CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

This chapter of the EIS provides an analysis of the impacts (environmental consequences) that would result from implementation of the proposed Ferron Natural Gas Project and alternatives. Certain measures that would avoid or reduce impacts have been included in the action alternatives as discussed in Chapter 2. The environmental impact analysis documented in this chapter took these measures into consideration.

An environmental impact or consequence is defined as a modification or change in the existing environment brought about by the action taken. Impacts can be direct or indirect in nature and can be temporary (short term) or permanent (long term). Impacts can vary in degree ranging from only a slight discernable change to a drastic change in the environment. For the purpose of this EIS, short-term impacts are defined as those that would occur during the construction and drilling/completion phases. Long-term impacts are impacts caused by construction and operations that would remain longer.

The impact analysis evaluated the effects that would occur in the Project Area, regardless of land ownership. However, the BLM and Forest Service's decisions on this project would only apply to federal lands. The impacts reported for non-federal lands may occur regardless of BLM's decision. Impacts on non-federal lands are included to provide a full disclosure of effects for the complete project and to support other environmental revisions and permitting associated with the project.

The basic environmental impacts identified from production of natural gas are premised on the use of gas-fired equipment (compressors and pumps). However, as described in Chapter 2, options were developed for Alternatives 1 and 2 where electric compressors, electric pumps, or both would be used instead of gas-fired equipment. The effects of implementing these options for electrical equipment instead of gas-fired equipment are discussed for Alternatives 1 and 2 separately for each resource.

Because the alternatives are conceptual in nature and final locations for project facilities are unknown, three primary assumptions were made to facilitate the analysis of the electric utilities options for Alternatives 1 and 2. First, the average disturbance for aboveground and underground power lines would be 10 feet. This assumption is based on the width of ROW the BLM commonly grants for power lines. Second, 50 percent of the total overall length of proposed aboveground power lines would not coincide with the access roads' disturbance. Aboveground power lines commonly follow relatively straight lines. They would not follow every curve in the access roads closely. Thus, parts of these aboveground power lines would extend away from the access roads' disturbance. A review of the proposed layouts of access roads for Alternatives 1 and 2 suggested as much as 50 percent of the ROW for the power lines could be could be away from the access roads' disturbance. Finally, power lines buried along access roads would be installed within the access road's disturbance along their entire length (unlike the situation with aboveground power lines). Thus, no additional disturbance would occur outside the access road's disturbance during burial of the underground power lines.

4.1 GEOLOGY AND MINERALS

The purpose of the Proposed Action is to remove all recoverable coalbed methane from the Companies' leases. The recovery of the methane is considered the only significant consequence to geological resources. Other potential impacts, such as precluding development of other mineral resources or disturbing paleontological resources, were considered, but not analyzed in detail by alternative.

4.1.1 Direct and Indirect Effects

4.1.1.1 Alternative 1 — Proposed Action

4.1.1.1.1 Irreversible Commitment of Natural Gas

Under the Proposed Action, for the new and existing wells, peak gas production is estimated to be 60 bcf per year and total production would be 680 bcf for the 25-year (1999 through 2024) project life (Cox 1998). This estimate is based on a zero-time plot analysis using production history from the existing Ferron wells. Natural gas production should increase initially (1999 through 2005), level off, then gradually decline (2008 through 2024).

The Energy Information Administration (EIA) (1996a) estimates proved reserves of coalbed methane in the United States in 1996 were about 10,566 bcf and production of coalbed methane reached 1,003 bcf. Additionally, proved reserves of natural gas in the United States in 1996 were about 166,474 bcf and overall production was 18,861 bcf (EIA 1996a). Thus, coalbed methane accounts for about 6 percent of the United States' proved reserves of natural gas and 5 percent of natural gas production. At peak production, the Ferron Natural Gas Project would add about 60 bcf of coalbed methane to the nation's total natural gas production, which would be an increase of about 6 percent (based on the 1996 level of 18,861 bcf). In Utah however, the increase would be more substantial. Production of CBM in Utah was 12.2 bcf in 1995 (Petzet 1996) and overall production of natural gas in Utah during 1996 was 180 bcf (EIA 1996a). The Ferron Natural Gas Project would add 680 bcf to Utah's proved reserves of natural gas, which the EIA (1996a) identified as 1,633 bcf.

4.1.1.1.2 Conflicts Between Natural Gas Drilling and Coal Mining

As shown on **Plate 3-1**, active coal leases and known coal reserve areas (KCRA) occur within the South Area. No active coal leases or KCRAs occur in the North Area or along the corridor for the transmission pipeline. Although about 3,250 acres of active coal leases and almost 9,700 acres of KCRA exist within the South Area, a conflict would exist with only one well. A well on State land in Section 36, Township 17 South, Range 6 East would be drilled into the KCRA. However, the well would be near the eastern boundary of the KCRA. No other wells or facilities would conflict with the active coal leases or KCRAs.

4.1.1.1.3 Geologic Hazards

The potential effects of seismic activity on project facilities, such as wells and pipelines, and the risks to public safety were identified as issues to be addressed in the impact analysis. General and site-specific reviews of the potential effect of seismic activity on the pipelines associated with this project have been conducted (McDonough 1998).

In general, modern transmission pipelines are constructed of high-strength carbon steel and butt-welded joints. Because of the high pressures common in gas transmission pipelines, the wall thickness is sufficient to consider transmission pipelines rigid in terms of their interaction with the soil. Standard practice assumes 100 percent x-ray inspection of welded transmission pipeline joints ensuring that the joints are as strong as the pipe itself. In addition, gas transmission pipelines are protected from corrosion by protective coatings or wrapping, sacrificial anodes, or impressed DC current.

It is common to monitor and control the flow of product in gas transmission pipelines electronically around the clock through a central control office. Information from remote sites is telemetered to control centers over telephone, radio, cellular, or microwave transmissions. Remote valves, compressors, and regulators can be operated from the control center by the same process. Irregularities in line pressure, product flow rate, or other operating conditions are evaluated as they occur. Control-center personnel are trained to respond rapidly in emergency situations in accordance with standard operating procedures and operator-specific emergency plans.

In the absence of corrosion, it is rare that welded steel pipelines would exhibit damage as a result of ground shaking. Exceptions may be found at transitions between vastly different soil deposits, connections to rigid structures (such as tanks), and branch connections to other piping. These exceptions are normally limited to natural gas LDC piping, refinery facilities, and product handling terminals.

Permanent ground deformation is the most severe earthquake-related condition affecting buried pipelines. Surface faulting is an obvious example. Other sources of permanent ground deformation include lateral spreading, liquefaction-related settlement, and earthquake-activated landslides. Continuous welded steel pipelines may be designed to withstand several feet of permanent ground deformation.

The performance of gas transmission pipelines in past earthquakes has demonstrated that they are inherently rugged because of the large service loads for which they are designed. Damage typically is limited to locations where permanent ground deformation has occurred or where corrosion or joining techniques have reduced strength.

Relationships exist between gas pipeline damage and the Modified Mercalli Intensity scale (McDonough 1998). These relationships have been developed based on review of numerous historic earthquakes and their effects on facilities. No damage to meter sets or associated equipment are predicted below intensity VI with probable damage to the steel pipe occurring only with an intensity IX or greater event.

McDonough (1998) used historical earthquake data for the east-central Utah region to predict the probability of the occurrence of an intensity IX earthquake in the Project Area. The historic data, reported in Richter Scale magnitudes, has been converted to Modified Mercalli intensities using a formula that factors distance from the earthquake's epicenter, soil type, and magnitude. McDonough's calculations show that no historic earthquakes have occurred along the proposed transmission pipeline route with magnitudes greater than VI. McDonough then estimated that a magnitude IX earthquake will occur once in 10,000 years. Based on this estimate, he calculated that there is a 0.5 percent probability of one earthquake-caused failure along the proposed 27-mile long pipeline during its 50-year life. Standard installation measures can reduce the probability of a pipeline failure during a seismic event (McDonough 1998).

H_2S has not been encountered to date during drilling in any of the more than 100 CBM wells in the Price area. However, H_2S has been detected in produced water from some of the CBM wells in small amounts (80 to 90 ppm below the minimum level of 100 ppm at which it is regulated under Onshore Order No. 6). Dissolved H_2S also was recently encountered in the drilling of a disposal well to a depth of approximately 6,000 feet into the Navajo Formation. As a result, the Companies would prepare an H_2S contingency plan in accordance with UDOGM's requirements (see **Section 4.16**).

4.1.1.1.4 Electric Power Option

No additional impacts to geology and minerals would occur with the installation and operation of electrically-powered facilities.

4.1.1.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

Under Alternative 2, some wells were moved to other locations within a lease to afford protection to certain resources and about 18 wells would not be drilled due to restrictions for natural resources. Therefore, the total production over the life of the 335 wells would be 645 bcf instead of 680 bcf under the Proposed Action. Similar to the Proposed Action, there would be no conflict with coal leases and only the one well in conflict with the KCRA. Therefore, the impacts for Alternative 2 would be similar to Alternative 1.

4.1.1.2.1 Electric Power Option

No additional impacts to geology and minerals would occur with the installation and operation of electrically-powered facilities.

4.1.1.3 Alternative 3 — No Action

A maximum of 155 new wells could be drilled on private and state lands under the No Action Alternative. Therefore, the total production over the life of the wells would be 430 bcf instead of 680 bcf under the Proposed Action. There would be no conflict with coal leases and only the one well in conflict with the KCRA. However, with no wells on federal estates, federal leases could be drained from the state and private leases. Seismic risk to wells and pipelines would be similar to the Proposed Action, although fewer wells would be drilled and the total length of pipelines would be considerably shorter under the this alternative.

4.1.2 Impacts Summary

Implementation of any of the three alternatives would result in no more than minor effects to geology and minerals. Only one well would under each alternative would be in conflict with KCRAs. No conflicts would exist with active coal leases. Seismic and geologic hazards would be minimal. Installation and operation of electrically-powered facilities under the two electric power options would not effect geology and mineral resources under Alternatives 1 or 2.

4.1.3 Mitigation

In accordance with Onshore Order No. 2, if usable quality water and/or prospectively-valuable minerals are encountered by the well bore, those formations shall be isolated and/or protected by the cement program for the production casing. Based upon cement log results, remedial cementing action shall be required as necessary.

Any potential conflicts with coal operations should be coordinated with the coal companies and the authorizing agencies.

4.1.4 Unavoidable Adverse Effects

The only unavoidable adverse effect identified is the conflict of one well with KCRAs. This well could prevent the extraction of coal from the part of Section 36 in which it is located. No other unavoidable adverse effects were identified.

4.2 WATER RESOURCES

4.2.1 Direct and Indirect Effects

4.2.1.1 Alternative 1 — Proposed Action

4.2.1.1.1 Ground Water

Extraction of the gas would require dewatering of the productive formation. Water from the Ferron Sandstone is not usable for domestic or irrigation purposes in the Project Area. It is a saline, sodium chloride water with TDS concentrations ranging from 6,000 to more than 15,000 mg/L. It would be disposed of into wells competed in the Navajo-Nugget aquifer. Some disposal wells also may be completed in the overlying Entrada-Preuss aquifer, but for simplicity sake, all discussion of disposal refers to the Navajo-Nugget aquifer. The produced water disposal wells would be completed approximately 6,000 feet deep. Maximum disposal would occur when all wells are on line in year five of the project.

Removal of water from the production zone would not substantially change the steady state discharges from the Ferron at the outcrop. Rather, it would accelerate the flow of water from the west to the east (Applied Hydrology Associates, Inc. 1998). More water would come from the area of greatest head, the west. Any effects to the outcrop discharge would be more pronounced in the North Area, where the western head is lower. Water levels would decrease in the Ferron Sandstone formation.

Most water users utilize ground waters derived from alluvial aquifers and water from shallow, saturated sandstone aquifers, which are potable and inexpensive to access. In the South Area, the State Engineer's Office has permitted three wells in the Ferron Sandstone, south of Huntington. The depths of these wells are not known, but, if they are completed in the Ferron, the wells could be affected by reduction of water levels.

For analysis purposes, conservative assumptions were made that a gas well would produce approximately 350 barrels of water per day (BWPD) during its first year of operation, dropping steadily to 100 BWPD in Year 6, and tapering off throughout the lifetime of the well. There are 80 wells in the North Area that would produce a maximum of 17,750 BWPD (2.3 acre-feet/day). Three disposal wells are proposed for the North Area and each could dispose 10,000 BWPD. Thus, a capability to handle 30,000 BWPD provides a surplus of disposal capacity. Currently 53 wells have been constructed in the South Area and an additional 220 would be constructed. Maximum production would be 60,300 BWPD (7.78 acre-feet/day). Nine disposal wells, two in use and six proposed, that could each dispose of 8,500 BWPD would be used in the South Area. The total capacity for disposing of produced water in the South Area would be 68,000 BWPD.

Where sampled in the Project Area, the Navajo-Nugget aquifer has TDS concentrations ranging from 13,100 to 217,264 mg/L, with the average concentrations of 101,142 mg/L. This water is a brine and is unacceptable for any traditional beneficial use. Disposal of produced waters from the Ferron Sandstone would marginally dilute Navajo-Nugget waters, but the water would remain unusable. There are three orders of magnitude

difference of volume between the water injected into the Navajo and its storage. The Ferron Project would inject a maximum of 45,513 (0.045 million) acre feet into the Navajo over the life of the project. The Navajo-Nugget aquifer in the San Rafael Swell area has 94 million acre feet in transient storage across 2,300 square miles (Hood and Patterson 1984). Even if one looks at mixing within a six-mile radius of influence, the Navajo has 4.62 million acre feet of storage, or a difference of two orders of magnitude from the quantity of injected water. There is an order of magnitude of difference in the water quality between the Ferron and Navajo, as the average TDS concentrations are 16,525 and 101,142 mg/L respectively.

