According to the EPA, ―Mining, cleaning, and transporting coal to the power plant generate additional emissions. For example, methane, a potent greenhouse gas that is trapped in the coal, is often vented during these processes to increase safety" (EPA 2008e). Thus, other tangible, but unquantified, emission reductions are realized with on-site energy production using produced natural gas compared to coal-produced electricity.

Oil and gas wells emit both CO_2 and methane which are potent GHGs. CO_2 has an atmospheric persistence on the order of 50 to 200 years. In general, CO_2 is released through fuel combustion. Methane is typically released from oil and gas wells, along with VOCs, as fugitives, or un-intended leaks. Methane is about 22 times more potent as a GHG than CO_2. Controlling VOCs is part of a strategy to minimize tropospheric ozone formation, and thus meet clean air standards. Current actions by the WDEQ to control fugitive VOCs would also help to limit methane emissions.

4.15.2 No Action Alternative

Under the No Action Alternative, BLM would not take action on the application for ROWs or drilling. As a result, impacts to air quality would not occur as a result of BLM actions. Non-

federal actions are likely to occur with the No Action Alternative, as described in Chapter 2, including the construction and operation of the M&HRF, HLF, new gas wells, and pipelines and transmission lines. Any stationary sources of emissions from non-federal Project components must adhere to the Clean Air Act and operate under WDEQ Air Quality Permit provided in Appendix C. Therefore, no adverse impacts would occur from stationary sources under the No Action Alternative.

The No Action Alternative would create short-term (mobile) construction emissions from constructing the M&HRF and HLF, drilling new wells, constructing pipelines and transmission lines, and the associated transportation required for these construction activities. These activities would create substantial emissions limited to about five months during the summer for a total of four years. These emissions are approximately quantified in Total Year Emissions (All Alternatives), shown in Table 4-56. Overall impacts would be similar to those identified for Alternative 2.

Table 4-56. Estimated Emissions During Construction Phase, by Alternative and Year.

	NO_x (Tons)	VOC (Tons)	CO (Tons)	PM_{10} (Tons)	CO_2 (Tons)
Year 1 – 2009					
BLM components					
Federal Well Drilling	35	6	42	38	641
Non-federal components					
Start M&HRF	701	1,824	270	215	2,246
Total Year 1 Emissions (All Alternatives)	736	1,830	312	253	2,887
Year 2 – 2010					
BLM components					
Alternatives 1–3 (all federal ROW components)	701	1,824	270	1,143	2,246
Alternative 4 (pipelines and fiber optic only)	351	912	135	571.5	1,123
Federal Well Drilling	28	5	34	37	759
Non-federal components					
Finish M&HRF	350	912	135	108	1,123
Construct and Start EGS (Alternative 4 only)	701	1,824	270	215	2,246
Total Year 2 Emissions Alternatives 1–3	1,079	2,741	439	1,288	4,128
Total Year 2 Emissions Alternative 4	1,080	2,741	439	823.5	4,128
Year 3 – 2011					
Federal Well Drilling	18	3	22	19	496
Year 4 – 2012					
Federal Well Drilling	17	3	21	19	379

CO = carbon monoxide
CO_2 = carbon dioxide
M&HRF = Methane and Helium Recovery Facility
EGS = Electricity Generating Station
NO_x = oxides of nitrogen
PM10 = particulate matter of 10 microns or less
VOC = volatile organic compound

4.15.3 Alternative 1

4.15.3.1 Impacts from BLM Actions with Alternative 1

Alternative 1 would create short-term (mobile) construction emissions from drilling new wells, constructing pipelines and transmission lines, and the associated transportation required. These activities would create substantial emissions limited to about five months during the summer. Operation of the proposed wells would create long-term emissions. See Table 4-56 for estimated monthly emissions.

4.15.3.2 Total Project Impacts with Alternative 1

In addition to the impacts that could occur as a result of the BLM actions, other, non-federal components including the proposed M&HRF and the HLF would also create new long-term (stationary source) emissions. The emission levels of the Project would come from operation of certain components or operations at the M&HRF. The Cimarex Air Quality permit (Appendix C) provides information on expected long-term emissions and WDEQ-required off-sets. The proposed Project would emit an annual long-term total of 44.8 tons per year of criteria pollutants under Alternative 1: NOx emissions would be 8.3 tons per year; CO would be 22.6 tons per year; VOC would be 13.7 tons per year; SO_2 would be 0.2 tons per year; and PM_{10} would be <0.1 tons per year. However, stationary sources would be required by WDEQ to reduce or offset emissions of criteria pollutants during the long-term operation of the gas separation and liquefaction processes at the M&HRF and the HLF. Therefore, no adverse impacts to air quality from the stationary sources of the proposed Project would be anticipated.

Effects of construction on air quality emissions is shown in Table 4-56. This assumes that there would be a mix of local and specialty work force from out of state, and that specialized materials and equipment would be hauled from out-of-state locations. Since the area is in proposed nonattainment status, the potential impacts of any of the proposed action alternatives would be proportional to the amount of criteria pollutants emitted.

It also assumes that M&HRF heavy hauling and construction would be performed in 2009, and 2010 would consist of the remaining one-third of construction emissions. The calculations do not include construction of the HLF. Calculations also assume that normal dust control (50% efficiency) is employed.

Based on these generalized assumptions, Alternative 1 would contribute measurable amounts of mobile source pollutants. Long-distance hauling would spread the emissions over multiple states and across Wyoming. In addition, the construction would be concentrated during the summer and early fall months, when air movement is high and conditions for local ozone formation are lower. However, effects from construction-phase PM_{10} generation could contribute to deterioration of visibility. Adoption of an even more aggressive Dust Control Plan could further reduce potential short-term visibility effects from Alternative 1. Up to 80% PM_{10} control efficiency can be achieved with an aggressive dust control, and that is recommended here (see PM_{10} Mitigation Measure 1 below). Therefore, no significant short-term impacts are anticipated as a result of implementation of Alternative 1.

13684 *4.15.3.2.1 Climate Change Effects*

13685 GHG emissions resulting from the proposed Project would be dispersed into the atmosphere
13686 and contribute to a global rise in CO_2 levels. The primary source of construction emissions is
13687 the diesel fuel combusted. During operation, CO_2 would be emitted by fuel combusted to
13688 make electricity. Table 4-55 provides estimates of CO_2 emissions from either grid (coal)
13689 electricity or local generators (produced gas).

13690 About 65% of the gas produced by wells in the Madison Formation is CO_2. In common older
13691 technologies, CO_2 is usually vented directly to the atmosphere resulting in substantial
13692 contribution to climate change effects. Examples of this venting include the gas processing,
13693 authorized in the Riley Ridge EIS and Record of Decision (BLM 1984). Under Alternative 1,
13694 all CO_2 produced by the proposed new wells would be re-injected back into the Madison
13695 Formation. This is a substantial improvement in environmental protection compared to
13696 existing technologies evaluated in the Riley Ridge Gas Project EIS (BLM 1984).

13697 **4.15.4 Alternative 2**

13698 4.15.4.1 Impacts from BLM Actions with Alternative 2

13699 Impacts as a result of BLM actions would be limited to the drilling and operation of the wells
13700 and construction (short-term) of a 1.3-mile segment of the natural gas pipeline as it crosses
13701 federal land to the Hare‘s Ear compressor station. Emission estimates are described in Table
13702 4-55 above.

13703 4.15.4.2 Total Project Impacts with Alternative 2

13704 Under Alternative 2, stationary criteria pollutant emission, and their long-term effects, would
13705 be the same as in Alternative 1. With the exception of PM_{10} emissions, short-term emissions
13706 from construction activities and hauling equipment would be essentially the same as
13707 Alternative 1. Construction on private ROWs would expose a larger area to wind erosion. As
13708 shown in Table 4-55, Alternative 2 PM_{10} emissions would be about 33 tons/month higher
13709 during the construction season, compared with Alternative 1.

13710 **4.15.5 Alternative 3**

13711 Stationary criteria pollutant emissions and their long-term effects would be the same in
13712 Alternative 3 as in Alternative 1. Construction and hauling emissions would be the same as
13713 Alternative 1. Collocated lines for the first 8 miles mean about 27 tons/month less PM_{10} from
13714 wind-blown dust over exposed areas.

13715 **4.15.6 Alternative 4**

13716 4.15.6.1 Impacts from BLM Actions with Alternative 4

13717 In Alternative 4, all but 3,100 feet of transmission line would be eliminated. Other short-term
13718 (construction and well drilling) and long-term (well operation) impacts would be similar to
13719 those in Alternative 1.

13720 4.15.6.2 Total Project Impacts with Alternative 4

13721 Alternative 4 includes the construction and operation of an EGS. For purposes of this
13722 document, it is assumed that the EGS would be constructed in one year using a comparable

level of effort as first-year construction of the M&HRF. The EGS would be serviced by a 1,200-foot-long gas pipeline and a similar-length 69- or 230-kV transmission line connecting it with the M&HRF. Cimarex would construct and operate a gas-fired EGS on 16 acres of state-owned land near the M&HRF. An ancillary 0.5-mile pipeline and transmission line would be built, as shown in Map 2-3. The gas for this plant would come from new or existing wells within the production field.

Local long-term stationary emissions would be slightly higher with Alternative 4 compared with Alternatives 1, 2, and 3 due to the operation of a gas-fired EGS. Regional criteria pollutant emissions would be lower, as shown in Table 4-57. Any additional local emissions of criteria pollutants would be offset; therefore, no long-term local impacts would occur from implementation of this alternative. With Alternative 4, short-term construction PM_{10} emissions would be about 900 tons per month less than Alternative 1.

Table 4-57. Expected Criteria Pollutant Emissions for Electrical Generation Options in Tons per Year.

Mode	CO	VOC	SO_2	NO_x	PM_{10}	CO_2*
18V50DF (Wartsila Reciprocating Technology)	N/A	N/A	Neg.	354	177	397,600
20V34SG (Wartsila smaller units)	53	53	Neg.	26	51	179,000
Grid Electric	N/A	N/A	2562	1183	N/A	443,278

*CO_2 is not a regulated emission at this time; however, it may be regulated in the future and require reporting.

Note: Construction emissions are the same for both types of generators, and in lieu of power line. Assumes scrubbers for both types of Wartsila generators. Coal emissions are for grid power (EPA 2008e).

GHG emissions under Alternative 4 would have different outcomes for air quality, depending on the technology adopted for gas turbines. A preliminary engineering consultation prepared by ION Consulting proposed an alternative that would install and operate four Wartsila 18V50DF generators using reciprocating technology. These electrical generators would burn 425 MMBTU/h, or 9.9 MMCFD of natural gas. Three generators would fulfill the power needs of the Project and the fourth unit (N+1) would be used as a spare to maintain necessary reliability levels.

A second option exists for the use of seven Wartsila 20V34SG units, which would consume about 7.8 MMCFD gas. This option would have even lower emissions and use less fuel than the initial estimate prepared for the 18V50Df generators. Wartsila USA staff report that the smaller 20V34SG unit is more efficient at higher altitudes. This is a fuel savings of about 25% below the 18V50DF units.

Some air quality design features have been assumed for the Wartsila reciprocating technology, such as Selective Catalytic Reduction and post combustion catalyst for NO_x control. These calculations assume that the reciprocating engines have a de-rating of 5% for

operation at an altitude of 8,600 feet. A summary of the estimated emissions from these two reciprocating engine generators schemes is show in Table 4-57, along with typical emissions from electricity purchased from the grid.

Estimates from ION Consulting for the 18V50DF do not break out CO and VOC separately; consequently, they are reported as a combined amount of about 42 tons/year. As shown in Table 4-55, SO_2 emissions would be negligible for either gas generator system because diesel and natural gas fuels would contain almost no sulfur. The primary GHG emitted would be CO_2.

Based on these estimates, GHG emissions as well as long-term emission of criteria pollutants would be reduced under Alternative 4, and substantially reduced with the use of the Wartsila 20V34SG models.

4.15.7 Cumulative Impacts

Currently, development of federal minerals in Wyoming‘s Sublette Basin is at a lower level than forecast in the Reasonable Foreseeable Development (RFD) Scenario prepared in 2001 for the Pinedale RMP (BLM 2008b). The impacts forecast by the RFD are still valid. At the time the 2003 EIS/RMP was written ambient readings did not violate the ozone NAAQS.

The leased area of the proposed action has been industrialized with oil and gas well development. The surface disturbance for each project has contributed to a fragmented land use pattern. Cumulative impacts fluctuate with the gradual reclamation of old wells and the creation of new access roads and well pads. The on-going process of restoration and creating new disturbances continues as the minerals are extracted from the land. Reducing disturbed areas and applying appropriate mitigation measures would minimize cumulative impacts, especially for fugitive dust and GHGs.

Sublette County and some surrounding areas have air quality that fails to meet the federal 8-hour ozone standard. Oil and gas production, inclusive of all sources associated with it, are a substantial portion of the entire anthropogenic emission inventory. Recent developments in Sublette County such as the Jonah Field and Pinedale Anticline projects are currently contributing criteria pollutant emissions to southwest Wyoming, and future proposed oil and gas development such as the LaBarge Platform Project will contribute additional emissions in the area (citations here). The WDEQ Air Quality Division has developed an emission inventory for 2008 for the proposed ozone nonattainment area; the inventory is available upon request from the WDEQ.

All of the Project alternatives would contribute small but incremental emissions (44.8 tons per year of criteria pollutants), but long-term emissions from operations would be offset by terms of the WDEQ permit. Consequently, the Project would not add to the long-term cumulative effects from these criteria pollutants.

Construction activities would result in cumulative short-term emissions for the 3-year construction period, as shown in Table 4-56, adding an incremental increase in region-wide emissions.

The Project would also contribute small but incremental amounts of GHGs, primarily from mobile emissions of CO_2 during construction. While the Project's potential contribution to climate change cannot be individually measured, Potential impacts to western Wyoming's natural resources from climate change are likely to be varied and could be severe. For example, if global climate change results in a warmer and drier climate, increased particulate matter emissions could occur from windblown dust with drier and less stable soils. Cool season plant species' spatial ranges could move north and to higher elevations and extinction of endemic threatened/endangered plants may be accelerated. With a warmer, drier climate agricultural practices would change and grazing may be impractical or prohibited on public lands.

4.15.8 Mitigation and Monitoring Opportunities

4.15.8.1 Mitigation

*4.15.8.1.1 BLM-Required Mitigation**

- PM_{10} Mitigation 1. The BLM shall require preparation and implementation of a construction Dust Control Plan. This plan shall include measures adequate to achieve 80% control efficiency for material entrained into the atmosphere from unpaved roads and disturbed soils. WDEQ can provide technical guidance on the adequacy of an applicant prepared dust plan.
- PM_{10} Mitigation 2. Heavy equipment exhaust opacity shall not exceed an average of 20% on the Ringleman scale for any three minutes during a one hour period.
- Project operations would not exceed applicable state and federal AAQS.
- Require that all drilling and construction equipment engines meet EPA tier 2 emission limits or better.

*4.15.8.1.2 Other Mitigation Opportunities***

EPA data show that improved practices and technology have successfully reduced emissions from oil and gas exploration and development (EPA 2009d). The Farmington Field Office has developed and implemented the following BMPs that could be adopted for the Project:

- Flare hydrocarbon and other produced gases at high temperatures (1,400°F or higher) to reduce incomplete combustion;
- PM10 is readily controlled by water and applying dust palliatives through an organized control plan, as stated in PM10 Mitigation Measure 1, above.
- Vapor recovery systems would be installed and maintained .
- Within three months of well completion (or as soon as weather is compatible), revegetate areas of the well pad not required for production facilities to reduce dust.
- All newly issued APDs shall limit compressor emissions to no more than 2 grams N2O per brake horsepower hour for engines of <300 horsepower.
- Diesel fueled equipment could use a minimum of 10% biodiesel for all machinery powered by engines built after 1994.

4.15.8.2 Monitoring

*4.15.8.2.1 BLM-Required Monitoring**

None.

*4.15.8.2.2 Other Monitoring Opportunities***

None.

* BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the proposed Project, as identified in Chapter 2.

** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal Project components.

4.16 LIGHT AND GLARE

4.16.1 Impact Criteria

Viewing stars and celestial bodies can be an important experience for visitors in the RBPA. While dust and clouds can temporarily degrade views of the night sky, human-made light sources can permanently impair star gazing. This impairment is called light pollution. The intensity and location of a light source directly affects the geographic area affected by light pollution. Snow and rain tend to attenuate light and can substantially reduce glare, but, since star viewing is also impaired, these weather conditions are not usually considered mitigations. Impact criteria focus on clear skies when night-time visibility is greatest, and hence, the most valuable to a resident or visitor.

The Pinedale RMP has no specific regulations or management objectives for management of light pollution affecting night (dark) skies. Because of the lack of specific regulations or statutes concerning outdoor lighting in Wyoming, the evaluation of light impacts involves determining potential line-of-sight direct visibility from light sources to receptors. The potential area of impact is in the Big Piney area and at a KOP along the Lander Road Historic Trail.

For purposes of this analysis, all alternatives are considered to have the same long-term light sources from the same fixed location (M&HRF) and the same short-term light source (drilling rig). The level of impact would be based on two factors. First, the intensity and direction of the light sources, and second, the number of individuals potentially within line-of-sight distance of the Project light sources. Human receptors that might be sensitive to light in the RBPA include hunters, residents, and recreationists in the vicinity of the Lander Road Historic Trail (see Section 4.13). All are considered equally sensitive to noise. Impacts to wildlife are analyzed in Section 4.8.

4.16.2 No Action Alternative

Under the No Action Alternative, BLM would not take action on the Cimarex applications for ROWs or APDs. However, several non-federal actions would likely occur on private and state lands with this alternative, as identified in Chapter 2. Construction of facilities such as the M&HRF and HLF would occur and a transmission line and pipelines would likely be constructed on private and state lands and would be visible as a point source from locations in

a direct line-of-site, as described in other alternatives. Gas production wells would be drilled entirely on State of Wyoming land, but short-term visibility of drill rig lighting cannot be predicted as the exact locations of the well pad, or pads, is not known at this time.

Similar to Alternative 2, the No Action Alternative would contain components in close proximity to Big Piney and night lights may be visible to residents of the town during construction. The pipeline construction lights would be exceptionally bright producing short-term nuisance impacts. The lights would be on private property and BLM would have no jurisdiction or ability to mitigate the impacts.

The impacts of light and glare from the No Action would be similar to the total Project impacts described in Alternative 2.

4.16.3 Alternative 1

4.16.3.1 Impacts of BLM Actions with Alternative 1

BLM actions producing light include the single drill rig located at high elevation on Riley Ridge. Short-term light emitted from this source would be observed during summer and early autumn during the first four years of the Project.

Light attenuates with the square of the distance. For instance, a light source measuring 100 lumens at 50 feet would be 25 lumens at 100 feet. Thus, light pollution from a single source, such as an outdoor street light, typically only blocks star viewing in a close proximity. Ground-based light can impairs star viewing over a wider area when dust in the lower atmosphere reflects and scatters light (back scatter). Clear air has much less potential for back scatter. Thus, urban areas generally experience significant light pollution from the multiplicity of both light and dust sources.

The BLM proposed drilling would include a single drill rig that would add light sources that would likely be visible for some distance due to the rural, undeveloped, and elevated location of the drill rig. The visible light would be considered ―nuisance light," but would not create a glow that could result in degradation of views of the night sky. Rather, the lights would appear from a distance as points of light on the landscape.

Project construction would result in short-term impacts. The drill rig would operate 24 hours a day from August 1 through November 15 for approximately four successive years. Because they operate around the clock, the rigs, which are close to 100 feet tall, are well-lit and direct visibility is likely.

4.16.3.2 Total Project Impacts with Alternative 1

The proposed Project would add light sources to the area that would likely be visible for some distance due to the rural, undeveloped, and elevated location of the M&HRF and the drill rigs.

The visible light would be considered ―nuisance light," but would not create a glow that could result in degradation of views of the night sky. Rather, the lights would appear from a distance as points of light on the landscape.

Project construction would result in short-term, seasonal impacts. Drill rigs would operate 24 hours a day from August 1 through November 15 for approximately four successive years. Because they operate around the clock, the rigs, which are close to 100 feet tall, are well-lit, and direct visibility is likely.

The M&HRF would be constructed and operated under private and state jurisdiction year-round, 24 hours a day. Light sources at the facility vary in type, wattage, and height placement around the site. High-intensity outdoor lights would be used at the M&HRF for security and to help repair crews perform work. Lights can also enhance safety for vehicle operators and visitors. Most would be outfitted with reflector globes or shields to concentrate as much of the light as possible downward. As a result, the site would be considered a quasi-point source and is unlikely to create an artificial light sky glow zone, which is often defined as the glow that can be seen over areas of concentrated light. Outdoor lights are usually mounted on buildings and perimeter poles in such a way that they do not impair those on the ground. Light colors may be yellow (sodium vapor) or white (halide). Light-emitting diodes (LEDs) are gaining in popularity as outdoor industrial lights because they are long lasting, consume minimal power and are directional.

The M&HRF is located in a rural, elevated, largely uninhabited area; potential long-term nuisance-light impacts could be experienced by individuals on the Lander Road Historic Trail and residents in or near Big Piney. During the first four years of the Project, light from the drill rig may also be visible along with lights of the M&HRF.

The HLF would also operate 24 hours a day. The facility is located north of Calpet Road, approximately 1 mile southwest of U.S. 189. Security and safety night lighting would be visible to residents in the area and travelers using the roads. Because of the distance between the HLF and M&HRF, these two facilities would not be visible at the same time by the same viewer.

The overall light effects of the Project would be a nuisance, but would not add significant change to the nighttime sky.

4.16.4 Alternative 2

4.16.4.1 Impacts of BLM Actions with Alternative 2

Impacts would be the same as Alternative 1.

4.16.4.2 Total Project Impacts with Alternative 2

Because Alternative 2 would contain components in close proximity to Big Piney, night lights may be visible to residents of the town during construction. The construction lights may be exceptionally bright, and produce short-term nuisance impacts. The lights would be on private property and BLM would have no jurisdiction or ability to mitigate the impacts. Long-term light effects would be very similar to Alternative 1 and light would be visible as a point source from locations in a direct line-of-sight.