Disposal of the produced water would temporarily increase the pressures within the Navajo-Nugget immediately adjacent to the disposal wells, but should not affect fresh water contained in the formation outside the Project Area. Modeling of water disposal of 100 gpm (3,428 BWPD) at the existing disposal wells, SWD #1 and SWD #2 near Castle Dale, using a hydraulic conductivity of 0.03 ft/day (Stevens and Garr 1997). Over a 30-year period, this would result in a radius of influence of approximately six miles and a maximum head of 6,360 feet. At 500 gpm (17,143 BWPD) after 30 years, the maximum hydrologic head would be 10,390 feet and the radius of influence would be approximately 8 miles. This is double the expected disposal rate of the proposed disposal wells in the South Area and does not consider a produced water decline from the peak production. Assuming fresh water flow patterns in the Navajo-Nugget aquifer are constant (see **Section 3.2.2.1.4**) on a long-term basis, produced water disposal would not affect these flow patterns.

A regional groundwater modeling study for the Navajo aquifer was not included as part of the analysis for this EIS. The ongoing regulatory responsibility for controlling underground injection through wells, such as those proposed in the Ferron Natural Gas Project, resides with EPA and the delegated State or Indian agency, in this case the UDOGM.

Impacts to springs are not likely to occur as it is not operationally viable to construct in a wet area. However, any blasting near springs could affect flows. Modifications to the permeability of the recharge area or a spring's flow may change the resource for preexisting uses, such as domestic, irrigation, or stock/wildlife watering. In addition, the springs or seeps may sustain riparian areas or wetlands and vegetative productivity could vary due to a change in flow.

4.2.1.1.2 Surface Water Quantity

As noted in Chapter 3, the Ferron Natural Gas Project would occur in an arid area overlain by poor soils and limited vegetative cover. Precipitation from intense rainfall events runs rapidly off steep slopes in channel flow, infiltrates in more gently sloping areas or basins, or evaporates. The Project Area is an erosional landscape etched by dry channels. The surface disturbance that would be associated with the Proposed Action encompasses about 0.7 percent of the total Project Area. The primary impact from the Ferron Natural Gas Project to surface water quantity would consist of slight changes in the timing and amounts of runoff that may occur following the increase in disturbance.

If roads, well pads, pipelines, or compressor sites would be constructed over or compact springs and seeps or their recharge areas, a reduction, cessation, or relocation of the spring's flow could occur. The proposed locations for three wells in the South Area and one proposed and one existing CPF in the North Area would be within 800 feet of identified springs. These locations may diminish the utility of the springs for preexisting uses, such as domestic, irrigation or stock/wildlife watering. In addition, the springs or seeps may support riparian or wetland vegetation, which could be affected by a reduction in flow. However, these facilities would likely be realigned during the APD stage either to avoid construction in moist areas or to install a drain to direct the flow away from the fill, thus promoting stabilization of the facility structure.

Blasting associated with construction has the potential to modify or discontinue spring flow. It also may damage the embankments of water storage reservoirs.

During the scoping process, the public raised a concern about changes in drainage density from the project. Although minor, localized realignment of flows associated with the roads may occur, the distribution of channels on the landscape would remain the same.

The dewatering and degasification of the Ferron Sandstone would not impact surface waters through subsidence or dewatering. The Ferron ranges in depth from 1,000 to 6,000 feet below the ground surface within the Project Area. There are several layers of confining shales between the surface and the coal seams. Water and gas are found in the cleats and fractures, and coal bed methane extraction does not result in collapse or subsidence of the formation. There is no direct hydrologic connection between the Ferron and surface waters within the Project Area (see **Section 3.2.2.1.2**).

4.2.1.1.3 Surface Water Quality

4.2.1.1.3.1 Sedimentation

Temporary increases in sediment loss would occur where the construction of facilities or wells occur in channels and at sites where pipelines or utilities cross perennial streams. Moderate sediment loss also would occur with other aspects of this project. Sedimentation impacts would generally occur in close proximity to the disturbances. Removal of vegetation typically increases sedimentation. Sediment loss already is very high in this area due to low vegetative cover and the high percentage of fine-grained soils. In the North Area, portions of nine soil complexes out of a total of 21 have a critical soil classification based on water erosion hazard. In the South Area, portions of 27 soil complexes out of 87 identified soils have a critical soil classification based on water erosion hazard.

Standard operating procedures for sediment control, as proposed by the Companies, include surfacing of roads and well pads, installing drainage controls, reseeding, and installing water bars across reclaimed areas. Site-specific reclamation would be tailored to the landowner's or authorizing officer's specifications. All sediment control work would be required to comply with the UPDES stormwater permit program and the Utah Nonpoint Source Management Plan (State of Utah 1995).

Specific sediment loss calculations for the Ferron Natural Gas Project are shown in **Appendix E**. The maximum rate of sediment loss from the 763 acres of long-term disturbance would be 11.2 tons per acre per year. Actual sediment delivery (i.e., the amount of sediment loss that would be transported to flowing streams) would be 4.5 tons per acre per year. Similar calculations for undisturbed, natural conditions in this area yielded a sediment loss of 0.64 tons per acre per year and a sediment delivery rate of 0.28 tons per acre per year. Natural conditions of sediment loss have been reported to range from 2 to 12 tons per acre per year in the Project Area (BLM 1997c). The range of natural sediment delivery is 0.8 to 4.8 tons per acre per year. Therefore, projected sediment loss (11.2 tons per acre per year) and delivery (4.5 tons per acre per year) from the Proposed Action should be within the naturally occurring range.

The Proposed Action includes twelve wells in the South Area that would be constructed in floodplains adjacent to perennial streams. No facilities have been identified adjacent to perennial streams or floodplains in the North Area. Seventeen proposed wells would be in intermittent or ephemeral channel beds in the South Area and five wells in the North Area would be located in intermittent or ephemeral channel beds.

Most precipitation events would result in runoff through facilities. In floodplains or channel beds, this would result in substantial sediment loss and increased pollution potential.

Typically, well pad and facility site construction results in a cut slope, flat pad, and fill slope. Cut slopes would be steeper than the surrounding slope, increasing sediment loss. The gently-sloping pad would counteract this effect in an area of high relief providing a break in slope length and a depositional surface for disturbed area runoff. Well pads may be surfaced with coarse-grained sands and gravels. The fill slope would show an increase in sediment loss immediately down gradient for the operating life of the well of approximately 20 years. All portions of the well pad not needed for production would be reclaimed and seeded following drilling in accordance with the authorizing agency or landowner's specifications. Increases in sediment loss would occur until sites and roads are abandoned and reclaimed.

A slight increase in sediment loss would be expected along pipeline routes and the transmission pipeline right-of-way. Even with sediment control reclamation techniques, reestablishing vegetation would be necessary to return to pre construction levels.

The transmission pipeline would cross three perennial streams: Ferron, Cottonwood Canyon, and Huntington Canyon creeks. A GP40 Stream Alteration Permit would be administered by the Utah Division of Water Rights, Price Office (Page 1998). Questar proposes to trench across these live steams and bury the pipeline at depths of six to eight feet. Short-term sedimentation would occur for about a week after construction. No long-term impacts would occur for the following reasons. Questar would submit pre-construction plans to include site drawings, depth of burial, placement of rip-rap, and reclamation plans. After construction, the Water Rights Division would conduct an on-site inspection of stream crossings to ensure that all construction and reclamation techniques have been implemented correctly. In addition, the pipeline would be constructed immediately adjacent to the existing Questar 6-inch pipeline.

4.2.1.1.3.2 Salinity

Water runoff across disturbed areas, particularly those with saline soils, results in an elevation of total dissolved solids (TDS). The significance of this impact depends on the size of the disturbed area, the period of disturbance, the salinity of the sediment involved, the amount of runoff affected, the proximity of the area to running water, and the effectiveness of erosion control measures. Also, characteristics of soils vary widely. The Ferron Natural Gas Project proposed permanent disturbance would be 763 acres, or 0.7 percent of the Project Area. The Project Area includes some particularly saline soils on the lower elevations overlying the Mancos shale. Two soils within the North Area have been identified as critical soils due to average conductivities that exceed 8 mmhos/cm: the Persayo-Chipeta Complex and the Ravola-Slickspots Complex. Eighteen soils within the South Area have been identified as critical soils due to their salinity. These soils are found in 53 percent of the proposed disturbance areas.

Salinity was calculated for the Ferron Natural Gas Project (**Appendix E**). Long-term salt delivery to flowing water would be 0.319 tons per acre per year. This value is within the natural range of 0.005 to 0.51 tons per acre per year for the region (BLM 1997c).

As noted earlier, there is very little running water within the Project Area, but in those places where roads or pipeline construction cross perennial streams, or areas where runoff readily enters streams, there would be an increase in the salinity. Regionally, this should not result in an adverse consequence to the salinity standard adopted by the Colorado River Basin Salinity Control Forum.

Salinity increases may have a deleterious impact to an irrigator whose headgate is located within the reach between the disturbed area and the point at which dilution decreases TDS concentrations. Elevated salinity can diminish the productivity of agricultural crops. Irrigation of saline soils results both in increased levels of TDS in the return flows as well as lower vegetative productivity for the irrigated fields.

4.2.1.1.4 Spill Impacts to Surface and Groundwaters

The Proposed Action could result in accidental spills of fuels, lubricants, hydraulic fluids, drilling fluids, assorted chemicals required for standard well field operations, and produced water. Project proponents would prudently manage their facilities to minimize spills and would employ practices described in Onshore Oil and Gas Order No. 1, Notice to Lessees 3a, and UDOGM rules, which identify strategies to reduce accidental spills and leaks.

All vehicles involved in the project would run a slight risk for spills of fuel and hydraulic fluids. This risk is equivalent to the risk assumed by communities for any agricultural or recreational uses within their borders. Reasonable care would be employed in fueling and servicing vehicles to ensure spills do not occur and that a spill does not impinge on surface or ground waters.

Drilling operators use pits to contain drilling fluids. In the event of an accidental release of drilling fluids due to failure or overflow of the pit, drilling fluids could traverse the well pad, descend the fill slope and migrate downhill until the fluid infiltrates. In this dry Project Area, infiltration would probably occur off the well pad before the fluids mix with surface waters. Should the ground have a high permeability and be a source of recharge, the fluids would commingle with the ground water. Drilling fluids consist primarily of fine-grained earthen materials, water, a surfactant similar to soap, and light lubricating oils. The hydrocarbons would either volatilize or bind with the soils and degrade slowly over time.

Appendix B identifies chemicals that may be used for operation and maintenance of the wells, compressors, and pipelines. These materials arrive in shipping containers and would be stored within other structures, which would amount to secondary containment. Reasonable care would be used in the use and transfer of these materials to minimize spills and used containers would be disposed of responsibly. Random vandalism could result in unplanned spills. However, the operators would only maintain a minimum inventory on site, to reduce the total quantity that could spill. Spills could infiltrate and migrate into shallow ground waters, if they exist. Remediation and treatment of such a spill would depend on the chemical and the quantity of the spill. It is unlikely that these spills would discharge directly into surface waters.

Each compressor station would produce an oil waste product through the bypass system consisting of 90 percent water and 10 percent hydrocarbons. This material would be piped to 50-barrel sump tanks, which would be periodically pumped by an off-site disposal contractor with a vacuum pump. The volume of this material would be limited and breach of the tank would infiltrate into the soil and shallow ground waters before intersecting surface waters. A spill of this nature easily could be remediated with no long-term impacts to ground water through excavation and biotreatment.

Produced water could accidentally spill due to a breach in the pipelines at the well sites or along the gathering pipeline network. This is most likely to occur from heavy equipment accidentally striking the pipeline. Warning signs placed along the pipeline would minimize this potential. Pressure ruptures are unlikely because pipelines are designed with a factor of safety to handle the expected maximum flows and they are leak tested under pressurized conditions during installation.

Nevertheless, a breach could occur due to a severe washout at a pipeline crossing or fault displacement during an earthquake. The Companies would perform daily monitoring to assess pressures in the line and would immediately shut off sections that could be affected by a breach. The produced water contains a sodium chloride water with concentrations of TDS ranging from 6,000 to more than 23,100 mg/L. Spilled produced water would initially saturate the unconsolidated materials around the pipelines and may mix with any existing shallow ground waters. Should produced water intersect alluvial waters, the concentrations of salts would be elevated. Some of this water may discharge into surface water channels. Should a spill of produced water reach a perennial waterway, concentrations of salts and chloride would be elevated until the fluids are effectively mixed to achieve dilution. Prior to dilution, the spilled produced water is unsuitable for domestic consumption, and may diminish the productivity of any crops irrigated by this water due to the elevated salt concentrations.

Produced water also could accidentally spill at the CPF due to a breach in the pipeline on the CPF. However, impacts would be less because the water could be diverted into the emergency pits. These pits would be designed to accept, at a minimum, a 24-hour volume of produced water.