Impacts from construction and operation of the M&HRF and the HLF would be the same as in Alternative 1.

4.16.5 Alternative 3

4.16.5.1 Impacts of BLM Actions with Alternative 3

Impacts would be the same as Alternative 1.

4.16.5.2 Total Project Impacts with Alternative 3

Impacts of light would be the same as for Alternative 1.

4.16.6 Alternative 4

4.16.6.1 Impacts of BLM Actions with Alternative 4

Impacts would be the same as Alternative 1.

4.16.6.2 Total Project Impacts with Alternative 4

Alternative 4 would add another light source similar in scope to the M&HRF. The visible light from the EGS would also be considered nuisance light, but would not create a glow in the air above the source. Impacts would be proportional to the number of lights installed and their wattage/lumen rating. The EGS would be located on state land and therefore outside of BLM jurisdiction.

4.16.7 Cumulative Impacts

Cumulative impacts associated with night lighting are expected to be negligible because lights would not be concentrated and would only be distantly visible from residences or municipal areas. The future foreseeable oil and gas development in the RBPA would result in some additional night lighting at dispersed industrial facilities. Cumulative impacts would not be significant.

4.16.8 Mitigation and Monitoring Opportunities

4.16.8.1 Mitigation

*4.16.8.1.1 BLM-Required Mitigation**

Impacts would occur only during drilling operations. Impacts would be less than significant with mitigation required below.

- Use reflector shields, if possible, on all equipment to deflect light towards the area where it would be needed.
- Aim lights as much as possible below the horizon.
- Use the minimum number of lights and locations to accomplish the job safely.

*4.16.8.1.2 Other Mitigation Opportunities***

- Conduct a lighting analysis to develop alternative light placements, light types, and colors.

4.16.8.2 Monitoring

*4.16.8.2.1 BLM-Required Monitoring**

None.

*4.16.8.2.2 Other Monitoring Opportunities***

None.

* BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the proposed Project, as identified in Chapter 2.

** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal Project components.

4.17 NOISE

4.17.1 Impact Criteria

EPA guidelines identify a maximum 24-hour exposure of 70 decibels as the level of environmental noise that would prevent any measurable hearing loss over a lifetime (EPA 1974). Sounds louder than 80 decibels, or roughly the equivalent of a running dozer (measured at 50 feet), are considered potentially dangerous to the human ear when experienced for an extended periods of time (more than 8 hours).

There are no specific regulations for managing significant noise impacts within the industrial work sites included in the RBPA (drill rigs, well pads, compressor stations, gas plants). Thus, the evaluation of noise impacts involves comparing each alternative for the number of receptors that could or would experience noise levels of 70 dBA or greater, which would be described as ―noisy." The alternatives would also be compared for the number of receptors who could or would experience noise levels of 55 dBA to 69 dBA, which would be described as ―quiet" to ―intrusive".

The level of impact would be general and proportional to the number of individuals expected to be within audible distance of the Project noise sources, the length of time they might remain there, and their expectation for quiet. Hunters, residents, and recreationists in the vicinity of the Lander Road Historic Trail might be sensitive to changes in noise in the RBPA .All are considered equally sensitive to noise. Potential noise impacts to wildlife are analyzed in Section 4.8.

4.17.2 No Action Alternative

Under the No Action Alternative, BLM would not take action on the Cimarex applications for ROWs or APDs. However, several non-federal actions would likely occur on private and state lands with this alternative, as identified in Chapter 2.

Impacts, both linear and point source, are largely transient, with the exception of the long-term operation of the plant sites. Specifically, construction and operation of facilities such as the M&HRF and HLF and would have similar noise impacts as described in Alternative 1. A transmission line and pipelines would likely be constructed on private and state lands; noise

impacts would be similar to those described in Alternative 2. The impacts of any non-federal actions would be outside BLM jurisdiction and ability to modify or change Alternative 1.

4.17.2.1 Impacts of BLM Actions with Alternative 1

Project construction would create short-term noise impacts. Construction noise would be generated by heavy equipment, generators, compressor, and personal vehicles. Except for well drilling operations, all of these activities would occur during daylight hours when noise is tolerated more than at night, largely because of the masking effect of background noise, and people tend to sleep at night. Tables 4-58 and 4-59, below, describe the estimated attenuation of construction noise of the linear components and the well drilling activities for the Project.

Table 4-58. Example of Noise Reduction (Attenuation) over Distance from 95 dB Source.

Distance from Source (feet)	Point Source (-6 dBA)	Estimated Pipeline Construction (-4.5 dBA)	Line Source (-3 dBA)
50	95	95	95
100	89	90.5	92
200	83	86	89
400	77	81.5	86
800	71	77	83
1,600	65	72.5	80
3,200	59	68	77
6,400	53	63.5	74

Table 4-59. Estimated Noise Levels for Project Components.

Project Components	Expected dBA at Source	70 dBA Attenuation Distance (feet)	55 dBA Attenuation Distance (feet)	Disturbance Time Frame
Drill rig	66.7 (at 220 feet)	N/A	396	Short-term

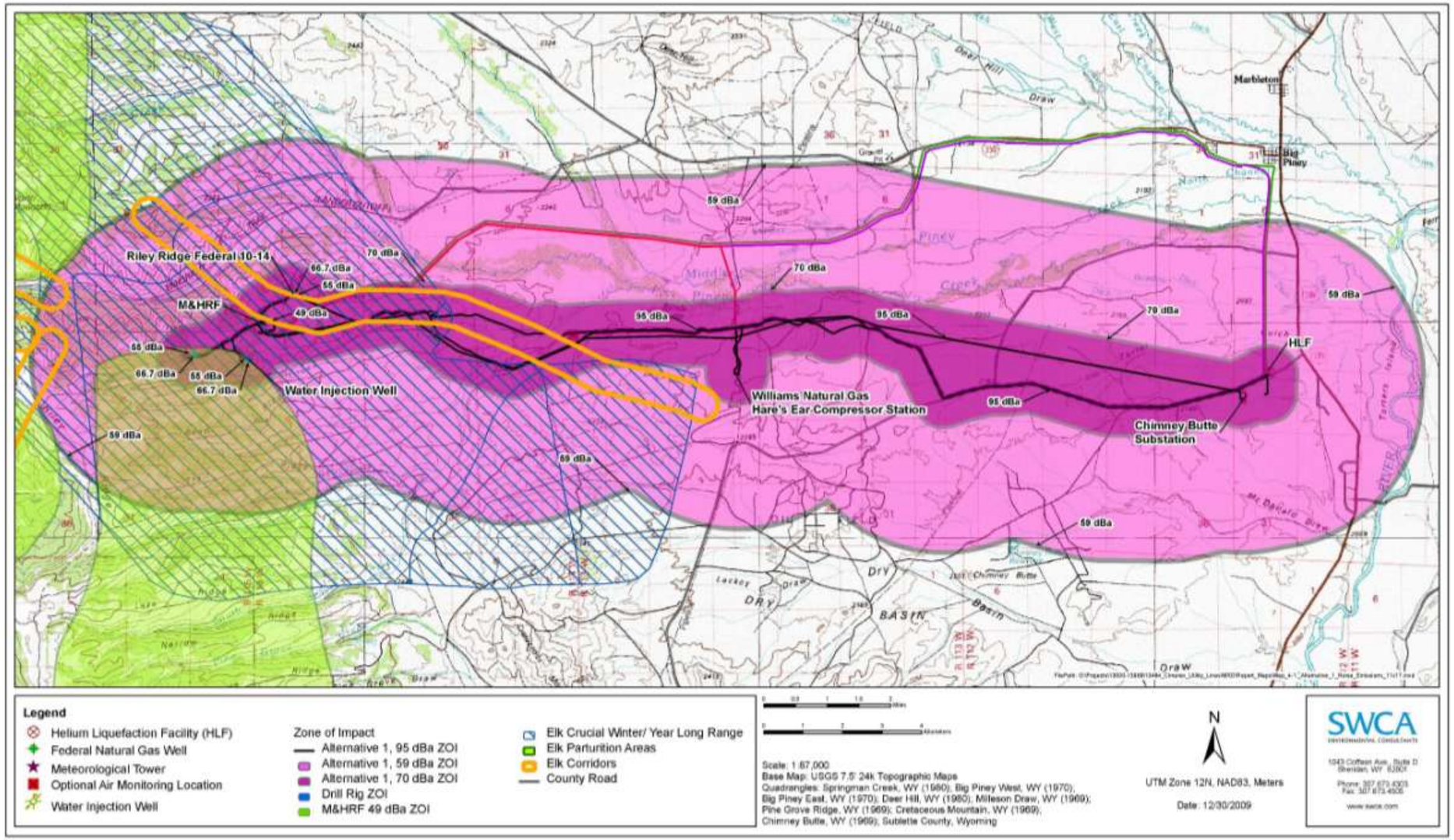
Short-term adverse noise impacts under Alternative 1 can be described as the interference with individual outdoor experiences (see Section 4.13) due to noise levels of 70 dBA and greater, within 800 feet of active construction sites. Noise interference could occur on private, state, and federal land, along existing county roads and other public and private access points. It would occur primarily during daylight hours from May through November 15 during the construction of the Project in 2009 and 2010, assuming a work schedule of approximately 1 mile/day per 10-hour work day/5-day work week. Oil and gas development is the dominant industry in the RBPA; ambient background noise associated with development (transient and ongoing) occurs in the RBPA. The area is not generally considered a destination for recreation, and individuals have alternative sites available within the RBPA for outdoor activities.

4.17.2.2 Total Project Impacts with Alternative 1

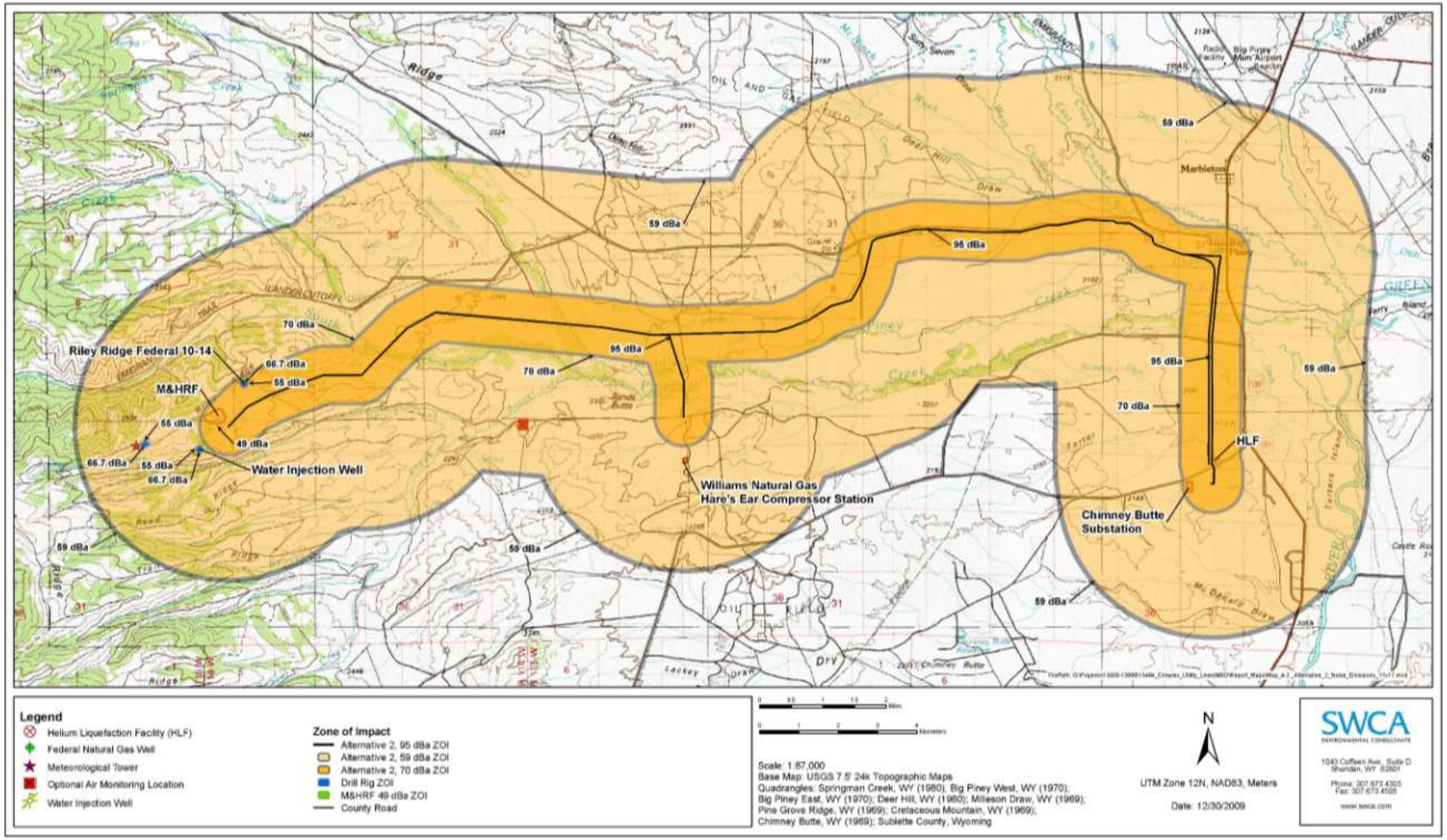
4.17.2.2.1 Short-term Impacts

Project construction would result in short-term noise impacts. Construction noise would be generated by heavy equipment, generators, compressor, and personal vehicles. Except for well drilling operations, all of these activities would occur during daylight hours when noise is tolerated more than at night, largely because of the masking effect of background noise. Additionally, the MOA with the State of Wyoming specifies that no outside construction of the M&HRF would be allowed during crucial winter range stipulations. Table 4-58 describes the estimated attenuation of construction noise of the linear components of the Project.

Short-term adverse noise impacts under Alternative 1 can be described as the interference with individual outdoor experiences (see Section 4.13) due to noise levels of 70 dBA and greater, within 800 feet of active construction sites. Noise interference could occur on private, state, and federal land, along existing county roads and other public and private access points and would occur primarily during daylight hours from May through November 15 during the construction of the Project in 2009 and 2010, assuming a work schedule of approximately 1 mile/day per 10-hour work day/5-day work week. Oil and gas development is the dominant industry in the RBPA; ambient background noise associated with development (transient and ongoing) occurs in the RBPA. The area is not generally considered a destination for recreation, and individuals have alternative sites available within the RBPA for outdoor activities. This short-term noise effect would be dispersed among all Project locations. Maps 4-1 and 4-2 show noise contours around the Project components. The contour closest to each component indicates the closest an individual is likely to get to the component due to security measures in place.



Map 4-1. Alternative 1 Noise Emission Zone.



Map 4-2. Alternative 2 Noise Emission Zone.

4.17.2.2.2 Long-term Impacts

Plant operations would result in long-term impacts to receptors near point sources (drill rig, M&HRF, and HLF) and line source (access road). Industrial equipment noise would occur 24 hours per day at these locations and intermittently along the access road.

Impacts as a result of noise sources are affected by noise type (point or line source), attenuation, and mitigation measures. For purposes of this analysis, all alternatives are considered to have the same long-term noise sources from the same fixed locations, identified in Table 4-60.

Table 4-60. Estimated Noise Levels for Project Components.

Project Components	Expected dBA at Source	70 dBA Attenuation Distance (feet)	55 dBA Attenuation Distance (feet)	Disturbance Time Frame
M&HRF at security fence line (approx. 200 feet from plant)	82	800	Approximately 4,800	Long-term
Transformer at substation	68	N/A	Approximately 200	Long-term
M&HRF Station Flare	94 (top of 90-foot stack)	360 feet (just outside fence line)	Approximately 2,200	5 minutes once per year

As the RBPA is located in a rural, largely uninhabited area and all road access is controlled with locked gates, potential long-term noise impacts would be limited to individuals who could reach the fenced area around the plant from the Bridger-Teton National Forest. Security measures for the plant site would include a fence with warning signs and access would be controlled by key-card. Individuals who were able to reach the fenced area would experience perceptible, but minor increases in noise within approximately 4,800 feet of the drill rig or M&HRF. If these individuals were to continue toward the facilities, they would experience increasing noise levels until reaching approximately 800 feet of the facility. At this point, the noise level would be experienced as loud and probably unpleasant. At the M&HRF fence line, the noise would be experienced as very loud or painful.

Long-term noise impacts of the Project under Alternative 1 can be described as the interference with outdoor experiences to individuals who may enter the areas within 800 feet of noise sources where the expected levels reach 70 dBA or greater. Interference with individuals using the area over the LOP are considered adverse, but minor since the area is very difficult to access on foot, very few individuals are expected to walk in to the areas with loud noise, and individuals seeking outdoor experiences have many alternative sites available within the RBPA. The WGFD MOA in Appendix B requires Cimarex to employ measures that would reduce the noise level to 49 dBA at the fenceline. With this required reduction, significant long-term adverse impacts are not anticipated.

4.17.3 Alternative 2

4.17.3.1 Impacts of BLM Actions with Alternative 2

Impacts of BLM actions with Alternative 2 would be limited to the short-term construction noise related to the installation of 1.3 miles of natural gas pipeline that crosses federal land to the Williams Hare‘s Ear compressor station, the Williams pipeline segment, well drilling operations, and installation of the AAQ&MS. Map 4-2 shows estimate noise impact contours for the construction phase of the Project.

4.17.3.2 Total Project Impacts with Alternative 2

4.17.3.2.1 Short-term Impacts

Short-term adverse noise impacts under Alternative 2 can be described as the interference with individual outdoor experiences and noise trespass issues at private residences due to noise levels of 70 dBA and greater within 800 feet of active construction sites. These effects would occur on private land, around private residences, along existing county roads and other public and private access points and would occur only during daylight hours from May through November 15 during the construction of the Project in 2009 and 2010.

The Middle Piney Road (CR 111) provides access to approximately 20 residences and to the Lander Road and South Piney Road (CR 142). Noise disturbances are expected to occur within 800 and 4,800 feet of the pipeline and transmission line construction area. There are two residences within 800 feet (70 dBA) of the construction area and approximately 25 residences within 4,800 feet (55 dBA). The town of Big Piney is also within the 4,800-foot buffer.

4.17.3.2.2 Long-term Impacts

Long-term impacts would be the same as those described for Alternative 1.

4.17.4 Alternative 3

4.17.4.1 Impacts of BLM Actions with Alternative 3

Impacts would be similar to those in Alternative 1.

4.17.4.2 Total Project Impacts with Alternative 3

As with Alternative 1, short-term impacts would occur as a result of loss of individual outdoor experiences due to noise levels of 70 dBA and greater, within 800 feet of active construction sites. The use of boring equipment would incrementally increase noise (up to 3 decibels) on private and BLM land and riparian areas for few additional days.

4.17.5 Alternative 4

4.17.5.1 Impacts of BLM Actions with Alternative 4

Noise generation would be similar to Alternative 1. However, there would be fewer pieces of equipment overall as the transmission line would not be constructed.

4.17.5.2 Total Project Impacts with Alternative 4

As with Alternative 1, short-term impacts would occur as a result of loss of individual outdoor experiences due to noise levels of 70 dBA and greater, within 800 feet of active construction sites. Short-term impacts would decrease due to the removal of the transmission line from the M&HRF to the Chimney Butte substation. The long-term noise impacts would increase with the addition of the EGS; however, noise generation would be held to the same restrictions as the nearby M&HRF.

4.17.6 Cumulative Impacts

Cumulative noise impacts in the RBPA are expected within a 400- to 800-foot range, both short-term and long-term. Beyond that, noise attenuation rapidly drops the background level to between 45 and 50 dBA, essentially not discernible. The existing background noise levels are generated by wind, motor vehicles, oil and gas facilities, and aircraft. The WGFD MOA in Appendix B requires Cimarex to employ measures that would reduce the noise level to 49 dBA at the fenceline. With this required reduction, long-term significant adverse impacts are not anticipated.

4.17.7 Mitigation and Monitoring Opportunities

4.17.7.1 Mitigation

*4.17.7.1.1 BLM-Required Mitigation**

- Cimarex would be required to adhere to noise provisions in the WGFD MOA.

*4.17.7.1.2 Other Mitigation Opportunities***

- Noisy construction activities could be limited to daylight hours during the work week, defined roughly as 12-hour shifts, approximately 6 days a week.
- All construction equipment used could be adequately muffled and maintained.
- Residences that would be affected by noise over 65 dBA can be protected by temporary sound walls during construction. These walls are typically 8 to 10 feet high and would be erected on or near the property line of affected homes. An 8-foot wall typically provides at least 5 dBA sound attenuation and each additional foot provides approximately one more dBA reduction.
- Hospital-grade mufflers could be used on drill rigs and construction equipment.

4.17.7.2 Monitoring

*4.17.7.2.1 BLM-Required Monitoring**

None.

*4.17.7.2.2 Other Monitoring Opportunities***

- Noise monitoring could be included in the Environmental Monitoring Plan.
- Post-construction noise monitoring could be conducted at the fenceline of the M&HRF to verify compliance with the WGFD MOA.

* BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the proposed Project, as identified in Chapter 2.

** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal Project components.

4.18 CULTURAL AND HISTORIC RESOURCES

4.18.1 Impact Criteria

The PFO RMP ROD has developed management objectives designed to protect significant historic, archaeological, and other culturally sensitive resources from damage or destruction and facilitate suitable scientific, educational, and recreational uses of cultural resources (BLM 2008b). Of particular concern, per the PFO RMP ROD, are the Lander Road Historic Trail and other significant historic transportation sites and Native American traditional use areas and sacred places, with concerns extending to any historically intact visual setting of these significant historic trail and tribally sensitive resources that may be integral to site significance (BLM 2008b).