4.2.1.1.5 Water Uses

At scoping, individuals expressed concerns that water use by the Companies would negatively influence the water supply and increase costs. As noted in Chapter 3, the Utah Division of Water Resources had estimated that 42,925 acre-feet of the surface water depletion in the North Area goes into wetlands, 27,551 acre-feet is used for irrigation, and 7,283 acre-feet is utilized for domestic and industrial purposes, on an annual basis. Annually, in the South Area, 47,478 acre-feet of the surface water is applied for irrigation, 29,322 acre-feet is employed for domestic and industrial uses, and 8,250 acre-feet is consumed by wetlands. Public water supplies are derived from surface waters in all communities, but Helper. Calculations show that about 84 acre-feet would be consumed in the Project Area over the life of the project. The Companies would purchase water from a variety of users, resulting in very minor shifts in water consumption from existing uses to this project. No change in costs to consumers should occur as a result of this project.

Many springs and seeps have been adjudicated to water users who have filed to protect the flow for dedicated uses. Injury to a water user could occur in the event that spring flow would decrease, halt, or relocate.

4.2.1.1.6 Electric Power Option

Implementation of the electric power option of Alternative 1 would result in minimal additional effects to water resources. Disturbance associated with construction of the 94 miles of aboveground power lines located away from access roads would contribute minor amounts of sediment and salinity to local surface waters. However, this contribution would be short-term because any disturbance associated with this construction would be reclaimed immediately after the power lines' construction is completed.

4.2.1.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

4.2.1.2.1 Ground Water

The impacts associated with Alternative 2 would be the same as described for Alternative 1 in the Ferron and Navajo-Nugget aquifers within the Project Area. The number of disposal wells would be the same, but 18 fewer production wells would be drilled. The result would be approximately 3.5 percent less water

transferred from the Ferron Sandstone aquifer to the Navajo-Nugget than under the Proposed Action. The water quality within the Navajo-Nugget would be diluted slightly, although probably immeasurably.

On Federal leases, construction of nonlinear facilities would be limited to areas outside the designated 100-year floodplain for perennial streams or for 330 feet on either side of a perennial stream centerline under Alternative 2. This would reduce changes to the hydrogeologic properties of the alluvium along perennial streams.

Springs and seeps are afforded greater protection under Alternative 2. No construction activities could occur within a 660-foot radius of a spring or seep. The blasting buffer around springs would be 0.25 mile. This would protect the discharge point of all springs and seeps and reduce the potential for damage to recharge zones that are immediately adjacent to the spring.

4.2.1.2.2 Surface Water Quantity

Effects to surface water quantity from Alternative 2 would be similar to the impacts projected for Alternative 1. The long-term surface disturbance for Alternative 2 would be about 85 less acres than the Proposed Action. These acreages are each less than 1 percent of the Project Area.

Similar to Alternative 1, no dewatering of surface streams due to gas and water production from the Ferron sandstone aquifer would occur.

Alternative 2 varies from Alternative 1 in the protection of spring discharge sites. Construction of roads, well pads, pipelines, and compressor stations would not occur within 660 feet of springs. The Proposed Action indicates that three wells in the South Area and a CPF in the North Area would be within 660 feet of springs, but these facilities would be located beyond 660 feet of springs under Alternative 2. Blasting would be restricted to distances greater than 0.25 miles from a spring. While this may not protect the recharge area of a spring, it would afford more protection for domestic, irrigation, or stock/wildlife watering uses than Alternative 1. Furthermore, Alternative 2 provides protection for riparian zones potentially supported by springs with a 220-foot buffer for right-of-way construction of linear facilities, unless an exemption is granted.

4.2.1.2.3 Water Quality

4.2.1.2.3.1 Sedimentation

Implementation of Alternative 2's Environmental Protection Measures and the long-term disturbance of 85 fewer acres would result in a sediment loss of 9.9 tons per acre per year, or 1.3 tons per acre per year less than the Proposed Action. Sedimentation delivery to streams would be reduced to 4.0 tons per acre per year.

Water quality immediately adjacent to disturbed areas may exhibit increased sediment loading, as noted in Alternative 1. Natural sediment loss is high in this area due to low vegetative cover and the high percentage of clay soils. Disturbances within the 100-year floodplain of perennial streams would be avoided. Surface disturbances also would be avoided 330 feet from the centerline of perennial streams. These environmental protection measures should limit the sediment loss associated with large storm events.

Slightly fewer disturbances of critical soils and disturbances within steeper slopes would occur under Alternative 2, compared with Alternative 1. Environmental protection measures for soils have been

incorporated into this alternative for activities on Federal lands (See **Section 4.4**). New road construction would avoid soils classified as critical, but, considering the prevalence of critical soils in the Project Area, complete avoidance would be difficult. Road grades on critical soils would never exceed 15 percent and would only exceed 10 percent with approval from an Authorizing Officer. Construction of well sites and facilities on critical soils with slopes greater than 6 percent would be avoided where possible. However, since all occupancy could not be avoided, erosion and sediment control measures should be employed. Sediment control measures include surfacing of roads and well pads, drainage control, reseeding, and installation of water bars across reclaimed sites and roads. Additionally, construction of well pads, roads, would be prohibited on slopes greater than 25 percent. Pipeline on slopes exceeding 25 percent could only be installed with approval of the Authorized Officer. Siting of facilities to avoid steeper slopes would reduce the overall disturbance by limiting the cut and fill disturbances. Reclamation of portions of the well pads not needed for operations would be performed following drilling.

Sediment losses from installation of the gas transmission line would be similar to Alternative 1.

4.2.1.2.3.2 Salinity

Implementation of Alternative 2's Environmental Protection Measures and a 85-acre reduction in long-term disturbance would result in a salinity of 0.239 tons per acre per year (**Appendix E**), or almost 0.1 tons per acre less than the Proposed Action. This value is within the natural range of 0.005 to 0.51 tons per acre per year for the region of the Project Area. Water runoff across disturbed areas results in an increase in salinity. Disturbance acreage between Alternatives 1 and 2 would be the similar, although the exact location of some well pads may be different due the use of buffer zones around perennial streams, springs, and riparian zones under Alternative 2. The environmental protection measures would limit construction on saline soils where possible, which not only limits the runoff of water with elevated salinity during operations, but would result in the better reestablishment of vegetative cover following reclamation. This, in turn, could further reduce runoff of water. Regionally, Alternative 2 should not result in any adverse consequence to the salinity standard adopted by the Colorado River Basin Salinity Control Forum.

4.2.1.2.4 Spill Impacts to Surface and Groundwaters

Spill effects from Alternative 2 would be similar to the Proposed Action. Alternative 2 differs from Alternative 1 in three aspects that have implications for accidental spills. One, there would be 330-foot no-occupancy zones for nonlinear facilities on either side of the centerline of perennial streams. This would reduce the potential for spills at a well pad or compressor station to migrate into a waterway and then into the alluvium. Two, no construction would occur within 660 feet of springs and, three, no blasting or geophysical drilling would occur with 0.25 miles of a spring or water well. This would minimize the risk of contaminating the immediate area of a spring or well with an accidental spill.

4.2.1.2.5 Water Uses

Water consumption and impacts to water users would be about the same for Alternatives 1 and 2 (84 and 77 acre-feet, respectively) with one exception. The no occupancy protection afforded within 660 feet of springs, coupled with the blasting restriction within 0.25 miles of springs, should protect adjudicated springs.

4.2.1.2.6 Electric Power Option

Implementation of the electric power option of Alternative 2 would result in minimal additional effects to water resources. Disturbance associated with construction of about 49 miles of aboveground power lines located away from access roads would contribute minor amounts of sediment and salinity to local surface waters. However, this contribution would be short-term because any disturbance associated with this construction would be reclaimed immediately after the power lines' construction is completed. Construction of the underground power lines would not contribute any additional effects because they would be installed within the ROWs for access roads. These ROWs would be disturbed with or without the installation of the underground power lines.

4.2.1.3 Alternative 3 — No Action Alternative

4.2.1.3.1 Ground Water

Natural gas development within the Project Area has already occurred at 68 wells. Additional development could occur on state and private lands within the area if the gas could be efficiently processed and transported off-site. Construction of an additional 136 wells and four CPFs in the South Area could occur. Similar development within the North Area could result in construction of another 19 wells. Hypothetically, additional development would take another five years at the Proposed Action's construction rate. Maximum annual production of produced water from the North and South areas would be 6,250 BWPD (0.8 acre-feet/day) and 39,050 BWPD (5.04 acre-feet/day), respectively. There is currently capacity to handle 10,000 BWPD in the North Area and 8,500 BWPD in the South Area. Alternative 3 would result in 42 percent less water transferred from the Ferron Sandstone aquifer to the Navajo-Nugget aquifer. The water quality within the Navajo-Nugget would improve slightly, although immeasurably.

4.2.1.3.2 Surface Water Quantity and Quality

Additional development could occur on state and private lands within the area in the event that the gas could be efficiently processed and transported off-site. This would involve the construction of an additional 136 wells and four CPFs in the South Area, disturbing an additional 331 acres over the long term. Similar development within the North Area could result in 19 wells disturbing an additional 36 acres over the long term. Construction of facilities in floodplains would increase sediment loss and spill potential to surface waters.

Water quantity and quality impacts from gas production are similar to those described for the Proposed Action and Alternative 2, but at a proportionally lower rate.

Sediment loss was evaluated for the No Action Alternative and the results are shown in **Appendix E**. Sediment loss was estimated to average 10.9 tons per acre per year on 367 acres and sediment delivery was estimated to be 4.4 tons per acre per year. Sediment losses from installation of the gas transmission line would be similar to Alternative 1.

Estimates of salt delivery suggest that the disturbance under the No Action Alternative would generate 0.31 tons per acre per year on 367 acres of disturbance. Additional details concerning these projections are shown in **Appendix E**.

4.2.1.3.3 Spill Impacts to Surface and Groundwaters

The impacts from accidental spills would be similar to the Proposed Action, but proportionally lower because of the fewer wells.

4.2.1.3.4 Water Uses

The No Action Alternative would result in some natural gas development on state and private lands. Construction and drilling is predicted to use 42 acre-feet in the Project Area. This work would be performed over two years and would shift water from existing irrigation and domestic uses to industrial uses. As noted under the Proposed Action, this is a minute percentage of the available water supply and this consumption should not impact costs to existing users.

4.2.2 Impacts Summary

Implementation of any of the three alternatives would not directly or indirectly result in deleterious effects to ground waters at depth. Pumping of water associated with all three alternatives would cause a transfer of water from the Ferron Sandstone to the Navajo-Nugget aquifer. Neither of these aquifers is used in the Project Area due to their depths and high salinities. Dewatering would not affect water quantity in bedrock aquifers overlying the Ferron within the Project Area or along its boundaries.

There may be impacts to springs or shallow alluvial waters from construction activities or spills. Spills of fuels, hydraulic fluids, drilling fluids, treatment fluids, and produced water may occur during construction, drilling or production. In the event of a water pipeline rupture, saline produced water could infiltrate into any nearby shallow alluvial aquifers, decreasing water quality. The probabilities of the occurrence of these impacts to ground waters would be less under Alternative 2 as 18 fewer wells would be drilled and environmental protection measures would be employed to provide protective buffers near water courses and springs. Effects under Alternative 3 would be similar to the Proposed Action, but proportionately less as 130 fewer wells would be drilled.

The most critical impacts to surface water quantity from the Proposed Action and Alternative 3 would occur if springs and seeps are damaged by blasting. Under Alternative 2, blasting would be prevented within 0.25 mile of known springs or seeps to reduce the potential for damage.

No communication exists between surface waters and the Ferron or Navajo aquifers in the Project Area. Surface waters would not be dewatered from any of the three alternatives. A comparatively small quantity of surface water would be redirected from irrigation or domestic uses during construction, but the quantities would be less than 0.02 percent of annual consumption.

Increased, short-term sediment loading would occur during construction of pipelines or roads across perennial streams or flowing intermittent or ephemeral channels. Increased sediment generation also would occur during heavy storm events when surface facilities have been constructed in or near dry channels or floodplains.

Other surface water impacts from the three alternatives would consist of increases in water runoff and sediment production from the removal of vegetation and increased compaction at disturbed sites. These increases would occur throughout the operating life of the project and for the first few years following reclamation. Sediment delivery to streams from the Proposed Action was calculated at 4.5 tons per acre per

year from 763 acres that would be disturbed over the long term. Sediment delivery from alternatives 2 and 3 were estimated at 4.0 and 4.3 tons per acre per year from 678 acres and 367 acres disturbed over the long term, respectively (**Appendix E**). These levels are within the range of the naturally occurring rate of 0.8 to 4.8 tons per acre per year (BLM 1997c). Salinity delivery to flowing water from disturbed area runoff would be 0.3 tons per acre per year for alternatives 1 and 3 and 0.2 tons per acre per year for Alternative 2 (**Appendix E**). These levels are within the range of the naturally occurring rate of 0.005 to 0.51 tons per acre per year (BLM 1997c). Regionally, none of the alternatives should result in adverse consequences to the salinity standard adopted by the Colorado River Basin Salinity Control Forum.

4.2.3 Mitigation

Drill pads and facility sites should be designed and constructed to prevent overland flow of water from entering or leaving the sites. This could be accomplished through the use of berms, terraces and grading to form depressions. Stormwater would be diverted around sites. Any stormwater on disturbed sites would be prevented from flowing off the site, thereby reducing pollution potential.