Alternatives 1 though 4 could have an effect on cultural resource sites that are determined or recommended as eligible for nomination to the NRHP; whereas, the No Action Alternative would have no effect. An effect is defined as an alteration to the characteristics of an historic property qualifying it for inclusion in or eligibility for the NRHP (43 CFR 800.16[i]). These effects could be in the form of direct, indirect, or cumulative impacts. Direct impacts are physical and can cause adverse effects to the cultural resource site or its setting. Direct impacts could occur from ground-disturbing activities such as:

- clearing (surface grading and leveling using heavy equipment) for the purpose of reclamation and to create equipment staging and stabilizing areas for the installation of transmission line poles and buried utility lines, pulling and tensioning areas, and construction of industrial facilities;
- trenching and auger holes (subsurface excavation) for power pole placement and installation of pipelines and flowlines;
- dragging transmission lines during construction and maintenance; and
- vehicle traffic during construction and maintenance operations and placement of snow control features that might directly damage cultural resources or create two-track roads through or adjacent to cultural resource sites resulting in surface displacement or soil compaction.

Direct impacts could also occur from visual, auditory, or olfactory changes to the setting of the area, including the placement of buildings or other facilities, power poles and transmission wires, new two-track trails, and any other disturbance considered to have a direct effect on cultural resource sites for which setting is integral.

Indirect effects to cultural resource sites could occur through such ground-disturbing activities as may increase soil erosion on adjacent cultural resource sites and the creation of adjacent trails, which subsequently might be used for access by recreational visitors and which may

increase erosion. Other indirect effects can result from providing access into areas containing cultural resource sites through the creation of additional two-track trails that lead to increased looting, vandalism, and damage to cultural resources.

Most prehistoric archaeological sites considered to be significant are so under Criterion D, because they may yield information important in prehistory or history (36 CFR 60.4[d]). These types of sites are most sensitive to direct impacts, which may affect their ability to provide information. Cultural resource sites may also be eligible for NRHP listing under Criteria A, B, or C (36 CFR 60.4) because they are associated variously with important events, people, styles, characteristics, and periods in American history. If one of these three criteria applies, then there are seven aspects of integrity that must be considered in order to support the eligibility determination: setting, location, design, material, workmanship, association, and feeling. To properly evaluate the cultural resource, one must take into account these aspects of integrity and consider all potential effects, such as visual, auditory, or olfactory intrusions, which may directly or indirectly cause alterations in the character or use of significant cultural resources. Because there is potential to affect the various aspects of integrity of cultural resources that may be NRHP-eligible under Criteria A, B, or C, it is appropriate to define separate and different APEs for each type of potential impact. For example, the APE for the setting of such historic properties is larger than the APE for on-site impacts and must be evaluated, both inside and outside the immediate footprint or path of Project construction. Visual intrusions by features out of character with the historic landscape can diminish or destroy the essential setting of such cultural resource sites, alter their integrity, and extinguish their eligibility for inclusion in the NRHP. In 2006, the BLM established a protocol with the Wyoming SHPO for assessment of potential impacts to the historic setting of historic properties and guidance for adequate mitigation of visual impacts (BLM and Wyoming SHPO 2006).

Cultural resource sites that are considered to be culturally sensitive or sacred to Native American groups are further specifically protected pursuant to EO 13007 addressing Indian Sacred Sites, in addition to their protection under the NHPA and other federal legislation, and may include, but are not limited to, rock shelters, rock art, rock alignments, Native American burials, and other traditional cultural properties (TCPs) as described in the PFO RMP ROD (BLM 2008b). Unlike most prehistoric archaeological sites, significant historic sites and sites sensitive to Native American tribes may be vulnerable to effects to their setting as well as immediate effects by Project development at cultural resource sites. Because the setting of significant historic properties and traditional Native American cultural properties can be integral to resource values, visual, auditory, and olfactory intrusions may adversely affect such cultural resources and are considered direct impacts. These types of sites can require additional consultation between the BLM and the appropriate tribal government(s), and do so once confirmed to be of further tribal concern. The BLM conducted on-site visits to sites in the project vicinity, potentially sensitive to Native American tribes, with tribal elders in October 2009.

4.18.2 No Action Alternative

Under the No Action Alternative, BLM actions would not be authorized and no additional impacts would occur to cultural resources as a result of federal undertakings. Non-federal

actions may occur, such as construction of the M&HRF and HLF on private and state land. Cultural resources are not protected on non-federal lands or as a result of non-federal actions. Pipeline and transmission line components of the No Action Alternative could be constructed anywhere on non-federal lands, but would most likely approximate the alignments on private and state lands indicated for Alternative 2. Impacts are expected to occur to cultural resources under the No Action Alternative similar to those on the non-federal portions of Alternative 2.

4.18.3 Alternative 1

4.18.3.1 Impacts of BLM Actions with Alternative 1

Table 4-61 provides a summary of the known cultural resource sites that would be impacted under the action alternatives, including Alternative 1. Under Alternative 1, all impacts and adverse effects to cultural resource sites or the integral settings of these resources could be avoided or mitigated through the approaches described below in Section 4.18.8.

Table 4-61. Currently Known Cultural Resource Sites Considered for Project Effects by Alternatives.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Cultural resource sites preliminarily identified as potentially sensitive to Native American groups, prior to tribal consultation in the visual APE	48SU550, 48SU551, 48SU1011 (Overlook Stone Circle Site), 48SU5115, 48SU5331 (South Piney Rock Art Site), 48SU6133, 48SU6134, 48SU6135, 48SU6139, 48SU6156	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
	Total = 10*	Total = 10	Total = 10	Total = 10
Historic sites in the visual APE	48SU387 (Lander Road), 48SU852 (Opal Wagon Road)	Same as Alternative 1 + 48SU539, 48SU942, 48SU990, 48SU1784	Same as Alternative 1	Same as Alternative 1
	Total = 2	Total = 6	Total = 2	Total = 2
NRHP-eligible sites in the direct APE	48SU807*, 48SU866, 48LN949 (Opal Wagon Road)	Same as Alternative 1 + 48SU1124	Same as Alternative 1 + 48SU5930	Same as Alternative 1
	Total = 3	Total = 4	Total = 4	Total = 3
Total Site Count	**15**	**20**	**16**	**15**

* 48SU807 contains rock cairns potentially sensitive to Native American tribes in addition to the components contributing to site significance.

14269 *4.18.3.1.1 Cultural Resource Sites Identified for Tribal Consultation*

14270 Eleven prehistoric archaeological sites (including features at 48SU807) in the RBPA were
14271 identified that potentially could be considered culturally sensitive to Native American tribes
14272 and are common to all proposed alternatives (see Table 4-61). The BLM PFO initiated
14273 consultation with Native American tribes traditionally affiliated with the project area, and
14274 conducted on-site visits of relevant cultural resource locations with tribal representatives in
14275 October 2009. Distance and other factors affecting the potential for impacts to culturally
14276 sensitive sites determined which sites the BLM ultimately consulted with tribes upon in
14277 relation to the currently proposed Project. Tribal consultation is required to be conducted by
14278 the BLM as a part of the NEPA and NHPA Section 106 processes before the Project proceeds.
14279 To maintain the integrity of those historic properties or TCPs determined to be significant,
14280 appropriate avoidance or mitigation measures are determined. Generally, the following
14281 guidelines are used by the PFO for establishing buffer zones around culturally sensitive sites:
14282 a buffer of 0.25 mile for simple cairns that are stable and embedded in the soil, standing
14283 cairns, medicine wheels, fire pots, and rock art; or a 1-mile buffer, minimum, for human
14284 burials and burial areas. Intrusive Project facility developments or ground-disturbing activities
14285 are excluded from areas in buffer zones.

14286 *4.18.3.1.2 Historic Sites in the Visual APE*

14287 The historic Lander Road (48SU387) is located in the northern portion of the RBPA.
14288 Consultation with the BLM confirmed the location of two contributing segments of the road
14289 within the 3-mile range required for VRM Class II assessment (Crowley 2009, personal
14290 communication). One of these segments is approximately 360 feet in length and located at the
14291 bottom of a relatively steep canyon adjacent to South Piney Creek. This segment is between
14292 1.00 and 1.25 miles from BLM-jurisdictional flowlines and the M&HRF. The second segment
14293 is several miles in length and located on BLM land south of Deer Hill. This segment is 3 or
14294 more miles from the 230-kV transmission line proposed in Alternatives 1 and 3, and 1.5 miles
14295 or more from the 230-kV transmission line proposed in Alternative 2.

14296 As described in Section 4.14, visual contrast ratings, visual simulations, and viewshed
14297 analysis using digital elevation models were performed as needed to evaluate direct impacts
14298 and effects to the Lander Road Historic Trail. Results of the viewshed analysis for the first
14299 trail segment indicate that any view of Project components proposed in all alternatives would
14300 be obstructed by the hillside. Therefore, the Project would have no visual or direct impact on
14301 the contributing segment of the Lander Road adjacent to South Piney Creek. Potential visual
14302 impacts to the second contributing segment were evaluated on the basis of KOP 2 (see Section
14303 4.14.2). Results indicate that visual impacts to the Lander Road Historic Trail at this distance
14304 would be absorbed by the natural landscape. Therefore, if mitigation measures described in
14305 Sections 4.14.8.2 and 4.18.8 are followed, the character of the Lander Road‘s physical setting
14306 would be retained for Alternatives 1 and 3. Additionally, any ambient light or noise pollution
14307 that could detract from the feeling of the trail during travel at night would be effectively
14308 mitigated given the measures described in Sections 4.16.5 and 4.17.7 resulting from any of
14309 the components proposed in Project alternatives.

14310 *4.18.3.1.3 NRHP-eligible Sites in the Direct APE*

14311 NRHP qualification for 8 of the 10 sites identified in the viewshed APE is based on the
14312 research value derived in determining functional, temporal, and spatial relationship among
14313 these and similar rock cairn, rock alignment, or stone circle features in the greater area. None
14314 of the Project alternatives would diminish the research value associated with any of the
14315 cultural properties considered in tribal consultation. The two remaining sites recorded in the
14316 viewshed APE are the Overlook Stone Circle site (48SU1011) and the South Piney Rock Art
14317 site (48SU5311). Because the Project would not change the NRHP status of these sites, they
14318 were considered only for cultural sensitivity to Native American tribes.

14319 Three NRHP-eligible cultural properties recorded in the RBPA could experience direct
14320 impacts from ground-disturbing activities proposed in Alternatives 1 through 4, all of which
14321 are associated with the Williams pipeline. Two of the NRHP-eligible resources along the
14322 proposed Williams pipeline route are prehistoric archaeological sites (48SU807 and
14323 48SU2311) recommended Eligible under Criterion D and are located directly in the Williams
14324 pipeline corridor. The contributing portions of both archaeological sites along the proposed
14325 Williams pipeline route are located outside and adjacent to the 300-foot-wide corridor
14326 surveyed for cultural resources on the proposed ROW. Implementation of measures described
14327 in Section 4.20.8 for avoiding or mitigating ground-disturbing activities would eliminate any
14328 adverse effects under all alternatives.

14329 However, 48SU807 also contains eight rock cairns possibly associated with the prehistoric
14330 occupation, which could be considered culturally sensitive or sacred to Native American
14331 groups or concerned parties as described above. Six of the eight cairns are located within the
14332 300-foot-wide corridor BLM and Eastern Shoshone Tribal representatives consulted on these
14333 and other resources in the area on October 23, 2009. Consultation determined that sites
14334 important to the Tribe were being sufficiently avoided by the project and, with protection of
14335 important sites, the Tribe would not have further concern for project actions in relation to
14336 cultural resource sites specifically important to the Tribe (Vlcek 2009, personal
14337 communication).