Roads should be designed to divert stormwater runoff and reduce erosion. Proper design and installation of erosion control structures, such as water bars and diversion channels should be completed. Road ditch turnouts should be equipped with energy dissipators. Where roads interrupt overland sheet-flow of water and convert this runoff to channel flow, ditch turnouts should be designed to reconvert channel flow to sheet flow, by using rock energy dissipators and gravel dispersion fans or other designs. As necessary, cut banks, road drainages and road crossings should be armored or otherwise designed to prevent headcutting.

To maintain stream channel stability, road crossings on channels having 10 year flows that would require a culvert diameter of 30 inches or greater should be engineered. Crossing designs should be based on cross-sections, longitudinal profile, and other pertinent physical characteristics specific to each crossing. Installation of culverts with 30-inch or greater diameter should be engineered to allow flows to pass through the crossing at the same velocity and position (i.e., on the floodplain or in the channel) as would occur if the crossing were absent. Bankfull flow should be determined and crossings designed to pass this flow within the channel. Flows in excess of this quantity should be channeled separately through the crossing (i.e., on the floodplain). Flows should not be converged from a floodplain into a channel when passed through by a road crossing. Multiple culverts or combination low-water crossing designs would be encouraged in these circumstances. Where multiple culverts are used, the minimum cumulative capacity of all culverts should be the 10-year flow. Floodplain culvert outlets should be equipped with energy brakes and dispersion fans if needed to preserve existing flow velocity and position. Such stream crossing designs would preserve the physical dimensions of channels such as slope, width, depth, pool/riffle ration, etc.

Spills, leaks, and contaminated soils would be cleaned up, excavated, or treated, to prevent pollution to surface or ground waters.

Additional mitigation specified for Soils (**Section 4.4**) and for Reclamation (**Section 4.17**) would assist in reducing impacts from sedimentation and salinity.

4.2.4 Unavoidable Adverse Effects

The primary unavoidable adverse effect to water resources would be the dewatering of the water resource in the Ferron Sandstone. However, due to the poor quality and currently-prohibitive depth of the water, this effect is not considered substantive.

4.3 AIR QUALITY

Air quality in and near the Project Area would be affected by construction activities; vehicle-generated road dust during construction and operational activities; emissions of nitrogen dioxide, carbon monoxide, and hazardous air pollutants from the operation of natural gas-powered compressors and hazardous air pollutants from amine units and occasional flaring; and venting of methane gas during the completion of wells. This section quantifies the emissions of pollutants and potential impacts that would be associated with the Proposed Action. The effects on regional visibility in Castle Valley and at the closest Class I airsheds (Arches, Canyonlands, and Capitol Reef National Parks) resulting from the Proposed Action and alternatives are also described.

The purpose of this document is to provide details on the air quality analysis for the Ferron Natural Gas Project. This air quality analysis was prepared in compliance with the requirements of the National Environmental Policy Act to determine significance of impacts. It is not a regulatory analysis. In the absence of detailed engineering specifications and detailed locations, a conservative air quality modeling approach was applied. The National Ambient Air Quality Standards, Prevention of Significant Deterioration increments, and other air quality standards were used as significance criteria for comparative purposes only. Air quality analyses for regulatory purposes would be performed by the UDEQ during the subsequent permitting processes. A more detailed technical description of this air quality analysis is found in the Technical Reference Document, Air Quality Analysis for the Ferron Natural Gas Project on file at the BLM State Office in Salt Lake City, Utah and at the BLM Price Office in Price, Utah.

4.3.1 Direct and Indirect Impacts

4.3.1.1 Alternative 1 — Proposed Action

4.3.1.1.1 Construction Impacts

Construction activities would generate fugitive dust from earth-moving activities and construction vehicles. A portion of the fugitive dust contains the PM_{10}, defined as inhalable particulates less than 10 microns in diameter, and regulated by federal and State standards as a criteria pollutant. Although temporary area emission of fugitive dust are not subject to State air quality permitting procedures, such emissions are subject to control measures to prevent public nuisance. The Companies would be required to comply with the Utah Air Conservation Rule R307–12–1 to control fugitive dust during construction. This rule requires control of fugitive dust for ground-moving activities over ¼ acre and truck traffic on unpaved roads. The Companies would apply water or dust suppressants (for example, magnesium chloride) to access roads and all construction sites. It is assumed the application of these measures would reduce fugitive dust emissions during construction activities by approximately 50 percent.

Generally, construction activities would occur from April through November because of weather and other environmental factors that would limit or prohibit construction activities during winter. Additionally, the

construction activities would be spread along the linear project facilities (roads and pipelines) and at multiple and widespread areas within the Project Area. Project-related construction fugitive dust emissions are shown on **Table 4–1**. Therefore, while fugitive dust levels may be raised at locations adjacent to construction sites, potential impacts would be minor and temporary, and would not violate ambient air quality standards. These activities are not assumed to result in any exceedances of ambient air quality standards because of dust suppression requirements prescribed by the State of Utah.

Table 4–1
Ferron Natural Gas Project
Construction-Related Fugitive Dust Emissions (PM_{10})[1]

Activity	North Area (tons/year)	South Area (tons/year)
Earth-moving	50	88
Vehicles on unpaved access roads	109	358
Vehicles on paved roads within Project Area	1	6
Vehicles on paved roads outside Project Area	1	49
Annual total within Project Area with dust controls applied	161	501

Note:
1. Assumes 50 percent control by watering or chemical application.

4.3.1.1.2 Operations Impacts

4.3.1.1.2.1 Fugitive Dust Emissions Impacts

Fugitive dust would also be generated by vehicles traveling to the wells to perform daily inspections and periodic maintenance, and vehicles performing periodic road grading. The Companies would take measures to reduce fugitive dust emissions from disturbed areas on permanent facilities (CPFs, compressor stations). The Utah Air Conservation Rule R307–12–1 requires the control of dust on land areas more than ¼ acre in size that have been cleared or excavated. The Companies shall take measures, as prescribed by the Utah Air Conservation Rules, to prevent fugitive dust from becoming airborne. Such measures may include, but are not limited to:

- planting vegetative cover,
- providing synthetic cover,
- watering and/or chemical stabilization,
- wind breaks, and/or
- other equivalent methods or techniques approved by the State of Utah.

The Utah Air Conservation Rule R307–12–1 does not require dust control on unpaved roads when the average daily traffic level does not exceed 150 vehicles. The average vehicles per day during operations would consist of pumpers driving pick-up trucks to the wells and facilities for daily inspections, larger vehicles for occasional maintenance operations, occasional road grading, and water trucks to well pads to control dust. Fugitive dust emissions were calculated using factors from the EPA document AP–42 (EPA 1995b). With no control of dust from these roads, the fugitive dust emissions from operational vehicles

would be 266 tons per year in the South Area and 68 tons per year in the North Area. These levels would be approximately 50 percent of the emissions produced during the five-year construction period for any given area. Temporary elevated dust levels would occur near roads. However, any vehicle traveling directly behind Company vehicles or other privately owned vehicle driving on access roads would incur high dust levels.

4.3.1.1.2.2 Compressor Emissions Impacts

Under the Proposed Action, the Companies would construct and operate 12 compressor stations. As development of the Project Area matures, the use of natural gas-powered compressors would diminish and selected units may be replaced with electric-powered compressors. However, the air quality analysis assumed all compressors would initially be natural gas-powered. NO_x and CO would be emitted from the operation of natural gas-powered compressor engines. Each gas-powered compressor station would require an Approval Order from the UDEQ prior to starting construction. The UDEQ has the responsibility to establish and enforce air quality regulations designed to protect the public health and welfare. Their review of the request for an Approval Order would include a review to ensure the application of Best Available Control Technology (BACT) and compliance with all applicable regulations.

4.3.1.1.2.3 Compressor Locations and Size

Chandler has proposed three compressor stations in the South Area, two rated at 2,200 HP and one at 850 HP. Texaco has proposed three new natural gas compressor stations in the South Area each rated at 4,000 HP. The proposed locations of these compressor stations are shown on **Plate 2–1**.

Anadarko has proposed a combination of five new CPFs and compressor stations with two 1,700 HP units at each location. One existing compressor (CPF), rated at 1,015 HP, is operating in the North Area (on State land) and would be upgraded to 3,400 HP. One of the CPFs is proposed on private land outside of the Project Area. Emissions from the four new CPFs and compressor stations proposed in the North Area, plus the existing compressor station in the North Area and the proposed new CPF on private land outside of the Project Area, are based on 3,400 HP rating for each station. The proposed locations of these compressor stations are shown on **Plate 2–1**.

4.3.1.1.2.4 Compressor Emissions

The emission rates and stack parameters used in the modeling of generic compressors are based on data supplied from manufacturers and compressors recently permitted by the UDEQ. Manufacturers' specifications from Cooper Energy Services and Waukesha, major manufacturers of natural gas-fired compressors, for compressor engines specify attainable emission rates of 1.5 to 2.0 g/HP-hour for NO_X and 0.7 to 2.0 for CO. The most conservative values of 2.0 g/HP-hour for NO_X and CO were used for the emissions inventory. The actual permitted emission rates would be based on site-specific data once the actual engine configuration is selected and would conform to BACT based on the pre-NOI meetings with the UDEQ. Based upon the preceding operating parameters, the NO_X and CO emissions from the 12 proposed compressors would be 664.4 tons per year. The contribution from each of the Companies' facilities are shown on **Table 4–2**.

Table 4–2
Ferron Natural Gas Project NO_X and CO Emissions from Compressors

Company	Compressor Rating (HP)	Number of Compressors	Total Compression (HP)	NO_X and CO Emissions	
				lbs/hour	tons/year
Anadarko	3,400	6	20,400	89.88	354.6
Texaco	4,000	3	12,000	52.86	208.5
Chandler	2,200	2	4,400	19.38	84.9
	850	1	850	3.74	16.4
Total		12	37,650	165.86	664.4

4.3.1.1.2.5 Flaring Emissions

Temporary flares may be used to determine if wells are capable of adequate production to justify the installation of a pipeline collection system. Each flare would be allowed to burn approximately 50 million cubic feet or for a maximum of 30 days, whichever occurs first. Normally, no more than ten days would be required to determine the adequacy of a well. Based on emission factors listed in Table 13.5–1 in the EPA's Compilation of Air Pollutant Emission Factors, AP–42 (EPA 1995b), the NO_X emissions from each flare would result in 0.425 lbs/hour or 10.2 lbs/day from each flaring episode.

Approximately 57 wells would be drilled each year in the five-year construction period. If all wells would be flared the maximum of 30 days, the annual $_{NOX}$ emissions would be 8.5 tons. Under the more likely scenario, all wells would be flared an average of ten days per year resulting in NO_X emissions of 2.8 tons per year. Furthermore, the wells would be spread out over the large geographical area of the Project Area and the emissions from flaring would be temporary. As a result, NO_X emissions from flaring would range from 0.4 to 1.3 percent of NO_X emissions from the Project's compressors. Therefore, emissions from flaring were not considered to be significant.

4.3.1.1.2.6 Dispersion Model

Air quality impacts from the operation of gas-powered compressor stations were predicted using the EPA-approved Industrial Source Complex Short Term (ISCST390) Dispersion Model, version 97365 according to the guidelines of the User's Guide for the Industrial Source Complex Dispersion Model User's Instructions (EPA 1995c).

A large grid of receptors was used to ensure an adequate spatial coverage for the Project Area. The receptor grid had a 1,000-meter spacing centered approximately between the North and South areas with an extent of 77 kilometers from north to south and 48 kilometers from west to east. This grid was used to determine the overall effect of all the compressors. To determine the effects of individual compressors with complex terrain in the vicinity of the compressors, a smaller circular grid with a 250-meter spacing was placed around each compressor. The overall grid included 2,950 receptors in and near the Project Area. Additional receptors were placed at the closest residences to compressors and at the key locations in Arches, Canyonlands, and Capitol Reef National Parks. The elevation of each receptor was determined from Digital Elevation Maps (1:24,000 scale) developed by the USGS.

A two-year data set (1986 and 1987) from the Clawson Power Plant site was provided by the UDEQ as meteorological input to the model. The model was run for both years, and the highest ambient concentrations are reported.

4.3.1.1.2.7 Modeled Impacts

The federal and State of Utah Ambient Air Quality Standards have been developed to determine the maximum concentrations of a pollutant in the air to protect the public health and welfare with an adequate degree of safety. The standards established for NO_2, shown in **Table 3–11** in **Section 3.3** is 100 µg/m^3 as an annual average. The standards established for CO, also shown in **Table 3–11** in **Section 3.3** are 40,000 µg/m^3 as a one-hour maximum and 10,000 µg/m^3 as an eight-hour maximum. The assumed average NO_2 background concentration throughout the vicinity of the Project Area is 17 µg/m^3 based on measured data at Castle Dale. This means that even if the Proposed Action would produce an increase in the NO_2 concentration of 82 µg/m^3, an adequate margin for the public health and welfare would still be maintained.

NO_x and CO emissions from each compressor station proposed under the Proposed Action were modeled using the 1986 and 1987 Clawson meteorological data and the highest concentrations for each year were compared to the Class II Prevention of Significant Deterioration (PSD) increments and the NAAQS. The modeled NO_x concentrations were multiplied by a factor of 0.75 to represent the conversion of total NO_x to NO_2. The results are summarized in **Table 4–3** and the concentration contours are shown on **Plate 4–1**. The maximum concentrations are closely centered around each compressor. The NO_2 results represent the incremental impact of the Ferron Project only with the background of 17 µg/m^3 added on, and the CO results are with the 8,000 and 2,000 µg/m^3 background values added for the one-hour and 8-hour averaging periods, respectively.

Table 4–3
Ferron Natural Gas Project Proposed Action NO_2 and CO Air Quality Impacts

Pollutant	NAAQS (µg/m^3)	PSD Class II Increment (µg/m^3)	Averaging Period	Maximum Modeled Concentration (µg/m^3)	Background (µg/m^3)	Maximum Modeled Concentration with Background (µg/m^3)	Percent of NAAQS	Incremental Percentage Increase of Class II Increment
NO_2	100	25	Annual	27.75	17	44.75	44	111
CO	40,000	Not Applicable	one hour	3,337	8,000	11,337	28.3	Not Applicable
CO	10,000	Not Applicable	eight hours	706	2,000	2,706	27.1	Not Applicable

Maximum concentrations would occur on elevated terrain within ½ mile of the compressors. The highest NO_2 concentration due to direct impacts was 27.7 µg/m^3, a value slightly exceeding the PSD Class II increment of 25 µg/m^3 but only 27.7 percent of the annual NAAQS. This maximum concentrations would at elevated terrain near Anadarko's proposed compressor in Township 13, South Range 10 East, Section 28. The PSD Class II increment also may be slightly exceeded (27.5 µg/m^3) near Texaco's proposed compressor in Township 17 South, Range 8 East, Section 10. No PSD Class II increments were predicted to be exceeded at any other locations. As shown on **Plate 4–1**, most of the Project Area away from compressors would have a concentration of less than one µg/m^3, a level considered to have an insignificant air quality impact.

All NEPA analysis comparisons to the PSD Class I and II increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis. The determination of PSD increment consumption is a regulatory agency responsibility conducted as part of the New Source Review process, which also includes a PSD Class I Federal Land Management Agency's evaluation of potential impacts to Air Quality Related Values (AQRV), such as visibility, aquatic ecosystems, flora, fauna, etc. The review would be conducted by the UDEQ when the Companies apply for construction and operating permits.

Since this NEPA air quality analysis shows that PSD Class II increments could be slightly exceeded on elevated terrain near two of the compressors, the UDEQ may require more stringent design and operational parameters when these compressors are individually permitted. Actual design parameters, as opposed to the conservative assumptions used in this analysis, would be the basis for determining impacts from individual compressors. Furthermore, the UDEQ may require lower emission rate than the 2.0 grams/horsepower-hour used in this analysis.

CO modeled concentrations would be approximately seven to eight percent of the NAAQS. The maximum one-hour concentration would be 3,337 $\mu g/m^3$, a value only 8.3 percent of the one-hour CO NAAQS of 40,000 $\mu g/m^3$. Likewise, the maximum 8-hour concentration would be 706 $\mu g/m^3$, a value only 7.1 percent of the 8-hour CO NAAQS of 10,000 $\mu g/m^3$. When the assumed CO backgrounds are added, the average one-hour CO concentration would be 11,337 $\mu g/m^3$, or 28.3 percent of the NAAQS. The average eight-hour CO concentration would be 2,706 $\mu g/m^3$, or 27.1 percent of the NAAQS. Similar to the NO_2 analysis, these maximum CO values would occur at elevated terrain near compressor stations. Since the CO ambient levels would be small compared to the NAAQS, a further analysis of CO was not done.

NO_2 concentrations were also modeled and compared to Class I PSD increments at the closest boundary to the Arches, Canyonlands, and Capitol Reef National Parks. The Class I NO_2 increment is only 2.5 $\mu g/m^3$ because the highest degree of protection from air quality impacts is enforced at Class I airsheds. The highest direct annual NO_2 concentrations were predicted to be 0.041 $\mu g/m^3$ at the Canyonlands and Arches National Parks, and 0.062 $\mu g/m^3$ at Capitol Reef National Park. These values would be less than 3 percent of the Class I increments at these National Parks. Therefore, air quality impacts at the Class I areas are not predicted to be significant.

Based on the results of the air quality dispersion modeling, it can be concluded that the Proposed Action would not cause any exceedances of the NAAQS in or near the Project Area or at distant Class I airsheds. Based on the conservative design and modeling assumptions, Class II increments may be slightly exceed on elevated terrain in the immediate vicinity of some compressors.

4.3.1.1.2.8 Hazardous Air Pollutant Impacts

The incomplete combustion of natural gas can result in the emission of formaldehyde, which is recognized as a carcinogen. The UDEQ has established screening criteria for formaldehyde. Assessment procedures use risk factors established by the EPA (EPA 1997) for carcinogenic compounds. Cancer risk in the in the range 1 per million to 1 per 10,000 is generally acceptable, while risks above 1 in 10,000 imply a need for mitigation.

Maximum predicted ground level concentrations are adjusted for the duration of exposure. The maximum exposed individual was assumed to be exposed for every hour of every day, but the Project would operate for 20 years. Because average human life expectancy is about 70 years, the exposure duration is adjusted

to 20/70 or 0.29. The EPA SCREEN3 dispersion model was used to calculate an annual maximum ambient air impact of 2.7 $\mu g/m^3$ within 200 meters of the largest proposed compressor (4,000 horsepower) because no residences would be closer than 200 meters to a compressor. The risk was calculated from the product of the annual formaldehyde ambient air concentration, the scale factor 0.29, and the unit risk factor 0.000013 (EPA 1997), which resulted in an overall risk of 0.0000102. A risk factor less than 0.0001 is generally acceptable. As a result of the preceding analysis and no residences located within 200 meters of a proposed compressor, no significant formaldehyde impacts would occur with implementation of the Proposed Action.

4.3.1.1.2.9 Visibility Impacts

The formation of regional haze and the resultant impairment of visibility in an area can result from ambient concentrations of particulate matter from PM_{10}, NO_X, and SO_2 emissions. The regional haze analysis in the vicinity of the Project Area incorporates the methods presented in the Interagency Workgroup on Air Quality Modeling (IWAQM) and the UDEQ. It is BLM's position that a reduction of 10 percent in the visibility within a region would be barely discernible to the general public. This method is generally used to evaluate regional haze at distant (over 40 miles) Class I airsheds. The IWAQM method was used, with modifications, to estimate the regional haze impacts in the vicinity of the Project Area.

Using the modified screening method, the standard visual range (SVR) in and near the Project Area was estimated to be reduced by 10 percent on two or fewer days in a year. Therefore, it can be concluded that the Ferron Natural Gas Project would have minimal effect on the regional haze in the vicinity of the Project.

The IWAQM method along with modifications by the UDEQ was used to evaluate effects on regional haze at Canyonlands, Arches, and Capitol Reef National Parks. The BLM recognizes that a SVR reduction of 10 percent would be the level that would be barely discernible to the general public. The National Park Service recognizes a 5 percent reduction as the level where a keen observer seeking a pristine visual experience in a National Park would just begin to notice a reduction. Accordingly, the National Park Service generally uses this 5 percent reduction as a significance level while the BLM recognizes a 10 percent reduction as a significance level, especially for the multiple, geographically-separated sources that are analyzed in the Ferron Natural Gas EIS. The BLM considers more than one day of a visual reduction more than 10 percent as a significant impact. Based on this method and the modeled 24-hour NO_X concentrations at the Class I areas, the regional haze reduction would exceed 10 percent four days at Capitol Reef National Park as a result of the Ferron Natural Gas Project's emissions. The visual reduction would be less than 10 percent on all other days evaluated in the air quality analysis.

4.3.1.1.2.10 Amine and Dehydration Units Impacts

An amine unit and a dehydrator would be co-located with each compressor unit. The amine unit would reduce the carbon dioxide in the gas stream to levels that are acceptable on transmission pipelines. The gas stream would first flow through a separator on the CPF site to remove water. Next, the gas stream would flow through the compressor to increase the pressure to about 700 psi. The gas steam would then pass through the amine unit to remove the carbon dioxide and finally through the tri-ethylene glycol dehydration unit to remove all the excess water.

Emissions associated with the amine units would be the carbon dioxide that is vented to the atmosphere through a 6-inch pipe at an elevation of 30 feet. Daily carbon dioxide emissions would be 3,000 cubic feet per day (cfd) from the approximate 15 million cfd of natural gas. Total annual project carbon dioxide emissions would be 13,140,000 cubic feet (3,000 cfd per unit X 12 units X 365 days per year) or 160 lbs per

year. The amine unit would produce minor levels of BTEX (benzene, toluene, ethylbenzene, and xylenes). The GRI-HAPCalc computer model, developed by the Gas Research Institute (GRI 1996) was used to estimate emissions from each amine unit. BTEX emissions were calculated with the assumption (although not proposed by the Companies) that the gas stream would be routed to a combustion devise before being vented to the atmosphere. If a combustion devise would not be constructed on the amine units, BTEX emissions could be significantly higher. In either case, the Companies would have to be in compliance with the Utah Air Conservation Rule 307–1–7–3 for hazardous pollutants levels emitted to the atmosphere. Based on a gas analysis from Texaco's Orangeville unit during March 1998, the annual BTEX emissions from each amine unit would be less than 0.6 tons per year, of which 0.02 tons per year would be benzene. The Utah Air Conservation Rule 307–1–7–3.C indicates that levels of benzene below 0.119 tons per year do not constitute a health hazard. After the gas stream leaves the amine unit, the stream would be purged of benzene. Therefore, no significant BTEX emissions would be expected from the glycol dehydration process.

4.3.1.1.3 Electric Power Option

No air pollutants from compressors would be emitted from the Ferron Natural Gas Project with electrically-powered equipment. Therefore, the air quality and visibility impacts resulting from emissions from natural gas compressors described in the Proposed Action would not occur. No indirect impacts would occur from extra generation of electrical power because there is excess electrical capacity at power generating facilities near the Project Area.

4.3.1.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

Under Alternative 2, 61 wells (four less than the Proposed Action) and 12.3 miles of roads (2.5 miles less) would be constructed in the North Area. A total of 206 wells (14 less than the Proposed Action) and 71.3 miles of roads (11.9 miles less) would be constructed in the South Area. The reduction in wells and roads would be a result of other environmental restraints. However, the same number of compressors as for the Proposed Action would be required.

Since the same number of compressors would be operated under Alternative 2, the air quality and visibility impacts would be identical to the Proposed Action. Because of concerns raised by public comment concerning adverse visibility impacts at Class I areas under the Proposed Action. Approximately five percent fewer facilities (well pads and roads) would be constructed under Alternative 2. Therefore, the fugitive dust emissions and resultant air quality impacts would be less.

4.3.1.2.1 Construction Impacts

Construction-related fugitive dust, as PM_{10}, is directly related to the amount of surface-disturbing activity. Under Alternative 2, 95 percent of the proposed wells and roads under the Proposed Action would be constructed. Therefore, fugitive dust levels would be approximately 95 percent of those for the Proposed Action. Total annual PM_{10} emissions, with legally-enforceable dust controls applied that would reduce dust emissions by 50 percent, would be 475 tons per year in the South Area, and 153 tons per year in the North Area.

4.3.1.2.2 Operational Impacts

Similar to construction-related fugitive dust, the amount of dust generated by project-related traffic would be approximately 95 percent of the Proposed Action. Because no control of fugitive dust, i.e., application of water or chemicals such as magnesium chloride, from project vehicles has been proposed by the Companies, the annual dust emissions would be 252 tons per year in the South Area and 65 tons per year in the North Area. These levels would be approximately 50 percent of the fugitive dust associated with construction activities.

4.3.1.2.3 Electrical Power Option

No air pollutants from compressors would be emitted from the Ferron Natural Gas Project with electrically-powered equipment. Therefore, the air quality and visibility impacts resulting from emissions from natural gas compressors described in the Proposed Action and this alternative would not occur. No indirect impacts would occur from extra generation of electrical power because there is excess electrical capacity at power generating facilities near the Project Area.

4.3.1.3 Alternative 3 — No Action

Under the No Action alternative, a maximum of 155 wells and nine compressors could be developed on State and private land. The compression required for the fewer wells would be approximately 50 percent of the Proposed Action and Alternative 2. Six new compressors would be constructed and operated on State and private land. Since potential impacts may occur under the Proposed Action and Alternative level of development, lesser, but potentially significant, impacts also may occur under the No Action level of development. With the operation of six natural gas compressors, no days at the Class I areas are predicted to have visibility reduced by more than ten percent. However, visibility is predicted to be reduced by more than five percent on five days at Capitol Reef and one day at both Arches and Canyonlands National Parks. The maximum NO_2 impact of 27.7 $\mu g/m^3$, 44.7 $\mu g/m^3$ with the background, would still occur near Anadarko's proposed compressor in the North Area.

Since no federal lands or actions would be involved with the No Action Alternative, the level and type of compressors would be totally under the authority of the UDEQ. When the compressors would be individually permitted by the UDEQ, a BACT analysis, an ambient air quality impact analysis, and an analysis of visibility effects on the Class I airsheds would be completed for each action. The BACT analysis would determine the lowest emission rate based upon economical, energy, and environmental impacts to comply with all air quality regulations. As part of the permit review process, the proponents may be required to either install gas-fired compressors with lower, and achievable in the industry, emission rates or install electric-powered compressors, which have no direct pollutant emissions, especially when the total effect on Class I airsheds would approach a significant level.