14338 A segment of the Opal Wagon Road (48LN949) is crossed by the Williams pipeline, but has
14339 already been bladed through in this area and is recommended as a non-contributing portion.
14340 Additional portions of the Opal Wagon Road (48SU852) are listed in PLSS sections crossing
14341 near the east portion of the proposed 230-kV transmission line and the HLF. The closest
14342 known contributing portion of the trail is approximately 1.25 miles east of the proposed 230-
14343 kV transmission line (see Johnson 2006:64–66). Currently known impacts to the setting of
14344 that historic site include U.S. 189 and the adjacent overhead transmission lines, local roads
14345 and two-tracks, and residential developments. Because of the existing visual disturbances and
14346 topography, the proposed transmission line and HLF would not produce a visible change or
14347 alter the feel of the physical setting and, therefore, have no effect on the significance of the
14348 road segment.

14349 4.18.3.2 <u>Total Project Impacts with Alternative 1</u>

14350 Fifteen cultural resource sites would be impacted by Alternative 1, as shown in Table 4-61,
14351 compared to 20 by Alternative 2. Non-federal actions would potentially contribute additional

visual impacts to known cultural resource sites, but would not increase the number of sites affected by the Project. Of the 15 cultural resource sites evaluated in all proposed action alternatives, 10 are located in the viewshed APE and were considered for Native American tribal consultation; 2 are NRHP-eligible historic roads in the viewshed APE; and 3 are NRHP-eligible prehistoric cultural resource sites in the direct APE of the Williams pipeline.

4.18.4 Alternative 2

4.18.4.1 Impacts of BLM Actions with Alternative 2

4.18.4.1.1 Cultural Resource Sites Identified for Tribal Consultation

Wells and flowlines and the Williams pipeline are Project components under BLM jurisdiction which would produce effects to known cultural resource sites in the RBPA under Alternative 2. Eleven prehistoric archaeological sites (including features at 48SU807) in the RBPA were identified that potentially could be considered culturally sensitive to Native American tribes and are common to all proposed alternatives (see Table 4-61). The BLM PFO initiated consultation with Native American tribes traditionally affiliated with the project area, and conducted on-site visits of relevant cultural resource locations with tribal representatives in October 2009. Distance and other factors affecting the potential for impacts to culturally sensitive sites may determine which sites the BLM ultimately consulted with tribes upon in relation to the currently proposed Project.

4.18.4.1.2 Historic Sites in the Visual APE

BLM activities would not impact historic sites in the visual APE under Alternative 2.

4.18.4.1.3 NRHP-eligible Sites in the Direct APE

Of the NRHP-eligible sites identified in Table 4-61, 20 cultural resource sites would be impacted by Project components proposed in Alternative 2 (see Table 4-61). Three NRHP-eligible cultural properties could have direct impacts from ground-disturbing activities proposed in Alternatives 1 through 4, all of which are associated with the Williams pipeline. Two of these are prehistoric archaeological sites (48SU807 and 48SU2311) recommended Eligible under Criterion D and are located in the direct APE of the Williams pipeline. The contributing portions of both historic properties are located outside and adjacent to the 300-foot-wide corridor surveyed for the Williams pipeline ROW. The means of avoiding or mitigating any ground-disturbing activities described in Section 4.18.8 would eliminate any adverse effects under all alternatives. However, 48SU807 also contains eight rock cairns possibly associated with the prehistoric occupation, which could be considered culturally sensitive or sacred to Native American groups or concerned parties as described above. Six of the eight cairns are located within the 300-foot-wide corridor and require protection/avoidance from site impacts.

A segment of the Opal Wagon Road (48LN949) is crossed by the Williams pipeline, but has already been bladed through in this area and is recommended as a non-contributing portion.

4.18.4.2 Total Project Impacts with Alternative 2

Fifteen cultural resource sites would be impacted by Alternative 1, as shown in Table 4-61, compared to 20 by Alternative 2. Non-federal actions would potentially contribute additional

visual impacts to known cultural resource sites, but would not increase the number of sites affected by the Project. Of the 15 cultural resource sites evaluated in all proposed action alternatives, 10 are located in the viewshed APE that require consultation with Native American tribes or concerned parties; 2 are NRHP-eligible historic roads in the viewshed APE; and 3 are NRHP-eligible prehistoric cultural resource sites in the direct APE of the Williams pipeline.

4.18.4.2.1 Cultural Resource Sites Identified for Tribal Consultation

Eleven prehistoric archaeological sites (including features at 48SU807) in the RBPA were identified that potentially could be considered culturally sensitive to Native American tribes and are common to all proposed alternatives (see Table 4-61). The BLM PFO initiated consultation with Native American tribes traditionally affiliated with the project area, and conducted on-site visits of relevant cultural resource locations Easter Shoshone Tribal representatives on October 23, 2009. It was determined that sites important to the Tribe were sufficiently avoided by the project and, with protection of important sites, the Tribe did not have further concern for project actions in relation to cultural resource sites specifically important to the Tribe (Vlcek 2009, personal communication).

4.18.4.2.2 Historic Sites in the Visual APE

Increased visual impacts to the Lander Road Historic Trail, one historic ranch, and three historic buildings in the town of Big Piney, and ground-disturbing activities to one NRHP-eligible prehistoric archaeological site from the proposed natural gas line and fiber optic cable account for the five additional sites likely to be impacted under Alternative 2, as compared with the other action alternatives. The potential impacts and effects from Alternative 2 are greater than that of other action alternatives because the utility lines are longer and cultural resource inventories have not been conducted on private land Potential visual impacts to the contributing segments of the Lander Road were evaluated for Alternative 2 according to the methods described in Section 4.14.

Based on the viewshed analysis, no Project components would be visible from the Trail segment adjacent to South Piney Creek in the western portion of the RBPA. Potential visual impacts to the second contributing segment of the Lander Road south of Deer Hills were evaluated through computer simulations and visual contrast ratings from KOP 2. Results for the M&HRF are similar to those described in Section 4.18.3. If mitigation measures described in Sections 4.14.4 and 4.17.8 are followed, the character of the physical setting of the Lander Road would be retained. Additionally, any ambient light or noise pollution that could detract from the feeling of the trail during travel at night would be effectively mitigated given the measures described in Sections 4.16.8 and 4.17.8.

Ground-disturbing activities from the construction of the natural gas line and fiber optic cable would likely result in direct impacts to 48SU1124, an NRHP-eligible prehistoric open camp. Currently available provenience information places the location of the cultural property in the direct APE. An updated site record indicating the specific areas contributing to the site‘s significance would be required to assess the type of effect. An avoidance or mitigation plan would also need to be developed.

Visual intrusions from the transmission line and pipeline scar would have a direct impact on the Eugene Noble Ranch (48SU990), an historic property which currently functions as a working ranch. The proposed utilities would pass within 500 feet of structures on the property. The site is recommended Eligible under Criterion C for its architectural integrity, lack of modern intrusions, and feeling associated with its era of historic significance. The property is located on a relatively flat landscape, against which power poles and transmission lines could potentially have adverse effects. An overall visual assessment including a contrast rating may be required to assess visual effects. Appropriate mitigation in collaboration with the landowner and BLM would be required prior to Project initiation.

Three historic properties (Big Piney Town Hall, Big Piney Bunkhouse and Garage, and the First Congregational Church) in the town of Big Piney were noted in the file search used to estimate the viewshed APE, which was based on PLSS sections overlapped by a 2-mile buffer of the proposed components for Alternative 2. Because the structures are located in a town with existing visual disturbances, there would be no new effect to these historic properties.

4.18.4.2.3 NRHP-eligible Sites in the Direct APE

Of the NRHP-eligible sites identified in Table 4-61, 20 cultural resource sites would be impacted by Project components proposed in Alternative 2 (see Table 4-61). As indicated in Chapter 2 of this EA, Alternative 2 would use private land ROW for the Cimarex helium pipeline, fiber optic cable, natural gas pipeline, and the 230-kV transmission line, which would also require new segments of natural gas pipeline to be constructed in the Williams pipeline ROW. Federal responsibility over cultural resources on non-federal lands derives primarily from the NHPA as amended (P.L. 89-665; 80 Stat. 915; 16 USC 470) and its implementing regulations found in 36 CFR Part 800, and EO 11593, 3 CFR 154 (1971) and reprinted in 16 USC 470. The NHPA requires that the necessary steps be taken to identify historic properties located on non-federal lands within the APE. Because Alternative 2 is almost exclusively located on privately held lands, if access is denied for cultural resource inventories, the BLM has limited Section 106 responsibilities. Significant portions of Alternative 2 have not been previously inventoried for cultural resources. Therefore, denial of access to the private lands may result in greater impacts to cultural properties than other action alternatives.

4.18.5 Alternative 3

The design modifications proposed in Alternative 3 would produce the same impacts and Project effects on cultural properties as those proposed in Alternative 1 with the addition of one NRHP-eligible site within the direct APE (48SU5130). The property is a prehistoric archaeological site recommended Eligible under Criterion D and is located in the immediate corridor of the 230-kV transmission line. The historic property is located on a slope on the north side of the 300-foot ROW. No project structures are planned within 30 meters of this archaeological site, and the location of the site on the slope makes incidental vehicle traffic along the power line route once it is built improbable. The means of avoiding or mitigating any ground-disturbing activities described in Section 4.18.8 will eliminate any adverse effects to this archaeological resource.

4.18.5.1 Total Project Impacts with Alternative 3

Sixteen cultural resource sites would be impacted by Alternative 3 development, as listed in Table 4-61, compared to 20 by Alternative 2 and 15 in Alternatives 1 and 4. Non-federal actions would potentially contribute additional visual impacts to known cultural resource sites, but would not increase the number of sites affected by the Project. Of the 16 cultural resource sites evaluated in all proposed action alternatives, 10 are located in the viewshed APE that requires consultation with Native American tribes or concerned parties; 2 are NRHP-eligible historic roads in the viewshed APE; and 4 are NRHP-eligible prehistoric cultural resource sites in the direct APE.

4.18.6 Alternative 4

Those cultural resource sites considered for direct impacts and effects under Alternative 4 are the same as those considered in Alternative 1, and thus more effectively avoid significant cultural resource sites compared to Alternative 2 and Alternative 3. No change in direct impacts or effects would result from ground-disturbing activities proposed in Alternative 4 either from the addition of the EGS or the omission of the 230-kV transmission line as compared to Alternative 1. By omitting the 230-kV transmission line, Alternative 4 would more effectively avoid impacts resulting from visual intrusions to the physical setting of the Lander Road Historic Trail and decrease the potential for impacts to culturally sensitive sites compared to Alternatives 1 through 3. The addition of the EGS, however, would represent an additional visual intrusion to the physical setting of the Lander Road Hsitoric Trail. The station would be visible at a range of 8.2 miles from the contributing Lander Road segment that is located south of Deer Hills. However, as described in Section 4.14, computer simulations and visual contrast ratings from KOP 2 indicate that Alternative 4 would have minimal visual impacts and the character of the physical setting would be retained as it concerns the significance of the Lander Road.