4.3.2 Summary of Impacts

Dust levels would be elevated near construction activities during the five-year construction period. Construction would generally occur from April to November because winter weather restraints and other environmental factors would preclude most winter construction. The Companies would apply dust suppression techniques such as watering or chemical application to reduce construction-related dust. Although dust levels would be elevated in the immediate vicinity of construction activities and along unpaved roads in the morning and evening, the dust levels would not constitute any threat to human health

and safety. During the operational phase, dust levels would be reduced by about 50 percent because of the decreased traffic to the wells and dust suppression techniques applied to exposed areas on well pads and facilities. However, the Companies have stated that no dust suppression would be applied to roads.

Operation of the 12 proposed compressors would result in elevated levels of NO_2 in the immediate vicinity of the compressors. The highest ambient air concentration would be 27.7 $\mu g/m^3$, a level 27 percent of the level that has been implemented to protect the public health and safety. The maximum NO_2 levels would occur on elevated terrain within ½ mile of the compressor sites. Away from the compressors, the ambient air concentration of NO_2 would rapidly decrease and be less than 10 $\mu g/m^3$ at more than 95 percent of the area within the Project Area. Visibility in and near the Project Area, although there is no visibility standard for this area, would be decreased at least 10 percent about 2 days per year. At the distant Class I airsheds of the National Parks, the contribution to air quality degradation would be minuscule and only three percent of the allowable increases. Visibility is predicted to be reduced more than 10 percent on four days at Capitol Reef National Park. This would be considered a significant impact. Under both alternatives 1 and 2, implementation of the electric power option and recommended mitigation would result in no exceedence of NO_2 Class II incremental increase. Also, visibility at Capitol Reef National Park would not be reduced by more than 10 percent on any days.

Under the No Action Alternative, the level and type of compressors installed would be under UDEQ's sole authority. Decisions about the level of emissions permitted and the use of electrical or gas-fired equipment would be made by UDEQ during the permit review process. The BLM would have no authority in the process.

4.3.3 Mitigation

The operation of compressors would require adherence to the State of Utah Air Conservation Rules. The Companies have proposed compressors with guaranteed emission rates that would be reviewed and subsequently approved by the State.

The state and National Ambient Air Quality Standards set absolute upper limits to specific air pollutant concentrations at all locations where the public has access. The PSD program is designed to limit the incremental increase (depending on the location's classification) of specific air pollutant concentrations above a legally-defined baseline level. All NEPA analysis comparisons to the PSD Class I and II increments are intended to evaluate a threshold of concern, and do not represent a regulatory PSD Increment Consumption Analysis. The determination of PSD increment consumption is a regulatory agency responsibility conducted as part of the New Source Review process, which also includes a Federal Land Management Agency's evaluation of potential impacts to AQRV, such as visibility, aquatic ecosystems, flora, fauna, etc.

Dust suppression would be required during construction activities, but the Companies have not proposed watering or other dust suppression techniques on roads during the operational period. This would result in temporarily-elevated dust at some points on roads. Dust suppression should be applied along roads near residential areas and at congested project traffic areas.

Because of concerns raised by public comment concerning adverse visibility impacts at Class I areas under the Proposed Action and Alternative 2, this section analyzes the air quality and visibility impacts that would be associated with lower emissions rates and more refined exhaust parameters, both attainable in the industry.

Therefore, the rest of this section discloses the reduced adverse impacts that would occur with lower emission rates and more refined exhaust parameters.

4.3.3.1 Compressor Emissions

Information on compressor engines that would have reduced emission rates of 0.7 gm/HP-hr NO_X and more refined stack parameters has been analyzed. Emissions rates for CO would remain at 2.0 gm/HP-hr because no significant CO impacts were identified under the Proposed Action. Similar to the assumption of the Proposed Action, an Approval Order from the UDEQ would be required for each individual compressor. The UDEQ's review of the request for an Approval Order would include a review to ensure the application of BACT and compliance with all applicable regulations, including the potential effect on visibility at Class I areas.

The compressor emissions and stack parameters used in the mitigation analysis were for Caterpillar Model G3606SITA natural gas-fired compressor engines. An emission rate of 0.7 gm/HP-hr NO_X is guaranteed by Caterpillar for these engines. The following stack and exhaust parameters are referenced by Caterpillar and the compressor building dimensions are proposed by the Companies:

- exhaust stack height: 56 feet,
- stack diameter: 12 inches,
- exhaust temperature: 466 ° Centigrade,
- exhaust velocity: 72.1 meters/second, and
- exhaust downwash resulting from compressor buildings 28 feet high, 65 feet long, 35 feet wide.

The actual engine configuration would be based on specific data once the actual engine configuration is selected and would conform to BACT based upon the UDEQ Approval Order. These emission levels are analyzed for this mitigation because they are attainable in the industry and would significantly reduce potential impacts to visibility at Class I areas as well as significantly reduce ambient air concentrations of pollutants near proposed compressor locations. Based on these operating parameters, the NO_X emissions from the 12 proposed compressors would be 232 tons per year (or 35 percent of the Proposed Action emissions) as shown in **Table 4–4**.

Table 4–4
Ferron Natural Gas Project NO_X Emissions with Mitigation

Company	Compressor Rating (HP)	Number of Compressors	Total Compression (HP)	NO_X Emissions	
				lbs/hour	tons/year
Anadarko	3,400	6	20,400	31.46	124.1
Texaco	4,000	3	12,000	18.50	72.9
Chandler	2,200	2	4,400	6.78	29.7
	850	1	850	1.31	5.7
Total		12	37,650	58.05	232.4

The air quality impacts analyzed for the mitigation used the same dispersion model as described under the Proposed Action. Of course, the compressor parameters were different as previously described.

4.3.3.2 Mitigated Air Quality Impacts

NO_x and CO emissions from each compressor station under the mitigation analysis were modeled using both the 1986 and 1987 Clawson meteorological data and compared to the Class II PSD increments and the NAAQS. The modeled NO_x concentrations were multiplied by a factor of 0.75 to represent the conversion of total NO_x to NO_2. The results are summarized in **Table 4–5** and the concentration contours are shown on **Plate 4–2**. The maximum concentrations for both pollutants were slightly higher using the 1986 data. The highest NO_2 annual concentration would be 20.37 µg/m^3 with the background added, a value 81 percent of the PSD Class II increment and 20.4 percent of the annual NAAQS. This maximum concentration would occur on elevated terrain near Texaco's proposed compressor station in Township 17 South, Range 8 East, Section 5. However, as shown on **Plate 4–2**, most of the analysis area would have concentrations of less than 1.0 µg/m^3, a value considered to have an negligible effect on air quality. CO concentrations would be minimal compared to applicable NAAQS. The maximum one-hour average concentration would be 8,279 µg/m^3 with the assumed background, a value 20.7 percent of the one-hour CO NAAQS of 40,000 µg/m^3. Likewise, the maximum 8-hour average concentration would be 249 µg/m^3 with the assumed background, a value 22.5 percent of the 8-hour CO NAAQS. Similar to the NO_2 analysis, these maximum CO values would occur east of the aforementioned Texaco compressor station. Since there are few major sources of CO in and near the Project Area and the mitigated ambient concentrations would be minimal compared to all applicable air quality standards, a further analysis of CO was not performed.

Table 4–5
Ferron Natural Gas Project Mitigated NO_2 and CO Air Quality Impacts

Pollutant	NAAQS (µg/m^3)	PSD Class II Increment (µg/m^3)	Averaging Period	Maximum Modeled Concentration (µg/m^3)	Background (µg/m^3)	Maximum Modeled Concentration with Background (µg/m^3)	Percent of NAAQS	Incremental Percentage Increase of Class II Increment
NO_2	100	25	Annual	3.37	17	20.37	20.4	81
CO	40,000	Not Applicable	one hour	279	8,000	8,279	20.7	Not Applicable
CO	10,000	Not Applicable	eight hours	249	2,000	2,249	22.5	Not Applicable

NO_X emissions were also modeled and compared to Class I PSD increments at the closest boundary to the Canyonlands, Arches, and Capitol Reef National Parks. The Class I NO_2 increment is 2.5 µg/m^3. The highest annual NO_2 concentrations would be 0.019 µg/m^3 at the Canyonlands and Arches National Parks, and 0.028 µg/m^3 at Capitol Reef National Park. These values would be less than 1.1 percent of the Class I allowable incremental increase at these National Parks.

Based on the results of air quality modeling with recommended mitigation, it can be concluded that no adverse air quality impacts would occur.

4.3.3.3 Mitigated Near-Field Visibility Impacts

The mitigated visibility analysis for the mitigation used the same methodology as for the Proposed Action. Using the modified emission source parameters, the SVR in and near the Project Area would not be reduced by more than ten percent on any day using both the 1986 and 1987 meteorological data. Therefore, it can be concluded that the recommended mitigation for the Ferron Natural Gas Project would result in no effect on the regional haze in the vicinity of the Project.

4.3.3.4 Mitigated Far-Field Class I Visibility Impacts

The IWAQM method along with modifications by the UDEQ was used to evaluate effects on regional haze at Canyonlands, Arches and Capitol Reef National Parks using the mitigated emissions and source parameters. Based on this method and the modeled 24-hour NO_X concentrations at the Class I areas, the regional haze reduction would exceed 5 percent on three days at Capitol Reef National Park using the 1987 meteorological data. When the 1986 meteorological data was used, the regional haze reduction at any of Class I areas would not exceed five percent. There would be no reduction greater than 10 percent using either year. When considering both years of meteorological data (730 days), the standard visual range would be reduced by more than five percent an average of 1.5 days per year, or just slightly exceeding the more restrictive National Park Service guidelines of considering an adverse impact of more than one day per year with a greater than five percent reduction.

The slight exceedance using the conservative IWAQM screening analysis represents the potential effect at Capitol Reef using the mitigated emission source parameters. The analysis demonstrates that there may be a minor impact to visual resources at Capitol Reef if all the natural gas-fired compressors are permitted and operated at the levels indicated in the mitigated analysis. Further analysis of potential visibility impacts may be required by the Utah Division of Air Quality in the future when Approval Order applications are submitted. Because there is a slight potential of adverse visibility impacts at Class I areas, there may be a upper level of gas-fired development approved by the Utah Division of Air Quality. Therefore, considering that the Ferron Natural Gas Project is considering the installation of 12 compressor stations, any compressor proposed beyond an upper level may be disapproved or have to be electrically powered.

4.3.4 Unavoidable Adverse Impacts

The Proposed Action and each alternative would lead to temporary increases in fugitive dust during construction. During operations, natural gas-fired compressor engine emissions from the Proposed Action could result in adverse impacts to visibility at Capitol Reef National Park, a PSD Class I area, and an exceedance of the PSD Class II increment for NO_2 in the Project Area. Alternative 3 represents actions beyond the jurisdiction of BLM and Forest Service and, if development occurred, potential unavoidable adverse impacts to visibility at Capitol Reef National Park and exceedence of the PSD Class II increment for NO_2 in the Project Area could be realized if mitigation is not implemented. With implementation of identified mitigation for Alternative 2, no adverse impacts to Class I visibility areas would be realized from the Ferron Natural Gas Project.

4.4 SOILS

4.4.1 Direct and Indirect Effects

Direct short-term impacts associated with construction activities include temporary disturbance of soils for installation of pipelines, buried electric transmission lines and construction of roads to access wells and facilities. Immediately following construction of pipelines and transmission lines, soil would be backfilled into trenches and regraded as needed. Portions of the construction right-of-way not necessary as part of the adjacent road would be reclaimed and revegetated. Portions of well pads not needed for production also would be reclaimed.

Long-term impacts would include disturbance of soils for development of production wells, disposal wells, compressor facilities, and access roads needed for the life of the project. Impacts would result from the clearing of vegetation, excavation, salvage, stockpiling, and redistribution of soils during construction and reclamation activities. Blading or excavation to achieve desired grades could result in slope steepening of exposed soils in cut and fill areas, mixing of topsoil and subsoil materials, and the breakdown of soil aggregates into loose particles. Soil structural aggregates also would be broken down by compaction from vehicular traffic. Removal and stockpiling of topsoil for revegetation purposes could reduce the natural fertility of the soil, cause a loss of soil profiles by mixing soil horizons, and a breakdown in soil structure. Soil compaction caused by equipment traffic may decrease infiltration, increase runoff and gully development, and reduce soil productivity. Long-term impacts would be greater on critical soils (as identified in Chapter 3) with slopes in excess of 6 percent. Reclamation would also be more difficult on critical soils. Analysis of reclamation potential is contained in **Section 4.17**.

There would be an increased susceptibility to erosion in newly disturbed areas. The removal of vegetative cover, steepening of slopes, and the breakdown of aggregates would increase the potential for channelized runoff and accelerated soil erosion. Wind erosion could also increase with removal of vegetation and exposure of soils. Erosion would result in the formation of more rills and gullies and increase sedimentation and salinity of surface water. Analysis of sedimentation and salinity associated with soil loss is contained in the **Section 4.2.**

Soils throughout the Project Area are naturally highly erodible. The amount of ongoing soil loss in the area under current conditions ranges from approximately 2 tons per acre per year on level, deeper soils to 12 tons per acre per year on steeper slopes with sparse vegetation (BLM 1997c). Soil loss calculation for this EIS are contained in **Appendix E**.

Indirect impacts would primarily result from off-road vehicle use and include disturbances to vegetative cover and potential for increases in rutting, erosion and compaction of soils.