4.18.7 Cumulative Impacts

Multiple oil and gas drilling and production projects contribute to the cumulative impacts to cultural resources in the RBPA. Although the PFO RMP ROD upholds a policy favoring avoidance of impacts and therefore preservation of cultural resources, as development becomes denser, cultural resources (and the integral visual setting of some) become increasingly more difficult to avoid and more intrusive mitigation measures are necessary to avoid the destruction of non-renewable material culture. Potential for disturbance of cultural materials and site settings is proportionate to the surface area of ground disturbance and the scale of aboveground development on the cultural landscape. Increased ground disturbance also increases the potential for unanticipated discoveries, and the potential for the unmitigated loss of cultural resource values and information if those discoveries go unrecognized or if there is loss due to damage as a result of the disturbance during discovery.

4.18.8 Mitigation and Monitoring Opportunities

4.18.8.1 Mitigation

*4.18.8.1.1 BLM-Required Mitigation**

- Should a new cultural resource site be encountered during construction or operations, the Operator would immediately discontinue operations and notify the BLM. The Operator would be responsible for the cost of evaluating and mitigating the site.
- Where avoidance re-routes are not feasible, additional subsurface testing or other appropriate assessment of cultural resource sites for potential for Project impacts would be required.
- A mitigation plan should be developed for prehistoric archaeological sites 48SU807 and 48SU2311 located in the direct APE of the Williams pipeline. Such a plan could include an archaeological monitor and/or avoidance fencing in the areas integral to the significance of the cultural properties.
- An avoidance plan should be developed for the prehistoric archaeological site 48SU5130 in the APE of the 230-kV transmission line under Alternative 3. The plan could require an archaeological monitor and/or avoidance fencing in the areas integral to the significance of the cultural property.
- In relation to crossing areas of substantial alluvial deposition in the Beaver Creek area, a subsurface testing plan (approximately 10-15 shovel tests along the centerline of any proposed project trenching) is needed to assess the potential for and to locate buried archaeological materials prior to construction. Archaeological monitoring in the form of trench inspection is further stipulated for this creek valley crossing during any permitted project pipeline installation.

*4.18.8.1.2 Other Mitigation Opportunities***

Cultural resources determined to be eligible for NRHP nomination, and thereby determined significant, would be protected; ―Potential effects on cultural resources would be managed, to the extent possible, through avoidance and confidentiality of location. Where avoidance is not feasible or prudent, mitigation through data recovery, monitoring, or other data collection would be required" (BLM 2008b:[2]11). Additionally where cultural resource sites of concern to Native American tribes are identified, appropriate tribes would be consulted and ―The input received from affected tribal groups would be considered before any irretrievable or irrevocable decisions are made" (BLM 2008b:[2]11); moreover, these sites are stipulated for no surface occupancy.

If a cultural resource site cannot be avoided, additional mitigation such as data recovery may be required. Data recovery is generally defined as excavation, analysis, and dissemination of all significant archaeological data as determined by a federal archeologist.

For this Project, cultural resource sites that are determined to be eligible or unevaluated for nomination to the NRHP and that fall within the APE for physical impacts may be avoided by rerouting the construction traffic around site boundaries, or through established roadways already crossing historic ditch and trail structures. Placement of barrier fencing or other

physical traffic diverters placed around sites during construction can further support avoidance.

The Operator/component owner (See Table 4-62) should coordinate operations and maintenance with BLM.

Table 4-62. Owners of Project Components and the Significant Cultural Resource Sites Considered for Impacts.

Project Component Owner	Cultural Resource Sites
Williams Pipeline Co.	48SU807, 48SU2311
Cimarex Energy	48SU1124
Rocky Mountain Power	Eugene Noble Ranch (48SU990)
Cimarex Energy and Rocky Mountain Power	The Lander Road (48SU387), 48SU550, 48SU551, 48SU1011, 48SU5115, 48SU5130, 48SU5331, 48SU6133, 48SU6134, 48SU6135, 48SU6139, 48SU6156

Large NRHP-eligible cultural resource sites straddling the corridor such that avoidance is impossible, would be managed in accordance with the BLM and Wyoming SHPO Programmatic Agreement (BLM and SHPO 2006).

The following mitigation measures could be implemented to further reduce adverse impacts:

- A discovery and mitigation plan could be developed to avert impacts should archaeological materials or burial remains be unexpectedly discovered.
- No structures or disturbance would be permitted on portions of NRHP-eligible cultural resource sites that contribute to site significance; transmission lines would span or bypass such sites, and Project traffic, trenching, and blading would be routed or placed away from or around them. Any portion of an NRHP-eligible cultural resource site not contributing to the site‘s significance that is proposed for structure placement or disturbance would require the appropriate level of testing, review, and agency concurrence within a mitigation plan prior to Project actions being decided or approved at the site.
- Protection of sites traditionally important or sensitive to Native American tribes is to be maintained in accordance with the details of Eastern Shoshone response letter following up on October 23, 2009, on-site tribal consultation with BLM, in supplement to and consistent with all existing BLM avoidances and protections being maintained for any such sites in the project area at all project component locations.
- Prior to installation of the AAM&WS a visual contrast rating assessment and acceptable treatment plan may need to be developed if the station is in the viewshed of a contributing segment of the Trail (BLM and SHPO 2006; BLM 2008b).

*4.18.8.1.3 BLM-Required Monitoring**

None.

14581 *4.18.8.1.4 Other Monitoring Opportunities***

14582 An archaeological monitor could be required in sensitive areas where ground disturbance may
14583 take place adjacent to known cultural resource sites or in areas with potential for
14584 archaeologically sensitive soil deposition.

14585 * BLM-required mitigation and monitoring applies only to BLM actions/authorizations associated with the
14586 proposed Project, as identified in Chapter 2.

14587 ** Other mitigation or monitoring opportunities can be applied to both the federal and non-federal Project
14588 components, but BLM cannot require or impose any mitigation or monitoring requirements on non-federal
14589 Project components.

14590 4.19 SUMMARY OF ENVIRONMENTAL CONSEQUENCES OF THE 14591 ALTERNATIVES

14592 4.19.1 Summary of the Consequences of No Action

14593 Consequences of the No Action Alternative would not occur from BLM components, but
14594 impacts from non-federal components may occur. Short-term and long-term consequences
14595 may occur to soils, vegetation, elk migration and crucial winter range, human health and
14596 safety, recreation, and transportation regardless of BLM approval of federal applications. In
14597 addition, there would be long-term benefits to socioeconomics from increased employment
14598 and tax revenues. The consequences of the No Action alternative would similar to the non-
14599 federal components of Alternative 2.

14600 Cumulative impacts would still occur with the No Action Alternative. Projected increases in
14601 oil and gas development in the Tip Top gas field, and the Big Piney-LaBarge Infill Project
14602 could double the number of wells in the RBPA. The incremental impacts of the Project under
14603 No Action, including the M&HRF and HLF, would produce additive moderate adverse
14604 impacts to surface water quality, soil, slope stability, elk migrations, and other sensitive
14605 wildlife species such as sage-grouse. Cumulative impacts to the human environment under No
14606 Action would include moderate short-term impacts to human health and safety, recreation,
14607 socioeconomics, and transportation as several gas development projects might compete for
14608 housing and services, and exceed the local capacity. On the other hand, cumulative impacts
14609 would also result in moderate long-term benefits from additive employment in the area and
14610 increased tax revenues.

14611 4.19.2 Summary of the Consequences of Alternative 1

14612 Alternative 1 would have some short-term adverse impacts arising from the proposed BLM
14613 components, such as the gas wells and injection well, and the pipeline and transmission line
14614 ROWs. BLM components would result in approximately 811.32 acres of temporary surface
14615 disturbance associated with federal actions. The resources that would experience short-term
14616 impacts with Alternative 1 include:

14617 • susceptible soils, especially in soils susceptible to erosion (140 acres), landslides (162
14618 acres), and slumping (86 acres);

14619 • aquatic resources, especially Spring Creek and Beaver Creek;

- vegetation, from temporary loss of 496.9 acres of Wyoming big sagebrush and 1.1 acres of riparian vegetation and wet meadow;
- elk, from temporary loss or disturbance of 382.2 acres of crucial winter range and 120.2 acres of migration area;
- sage-grouse, from direct short-term impacts to 244.6 acres of potential habitats within 2 miles of eight leks;
- sagebrush obligate species, from direct and indirect impacts to sagebrush;
- grazing, from temporary loss of forage and reduction in 75.5 AUMs; and
- air quality, from the release of pollutants from drilling and construction equipment.

Long-term surface disturbance of Alternative 1 would result in the loss of 31.56 acres from BLM jurisdictional components, producing the following impacts:

- Sage-grouse, from the unauthorized use of transmission line ROW by OHV resulting in the loss of 6.1 acres of habitats within 2 miles of four occupied leks and potential sage-grouse abandonment of the Calpet 8 lek as a result of overhead transmission structures located less than 0.5 miles from the lek perimeter.
- Potential reduced use or abandonment of sage-grouse habitats as a result of overhead transmission structures located less than 0.5 mile from the perimeter of one occupied lek.
- Vegetation, from 23.1 acres long-term loss of Wyoming big sagebrush, loss of other native vegetation types, and increase and spread of noxious weeds.
- Grazing, from the long-term loss of 2.43 AUMs.
- Elk, from long-term loss of 6.4 acres of crucial winter range.

Placement of the 230 kV power line at the proposed location, approximately 0.25 miles from the perimeter of the Caplet 8 lek, is considerably less than the WGFD recommended lek protection separation distance of 0.5 miles and would potentially lead to lek abandonment, which would be significant impact to the Calpet 8 lek. None of the other of the adverse impacts indicated for BLM actions in Alternative 1 are considered significant, although mitigation measures are recommended to reduce adverse impacts to the extent possible

Non-federal components in Alternative 1 would result in short-term environmental consequences from surface disturbance (61.0 acres), noise, destruction of vegetation during the construction of the M&HRF, water injection well, and HLF. Long-term impacts to 23.0 acres would arise from the operation of the M&HRF, HLF, and water injection well. Many of the environmental consequences would add to impacts identified for BLM actions.

The overall long-term impacts of Alternative 1 would result from non-federal components of Alternative 1:

- Socioeconomics, from the beneficial effects of increased long-term employment and tax revenues.
- Vegetation, from temporary loss of 10.0 acres of Wyoming big sagebrush, and other native vegetation for facilities.
- Grazing, from the long-term loss of 3.7 AUMs.
- Elk migration, from operational noise and human disturbance.
- Health and safety, from low level of risk of accidental release of toxic chemicals from operations.

Cumulative impacts of the Project, plus the additive effect of new oil and gas development in the existing gas fields surrounding the Riley Ridge Unit, would have continuing adverse effects on wildlife values, including sage-grouse and elk. New development in any areas adjacent to or within sage-grouse lek buffer areas or elk crucial winter range or migration corridors could continue to exert pressure on the Calpet/Deer Hills sage-grouse complex or the Piney elk herd and create short-term and long-term impacts. Other cumulative effects would include the minor short-term impacts to air quality, and moderate long-term benefits of increased employment and tax revenues.