4.4.1.1 Alternative 1 — Proposed Action

Of the 65 new wells proposed for the North Area, 28 would be located on critical soils where slopes are 6 percent or greater. The proposed CPF and compressor sites would not be located on critical soils with slopes greater than 6 percent. Five well pads would be located on slopes greater than 25 percent (including both slopes where critical soils are present and absent). In addition, nine of the new roads proposed to link new well pads with the existing road network would cross areas where slopes are greater than 25 percent. In some cases, only short road segments (less than 200 feet long) would be involved.

Of the 220 new wells proposed for the South Area, 150 would be located on critical soils where slopes exceed 6 percent. The proposed CPFs would not be located on critical soils with slopes greater than 6 percent. Thirty-nine well pads would be located on slopes greater than 25 percent (including both slopes where critical soils exist and are absent). In addition, new roads proposed to link new well pads with the existing road network would cross areas where slopes are greater than 25 percent. In some cases, only short road segments (less than 200 feet long) would be involved.

The transmission pipeline would only traverse small portions of critical soils with slopes in excess of 6 percent.

The rate of soil loss from long-term surface disturbance within the Project Area has been estimated at 11.2 tons/acre/year.

Impacts to soils from well pad, facility, access road, and pipeline construction and utilization would be greater on critical soils with slopes in excess of 6 percent and on all slopes greater than 25 percent. Water and wind erosion would increase in these areas and reclamation would be more difficult. At the end of the project, a slower recovery of these areas would be expected.

4.4.1.1.1 Electric Power Option

Under the Proposed Action, 187 miles of aboveground power lines would be installed. Half of these power lines would be installed outside of the access road ROW resulting in a temporary disturbance of 113 acres (93.5 miles X 5,280 feet/mile X 10-foot-wide ROW), or 7 percent of the 1,633 short-term disturbance to construct all other facilities within the Project Area. Clearing of vegetation along the ROW would be minimal and only limited blading of vegetation is likely to occur. Some soil compaction would occur as vehicles traverse the ROW to erect the poles and power lines. As a result, erosion potential and subsequent increased sedimentation on these soils would be minimal and short-term during the construction period. Therefore, the installation of almost 94 miles of aboveground power lines would have a minimal and short-term effects on soil resources. Because no long-term clearance of vegetation would occur, long-term impacts to soil resources are not expected.

4.4.1.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

Alternative 2 would result in drilling of 18 fewer wells because of various resource protection restrictions. This alternative would also involve the implementation of the environmental protection measures identified in **Section 2.2**, which would reduce soil impacts when compared to the Proposed Action.

Under this alternative, 18 fewer, or 160, proposed wells would be located on critical soils with slopes exceeding 6 percent. Due to the extent of these soils in the project area (see **Plate 3–3**), it would not be possible to exclude the construction of these 160 wells and associated roads and pipelines, although, at the application stage, individual wells and roads could be relocated to different areas within a quarter section to avoid critical soils on slopes exceeding 6 percent if on-the-ground conditions permit. On Federal lands, all proposed wells and roads would be prohibited on slopes greater than 25 percent and would be moved or not permitted.

Soil loss from long term surface disturbance within the Project Area would be 9.9 tons/acre/year. Soil loss for Alternative 2 would be about 88 percent of the loss associated with the Proposed Action.

Impacts to soils from well pad, facility, access road, and pipeline construction and utilization would be slightly less that the Proposed Action. Soil loss from Alternative 2 would be about 12 percent less than Alternative 1. Reclamation of disturbances on critical soils with slopes exceeding 6 percent would be difficult.

4.4.1.2.1 Electric Power Option

Under Alternative 2, about 97 miles of aboveground power lines would be installed, or 90 miles less than under the Proposed Action. Half of these power lines would be installed outside of the access road ROW resulting in a temporary disturbance of 59 acres (48.5 miles X 5,280 feet/mile X 10-foot wide ROW), or about 4 percent of the 1,472 short-term disturbance to construct all other facilities within the Project Area. Clearing of vegetation along the ROW would be minimal and only limited blading of vegetation is expected to occur. Additionally, construction activities would be avoided on frozen or saturated soils. Therefore, erosion potential and increased sedimentation on these soils would be minimal and short term during the construction period. Therefore, installation of about 48 miles of aboveground power lines would have a minimal and short-term impact on soil resources. Because no long-term clearance of vegetation would occur, there would not be any long-term impacts to soil resources.

Approximately 73 miles of power lines would be buried within the access road ROW. Therefore, no additional short- or long-term disturbance to soils would occur with the installation of buried power lines.

4.4.1.3 Alternative 3 — No Action

Under the No Action Alternative, no additional wells would be drilled on Federal lands. Less than one mile of new roads could be constructed across BLM lands to grant access to State or private leases. None of these roads would be constructed on slopes greater than 25 percent and areas where critical soils occur on slopes greater than 6 percent would be avoided. Effects to soils on Federal lands would be slight.

155 wells and 44 miles of roads could be constructed on State and private lands. A maximum of 39 of these wells and their associated access roads could be constructed on critical soils with slopes greater than 6 percent. Increased soil erosion and sedimentation could occur at these locations if facilities would be constructed on steep slopes.

Soil loss from long-term surface disturbance in the Project Area under this alternative would be 6.6 tons/acre/year. When compared to the Proposed Action, soil loss for Alternative 3 would be about 41 percent less.

4.4.2 Impacts Summary

Impacts to soils from the construction of well pads, access roads, compressor facilities, injection wells, installation of gas and water pipelines, and installation of electrical power lines include:

- Increased exposure of surface soil materials to accelerated erosion and loss of soils resources.
- Increased sediment loads of stream channels and rivers, particularly increased salinity of surface water as a result of erosion of high to very highly saline soils. (Analysis of sediment and salinity increases resulting from surface disturbing activities are contained in **Section 4.2**).
- Increased volumes of surface runoff resulting in new gully development.

- Soil compaction and rutting from heavy equipment traffic.
- Reduced soil productivity as a result of decreased biological activity and reduced organic matter content of surface soils.
- Loss of soil profile due to mixing of soil horizons.
- A breakdown of soil structure.

Indirect impacts would primarily result from off road vehicle use, and include disturbances to vegetative cover and potential for increases in rutting, erosion, and compaction of soils.

Under the Proposed Action, some roads are proposed to be constructed on slopes greater than 25 percent resulting in accelerated soil erosion. This would result in the formation of more rills and gullies on and along the roads with increased sedimentation and salinity of surface water. The end result would be increased difficulty in achieving successful reclamation. Also, 178 wells would be located on critical soils with slopes greater than 6 percent. Reclamation efforts would be more difficult on these areas. For long-term surface disturbances, soil loss over the entire Project Area would be about 11.2 tons/acre/year.

With Alternative 2, environmental protection measures would be implemented to reduce effects to soils. Roads and well pads would be prohibited on slopes greater than 25 percent. Where possible, construction would be avoided on critical soils on slopes greater than 6 percent, but up to 160 wells could be drilled on such soils. Road grades exceeding 10 percent would be avoided on critical soils. Soil erosion would decrease slightly. Soil impacts would be slightly less than the Proposed Action. The rate of soil loss has been estimated at 9.9 tons/acre/year. Soil loss would be about 88 percent of the Proposed Action. The difficulty in achieving successful reclamation would be similar to the Proposed Action.

Under the No Action Alternative, 39 wells could be constructed on soils with slopes greater than 6 percent on private and State land. Average soil loss has been estimated at 6.6 tons per acre per year. These values represent about a 41 percent reduction in soil loss when compared to Alternative 1.

4.4.3 Mitigation

The following mitigation measures would assist in reducing effect to soils:

- To prevent unnecessary damages and soil loss, road construction or routine maintenance should be performed during periods when soils are dry enough to adequately support construction equipment. Soils would be deemed too wet if construction equipment creates ruts more than six inches deep.
- During construction, topsoil should be removed by clearing and stripping and stockpiled within or adjacent to the drill pad. Topsoil depths should be determined for individual applications by the authorizing agency. Saving topsoil would aid in site reclamation.
- To stabilize topsoil stockpiles, any areas left disturbed for more than one year should have stockpiles seeded with mixtures specified by the authorizing agency.
- Topsoil from access road construction should be windrowed along the uphill side of the road for uses as a seed bed top coating during road rehabilitation.

In addition to these measures, mitigation specified for Water Resources (**Section 4.2**) and Reclamation (**Section 4.17**) would aid in reducing erosion and facilitate reclamation.

4.4.4 Unavoidable Adverse Effects

Significant unavoidable adverse impacts to soils should not occur due to development of the Proposed Action or other alternatives with implementation of the mitigation measures noted above. The estimated rate of soil loss for each alternative would be within the range of naturally-occurring erosion.

4.5 VEGETATION

4.5.1 Direct and Indirect Effects

Direct effects to vegetation would occur from the disturbance or removal of vegetation for the construction of well pads, ancillary facilities, and the transmission pipeline. Duration of the effects would vary from short term to long term. Short-term effects would occur in areas where previously-vegetated areas are disturbed, but reclaimed within one to three years of the disturbance. Long-term effects would occur where well pads, roads, or other semi-permanent facilities displace previously-vegetated areas for the life of the project.

Indirect effects to vegetation would occur as a result of activities other than the direct disturbance or removal of vegetation. Sources of indirect effects would include the introduction or spread of noxious weeds; accidental spills of fuels, lubricants, or other materials; fugitive dust; and increases in the incidence of wildfire.

4.5.1.1 Alternative 1 — Proposed Action

The primary impact to vegetation resources would be the direct disturbance of a total of approximately 1,633 acres distributed across seven vegetation types. The seven vegetation types include pinyon-juniper, sagebrush-grassland, barren, salt desert shrub, agriculture, urban, and riparian (impacts to riparian areas are discussed in more detail in **Section 4.6**). This removal would occur during the construction phase of the project and about 43 percent of it would occur on federal lands. Overall, direct disturbance of vegetation types in the Project Area would involve about one percent of the 111,782-acre Project Area and pipeline corridor combined.

Most of the direct disturbance associated with the project (69 percent) would occur in the South Area. Here, about 1,127 acres of vegetation types would be disturbed (about one percent of the 93,170-acre South Area). Although the direct disturbances would involve seven vegetation types, about 94 percent of the disturbance would occur in three vegetation types — the pinyon-juniper, sagebrush/grassland, and salt desert shrub types (**Table 4–6**).

Implementation of this alternative would disturb about 245 acres of the 18,350-acre North Area. However, the disturbances would involve only the pinyon-juniper, sagebrush/grassland, and salt desert shrub vegetation types (**Table 4–6)**. None of the direct disturbances would involve the barren, agricultural, urban, or riparian types, which would be disturbed in the South Area and/or along the transmission pipeline's corridor.

Disturbance associated with construction of the transmission pipeline would involve an areal extent of 261 acres (**Table 4–6**). Similar to the situation with the South Area, most of this disturbance would occur

Table 4–6
Vegetation Disturbed for Construction of Project Facilities Under Alternative 1

	Pinyon-juniper			Sagebrush Grassland			Salt Desert Shrub			Barren and Urban			Agriculture			Riparian			
Facility	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**Total**
North Area																			
Wells	19.3	4.1	4.1	41.3	2.8	9.6	2.8	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89.5
Roads	24.6	9.5	4.3	63.9	5.1	20.1	1.8	9.1	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	139.7
CPFs	0.0	0.0	0.0	0.0	0.0	6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2
CSs	0.0	0.0	0.0	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.3
Subtotal	43.9	13.6	8.4	114.5	7.9	35.9	4.5	14.6	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	244.8
South Area																			
Wells	23.4	52.3	26.2	73.0	56.5	13.8	15.2	15.2	13.8	1.4	1.4	0.0	0.0	0.0	5.5	2.8	0.0	2.8	303.0
Roads	98.7	101.9	30.8	231.9	160.3	37.8	34.0	52.8	29.8	0.9	0.7	0.0	1.0	0.0	3.9	1.0	0.0	1.0	786.5
CPFs	0.0	0.0	6.2	0.0	0.0	18.6	0.0	0.0	6.2	0.0	0.0	0.0	0.0	0.0	6.2	0.0	0.0	0.0	37.2
CSs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	122.2	154.2	63.1	304.9	216.8	70.1	49.2	68.0	49.7	2.2	2.1	0.0	1.0	0.0	15.7	5.1	0.0	2.4	1,126.7
Pipeline																			
Pipeline	11.7	2.7	36.0	33.6	0.0	34.1	17.0	0.0	48.5	0.0	0.0	1.3	0.0	0.0	73.7	0.0	0.0	2.8	261.4
Subtotal	11.7	2.7	36.0	33.6	0.0	34.1	17.0	0.0	48.5	0.0	0.0	1.3	0.0	0.0	73.7	0.0	0.0	2.8	261.4
Total	177.8	170.5	107.5	453.0	224.7	140.1	70.7	82.6	99.6	2.2	2.1	1.3	1.0	0.0	89.4	5.1	0.0	5.2	1,632.9

in the pinyon-juniper, sagebrush/grassland, and salt desert shrub vegetation types. However, the pipeline also would involve the largest areal extent of agricultural land of the Project Area's three primary components.

Upon completion of each well and road, the portion of the disturbance not needed for the facility would be reclaimed. Well pads would be reduced to about 60 percent of their initial disturbance and roads would be reduced to their 40-foot ROW width. Thus, the long-term disturbance associated with the project would be less than the areal extent of disturbances shown on **Table 4–6**. Overall, direct long-term disturbances to vegetation resources (**Table 4–7**) would be about 47 percent of the initial disturbances.