4.19.3 Summary of the Consequences of Alternative 2

Alternative 2 would reduce the impacts of the Project on public lands, but would not necessarily reduce overall impacts of the Project. BLM components would result in approximately 195.6 acres of temporary surface disturbance associated with federal actions. The resources that would experience short-term impacts with Alternative 2 include:

- susceptible soils, especially in soils susceptible to erosion (8.0 acres), landslides (4.2 acres), and slumping (6.7 acres);
- aquatic resources, especially Spring Creek and Beaver Creek;
- vegetation, from temporary loss of 87.5 acres of Wyoming big sagebrush;
- elk, from temporary loss or disturbance of 39.9 acres of crucial winter range and 5.8 acres of migration area;
- sage-grouse; from direct short-term impacts to 32.4 acres of potential habitats within 2 miles of two leks;
- sagebrush obligate species, from direct and indirect impacts to sagebrush;
- grazing, from temporary loss of forage and reduction in 23.5 AUMs; and
- air quality, from the release of pollutants from drilling and construction equipment.

Alternative 2 would produce 12.0 acres of long-term surface disturbance from BLM jurisdictional components, producing the following long-term impacts:

- Vegetation, from 7.7 acres long-term loss of Wyoming big sagebrush, loss of other native vegetation types, and increase and spread of noxious weeds.

- Elk, from long-term loss of 6.4 acres of crucial winter range.

None of the adverse impacts indicated for BLM actions in Alternative 2 are considered significant, although mitigation measures are recommended to reduce adverse impacts to the extent possible.

Non-federal connected actions would result in 789.0 acres of temporary surface disturbance during construction. Pipelines and transmission lies ROW would cross South Fork and Middle Fork of Piney Creek in three locations. This would bring about potentially significant short-term and long-term impacts to surface water quality, bottomland soils, riparian vegetation, wetlands, moose crucial winter range, and other sensitive wildlife and plant habitats.

Additional overall long-term impacts to 47.7 acres would result from non-federal components of Alternative 2, including:

- socioeconomics, from the beneficial effects of increased long-term employment and tax revenues;
- vegetation, from temporary disturbance of 88.1 acres and long-term loss of 3.2 acres of riparian vegetation and wet meadows;
- potential reduction in elk migration from ongoing noise and human disturbance;
- visual resources, from drastic change in the visual character of the valley of the Middle Piney and South Piney creeks;
- historic trails, from visual effects to the setting and character of the Lander Road;
- recreation, from decreased quality of recreational experience in the region; and
- human health and safety, from low level of risk of accidental release of toxic chemicals from operations.

Cumulative impacts of the Project, plus the additive effect of new oil and gas development in the existing gas fields surrounding the Riley Ridge Unit would have continuing adverse effects on wildlife values, including Sage-grouse and elk. New development in any areas adjacent to or within sage-grouse lek buffer areas or elk crucial winter range or migration corridors could continue to exert pressure on the Calpet/Deer Hills Sage-grouse complex or the Piney elk herd and create short-term and long-term impacts. Other cumulative effects would include the minor short-term impacts from to air quality, and moderate long-term benefits of increased employment and tax revenues.

Alternative 2 would also produce minor and moderate long-term impacts to visual resources, recreation, and the visual setting of the Lander Road Historic Trail since it approaches Big Piney near the Lander Road and in areas frequently used to access recreation areas. Disruptions to local traffic and social systems would also bring about moderate long-term impacts.

Cumulative impacts from Alternative 2 would potentially add to both the short-term adverse impacts of construction on the physical, biological, and human environment, but also result in long-term significant impacts from changes from rural character of the Piney Valley to an industrialized landscape.

4.19.4 Summary of the Consequences of Alternative 3

Alternative 3 would have some minor to moderate short-term adverse impacts arising from the proposed BLM components, such as the gas wells and injection well, and the pipeline and transmission line ROWs. BLM components would result in approximately 631.3 acres of temporary surface disturbance associated with federal actions, as shown in Table 4-5. The resources that would experience short-term impacts with Alternative 3 include:

- susceptible soils, especially in soils susceptible to erosion (92 acres), landslides (104 acres), and slumping (57 acres);
- aquatic resources, especially Spring Creek and Beaver Creek;
- vegetation, from temporary loss of 364.1 acres of Wyoming big sagebrush and 1.6 acres of riparian vegetation and wet meadow;
- elk, from temporary loss or disturbance of 270.0 acres of crucial winter range and 104.0 acres of migration area;
- sage-grouse; from direct short-term impacts to 170.7 acres of potential habitats within 2 miles of nine leks;
- sagebrush obligate species, from direct and indirect impacts to sagebrush;
- grazing, from temporary loss of forage and reduction in 61.5 AUMs; and
- air quality, from the release of pollutants from drilling and construction equipment.

Alternative 3 would produce 25.7 acres of long-term surface disturbance from BLM jurisdictional components, producing the following long-term impacts:

- Sage-grouse, No long-term habitat loss. Avoid significant impacts to Calpet 8 lek by locating the transmission line 0.8 miles from the lek perimeter.
- Vegetation, from 18.6 acres long-term loss of Wyoming big sagebrush and loss of other native vegetation types, and increase and spread of noxious weeds.
- Grazing, from long-term loss of 2.0 AUMs.
- Elk, from long-term loss of 7.8 acres of crucial winter range.

None of the adverse impacts indicated for BLM actions in Alternative 3 are considered significant, although mitigation measures are recommended to reduce adverse impacts to the extent possible.

Non-federal components in Alternative 3 would result in additional short-term environmental consequences from 61.0 acres of surface disturbance during the construction of the M&HRF, water injection well, and HLF. Long-term impacts would arise from the operation of the

M&HRF, HLF, and water injection well. Many of the environmental consequences would add to impacts identified for BLM actions.

Overall long-term impacts of Alternative 3 to 23.0 acres would result from non-federal components of Alternative 3 include the following:

- Socioeconomics, from the beneficial effects of increased long-term employment and tax revenues.
- Vegetation, from long-term loss of 4.6 acres of Wyoming big sagebrush, and other native vegetation for facilities.
- Grazing, from long-term loss of 1.1 AUMs.
- Potential reduction in elk migration from operational noise and human disturbance.
- Human health and safety, from low level of risk of accidental release of toxic chemicals from operations.

Cumulative impacts of the Project, plus the additive effect of new oil and gas development in the existing gas fields surrounding the Riley Ridge Unit would have continuing adverse effects on wildlife values, including sage-grouse and elk. New development in any areas adjacent to or within sage-grouse lek buffer areas or elk crucial winter range or migration corridors could continue to exert pressure on the Calpet/Deer Hills sage-grouse complex or the Piney elk herd and create short-term and long-term impacts. Other cumulative effects would include the minor short-term impacts from to air quality, and moderate long-term benefits of increased employment and tax revenues.

Alternative 3 would have the lowest short-term and long-term cumulative impacts compared with other action alternatives. Minor adverse impacts to soils and the surface water quality of the area streams could result from this and other foreseeable projects, however, including surface disturbance in the watersheds of Beaver Creek and Spring Creek. Minor short-term and long-term impacts to elk migration are expected from this and other activities in the RBPA. And depending on the intensity of other new projects in the RBPA, air quality, socioeconomics, transportation, recreation, and human health and safety could experience moderate adverse impacts during the construction phase.

4.19.5 Summary of the Consequences of Alternative 4

Alternative 4 would reduce Project reliance on electrical power from coal, in favor of an on-site EGS using gas produced at the M&HRF. Short-term impacts from construction would be reduced for surface disturbance since most transmission line construction would not be needed. However, substantial construction disturbance would be required for the EGS. Deep foundations and substantial site preparation would likely be required due to the unstable soils and steep slopes. Short-term adverse impacts would result for soils, slope stability. Air quality effects would be reduced by adoption of Alternative 4, compared with the No Action Alternative and other action alternatives. Noise and disturbance from additional industrial facilities within elk migration corridor would produce potentially significant short-term and long-term adverse impacts.

Alternative 4 would have some minor to moderate short-term adverse impacts arising from the proposed BLM components, such as the gas wells and injection well, and the pipeline and transmission line ROWs. BLM components would result in approximately 492.4 acres of temporary surface disturbance associated with federal actions. The resources that would experience short-term impacts with Alternative 4 include:

- susceptible soils, especially in soils susceptible to erosion (79 acres), landslides (93 acres), and slumping (52 acres);
- aquatic resources, especially Spring Creek and Beaver Creek;
- vegetation, from temporary loss of 251.5 acres of Wyoming big sagebrush;
- elk, from temporary loss or disturbance of 218.1 acres of crucial winter range;
- sage-grouse, from direct short-term impacts to 150.3 acres of potential habitats within 2 miles of nine leks;
- sagebrush obligate species, from direct and indirect impacts to sagebrush;
- grazing, from temporary loss of forage and reduction in 49.1 AUMs; and
- air quality, from the release of pollutants from drilling and construction equipment.

Alternative 4 would produce 12.2 acres of long-term surface disturbance from BLM jurisdictional components, producing the following long-term impacts:

- Vegetation, from 7.7 acres long-term loss of Wyoming big sagebrush and loss of other native vegetation types, and increase and spread of noxious weeds.
- Grazing, from long-term loss of 1.2 AUM.
- Elk, from long-term loss of 6.5 acres of crucial winter range.

None of the adverse impacts indicated for BLM actions in Alternative 4 are considered significant, although mitigation measures are recommended to reduce adverse impacts to the extent possible.

Non-federal components in Alternative 4 would result in short-term environmental consequences from surface disturbance (78.4 acres), noise, destruction of vegetation during the construction of the M&HRF, water injection well, EGS, and HLF. Long-term impacts to 30.2 acres would arise from the operation of the M&HRF, EGS, HLF, and water injection well. Many of the environmental consequences would add to impacts identified for BLM actions.

The overall long-term impacts of Alternative 4 include:

- socioeconomics, from the beneficial effects of increased long-term employment and tax revenues;
- vegetation, from temporary loss of 4.6 acres of Wyoming big sagebrush, and other native vegetation for facilities;

- grazing, from temporary reduction on 2.3 AUMs;
- elk migration, from operational noise and human disturbance; and
- human health and safety, from low level of risk of accidental release of toxic chemicals from operations.

Cumulative impacts of the Project, plus the additive effect of new oil and gas development in the existing gas fields surrounding the Riley Ridge Unit would have continuing adverse effects on wildlife values, including sage-grouse and elk. New development in any areas adjacent to or within sage-grouse lek buffer areas or elk crucial winter range or migration corridors could continue to exert pressure on the Calpet/Deer Hills sage-grouse complex or the Piney elk herd and create short-term and long-term impacts. Other incremental and cumulative effects would include the minor short-term impacts from to air quality, and moderate long-term benefits of increased employment and tax revenues.

The incremental cumulative impacts of Alternative 4 would be very small compared with the larger issue of large scale oil and gas development projected in the foreseeable future for the Big Piney-LaBarge Infill Project. Cumulative impacts from Alternative 4 would see minor adverse short-term and long-term impacts. Compared with other action alternatives, however, Alternative 4 would not have visual impacts from transmission structures and therefore would not contribute to long-term cumulative impacts to visual resources, recreation, sage-grouse, or the Lander Road Historic Trail visual setting.