With successful reclamation of the short-term disturbances, about 763 acres of vegetation types would be converted to project facilities for the life of the project (**Table 4–7**). At the end of the project, these long-term disturbances would be reclaimed, but it could take several years. The Companies would reclaim the facilities according to the reclamation plan contained in **Appendix A**.

Implementation of this alternative also would increase the potential for the occurrence of indirect effects. Disturbances from construction would increase the potential for the limited invasion and establishment of noxious weed species. Noxious weeds tend to be aggressive colonists of disturbed areas where the native vegetation has been removed. Therefore, disturbances associated with the construction of well pads, roads, and other ancillary facilities would provide opportunities for noxious weeds to invade and become established. However, implementation of the vegetation and weed management plan (**Appendix C**), which includes the direction on the control of noxious weeds, would minimize the potential for the establishment of noxious weeds.

The increased traffic on dirt roads that would occur in association with construction and operation could also indirectly affect vegetation communities adjoining the roads by increasing the level of fugitive dust. While dust is a common environmental condition in the Project Area, increases in dust along the new roads would increase the amount of dust deposited on the leaves of plants present along those roads (primarily within 100 feet of the roads). This increase in deposition would depress photosynthesis in these plants, until the dust is removed by wind or precipitation. The effect of this deposition would be to reduce the productivity of the plants immediately along the roads.

Wetlands located within disturbance areas are anticipated to experience those impacts detailed for above for upland areas. Project facilities placed in or adjacent to spring and seep wetlands would have short- and long-term impacts to these communities. Project facilities would directly impact the hydrology and vegetation community if placed in a wetland. These impacts would permanently impact the function of the system. Project facilities would indirectly impact wetlands if placed adjacent to them. However, it is anticipated that these impacts (changes to hydrology, increase in noxious weed invasion) would be minimal and would not remain after facilities were removed.

Upon closure of the project, facilities would be removed and their disturbances would be reclaimed to stabilize soils and return the areas to productive use. This would typically entail regrading, replacing salvaged topsoil, and reseeding disturbed areas. Although reclamation of the native vegetation types present in the Project Area, particularly pinyon-juniper and salt desert shrub, efforts directed to successful reclamation of all project disturbances would be repeated until reclamation is successful.

Table 4–7
Vegetation Disturbed for the Life-of-Project Facilities Under Alternative 1

	Pinyon-juniper			Sagebrush Grassland			Salt Desert Shrub			Barren and Urban			Agriculture			Riparian			
Facility	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**Total**
North Area																			
Wells	11.6	2.5	2.5	24.8	1.7	5.8	1.7	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.7
Roads	12.6	4.8	2.2	32.8	2.6	10.3	0.9	4.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	71.7
CPFs	0.0	0.0	0.0	0.0	0.0	6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2
CSs	0.0	0.0	0.0	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.3
Subtotal	24.2	7.3	4.7	66.9	4.3	22.3	2.6	8.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	140.9
South Area																			
Wells	14.0	31.4	15.7	43.8	33.9	8.3	9.1	9.1	8.3	0.8	0.8	0.0	0.0	0.0	3.3	1.7	0.0	1.7	181.8
Roads	50.6	52.2	15.8	118.9	82.2	19.4	17.4	27.1	15.3	0.4	0.4	0.0	0.5	0.0	2.0	0.5	0.0	0.5	403.3
CPFs	0.0	0.0	6.2	0.0	0.0	18.6	0.0	0.0	6.2	0.0	0.0	0.0	0.0	0.0	6.2	0.0	0.0	0.0	37.2
CSs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	64.7	83.6	37.7	162.7	116.1	46.2	26.5	36.2	29.7	1.3	1.2	0.0	0.5	0.0	11.5	2.2	0.0	2.2	622.3
Pipeline																			
Pipeline	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	88.9	90.9	42.4	229.6	120.4	68.5	29.1	44.2	30.4	1.3	1.2	0.0	0.5	0.0	11.5	2.2	0.0	2.2	763.2

4.5.1.1.1 Electric Power Option

Under the Proposed Action, 187 miles of aboveground power lines would be installed. Half of these power lines would be installed outside of the access road ROW resulting in a temporary disturbance of 113 acres (93.5 miles X 5,280 feet/mile X 10-foot wide ROW), or 7 percent of the 1,633 short-term disturbance to construct all other facilities within the Project Area. Clearing of vegetation along the ROW would be minimal and limited blading of vegetation is expected to occur. Vegeatation may be cleared by hand-held chainsaws or other equipment where the vegetation may impede construction or the performance of the power lines. Therefore, installation of about 94 miles of aboveground power lines would have a minimal and short-term impact on vegetation.

4.5.1.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

Under Alternative 2, an estimated 1,472 acres of vegetation would be removed for the development of project facilities (**Table 4–8**). The areal extent of vegetation disturbed under this alternative would only be slightly less than that would occur under Alternative 1 (about 161 fewer acres). As with Alternative 1, most of the disturbance would occur in the South Area (about 994 acres) and most would involve the pinyon-juniper, sagebrush grassland, and salt desert shrub vegetation types. Additionally, almost 39 percent of the acreage disturbed by construction of the project would occur on Federal lands. The direct loss of vegetation in the North Area and along the corridor for the transmission pipeline would be the same as under Alternative 1.

Upon completion of each well and road, the portion of the disturbance not needed for the facility would be reclaimed. Well pads would be reduced to about 60 percent of their initial disturbance and roads would be reduced to their 40-foot ROW width. Additionally, the ROW for the transmission pipeline would be reclaimed after the pipeline is constructed. Thus, the long-term disturbance associated with Alternative 2 would be less than the areal extent of disturbances shown on **Table 4–8**. Overall, direct long-term disturbances to vegetation resources (**Table 4–9**) would be about 46 percent of the initial disturbances. With successful reclamation of the short-term disturbances, about 679 acres of vegetation types would be converted to project facilities for the life of the project (**Table 4–9**).

At the end of the project, these long-term disturbances would be reclaimed back to vegetation. The companies would reclaim the facilities according to the reclamation plan contained in **Appendix A** Because direct disturbances and reclamation would be very similar between alternatives 1 and 2, the direct effects of implementing Alternative 2 would be almost the same as those that would occur under Alternative 1.

Under Alternative 2, the vegetation/weed management plan was developed in coordination with the BLM and implemented on federal lands (**Appendix C**). Implementation of this plan would ensure vegetation and weeds around the project's facilities are managed effectively and that the management is coordinated with federal and county agencies. This action would reduce the potential short-term impact of noxious weed invasion and control the establishment of weeds during the life of the project. The potential for noxious weed invasion from facility to undisturbed areas would therefore be diminished, thereby reducing the indirect impacts to undisturbed areas. Other indirect impacts discussed in Alternative 1, such as fugitive dust, would be similar.

Table 4–8
Vegetation Disturbed for Construction of Project Facilities Under Alternative 2

	Pinyon-juniper			Sagebrush Grassland			Salt Desert Shrub			Barren and Urban			Agriculture			Riparian			
Facility	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**Total**
North Area																			
Wells	17.9	4.1	4.1	38.6	2.8	9.6	1.4	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	84.0
Roads	19.5	8.1	2.0	49.8	4.8	20.2	1.3	9.3	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	116.7
CPFs	0.0	0.0	0.0	0.0	0.0	6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2
CSs	0.0	0.0	0.0	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.3
Subtotal	37.4	12.2	6.1	97.7	7.6	36.1	2.7	14.8	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	216.3
South Area																			
Wells	23.4	52.3	26.2	57.9	56.5	13.8	13.8	15.2	13.8	0.0	1.4	0.0	0.0	0.0	5.5	1.4	0.0	2.8	283.7
Roads	76.8	95.0	21.1	151.4	158.5	35.4	39.9	54.8	32.1	0.0	0.6	0.0	1.0	0.0	4.6	1.2	0.1	1.0	673.6
CPFs	0.0	0.0	6.2	0.0	0.0	18.6	0.0	0.0	6.2	0.0	0.0	0.0	0.0	0.0	6.2	0.0	0.0	0.0	37.2
CSs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	100.2	147.3	53.5	209.2	215.0	67.8	53.7	70.0	52.0	1.4	2.0	0.0	1.0	0.0	16.4	2.6	0.1	3.8	994.5
Pipeline																			
Pipeline	11.7	2.7	36.0	33.6	0.0	34.1	17.0	0.0	48.5	0.0	0.0	1.3	0.0	0.0	73.7	0.0	0.0	2.8	261.4
Subtotal	11.7	2.7	36.0	33.6	0.0	34.1	17.0	0.0	48.5	0.0	0.0	1.3	0.0	0.0	73.7	0.0	0.0	2.8	261.4
Total	149.3	162.2	95.6	340.5	222.6	138.0	73.4	84.8	102.1	1.4	2.0	1.3	1.0	0.0	90.1	2.6	0.1	6.6	1,472.2

Table 4–9
Vegetation Disturbed for the Life-of-Project Facilities Under Alternative 2

	Pinyon-juniper			Sagebrush Grassland			Salt Desert Shrub			Barren and Urban			Agriculture			Riparian			
Facility	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**Total**
North Area																			
Wells	10.7	2.5	2.5	23.1	1.7	5.8	0.8	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.4
Roads	10.0	4.1	1.0	25.6	2.5	10.4	0.7	4.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59.9
CPFs	0.0	0.0	0.0	0.0	0.0	6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2
CSs	0.0	0.0	0.0	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.3
Subtotal	20.8	6.6	3.5	58.0	4.1	22.4	1.5	8.1	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	125.8
South Area																			
Wells	14.0	31.4	15.7	34.7	33.9	8.3	8.3	9.1	8.3	0.0	0.8	0.0	0.0	0.0	3.3	0.8	0.0	1.7	170.2
Roads	39.4	48.7	10.8	77.6	81.3	18.2	20.5	28.1	16.4	0.0	0.3	0.0	0.5	0.0	2.4	0.6	0.0	0.5	345.4
CPFs	0.0	0.0	6.2	0.0	0.0	18.6	0.0	0.0	6.2	0.0	0.0	0.0	0.0	0.0	6.2	0.0	0.0	0.0	37.2
CSs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	53.4	80.1	32.7	112.3	115.2	45.0	28.8	37.2	30.9	0.0	1.1	0.0	0.5	0.0	11.9	1.4	0.0	2.2	552.9
Pipeline																			
Pipeline	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	74.2	86.7	36.2	170.3	119.3	67.4	30.3	45.3	31.7	0.0	1.1	0.0	0.5	0.0	11.9	1.4	0.0	2.2	678.7

4.5.1.2.1 Electric Power Option

Under Alternative 2, 97 miles of aboveground power lines would be installed. Half of these power lines would be installed outside of the access road ROW resulting in a temporary disturbance of 59 acres (48.5 miles X 5,280 feet/mile X 10-foot wide ROW), or 4 percent of the 1,472 short-term disturbance to construct all facilities within the Project Area. Clearing of vegetation along the ROW would be minimal and no blading of vegetation would occur. Installation of power poles would be aligned to avoid sensitive plant species. None of these species would be removed without prior consultation with the BLM. Vegeatation may be cleared by hand-held chainsaws or other equipment where the vegetation may impede the performance of the power lines. Therefore, it is concluded that the installation of 48.5 miles of aboveground power lines would have a minimal and short-term impact on vegetation.

Approximately 73 miles of power lines would be buried within the access road ROW. Therefore, no additional short- or long-term disturbance to vegetation would occur with the installation of buried power lines.

4.5.1.3 Alternative 3 — No Action

Under Alternative 3, no additional gas drilling would be authorized on federal lands. Drilling on private and state lands would entail the placement of an additional 155 wells in the Project Area, 19 in the North Area and 136 in the South Area. As is common to all of the alternatives, the primary impact to vegetation resources caused by Alternative 3 would be the direct removal of vegetation during the construction phase of the project. A total of about 917 acres of vegetation on state and private lands would be disturbed for the construction of these 155 wells and the roads and CPFs needed to support them (**Table 4–10**). Although the proportional distribution of the disturbances would be similar to those associated with alternatives 1 and 2, the overall areal extent of disturbance under this alternative would be smaller than would occur under either of the other two alternatives.

Long-term effects to vegetation probably would be similar to the short-term effects. The Companies would reclaim the well pads, access roads, and other facilities on state and private lands according to agreements developed between each company and individual landowner. Assuming the reduction in pad size is similar to what would occur under alternatives 1 and 2, long-term disturbance would involve about 367 acres (**Table 4–11**).

The types of indirect effects that would occur under this alternative would be the same as those described for alternatives 1 and 2. However, the extent of the effects would be substantially smaller because the number and areal extent of facilities and disturbances would be smaller. Consequently, any increase in the potential for noxious weeds and the effects of dust accumulating on plants near roads would be smaller than would occur under alternatives 1 or 2.

4.5.2 Impacts Summary

All three alternatives would remove at least some of seven vegetation types present in the Project Area. Alternatives 1 and 2 would remove similar amounts of vegetation, over both the short and long terms. The indirect effects of Alternative 2 would be less than those that would occur under Alternative 1 due to the implementation of the Vegetation and Weed Management Plan. Alternative 3 would have the fewest direct and indirect effects, primarily due to the more limited scope of development that would occur under that alternative.

Table 4–10
Vegetation Disturbed for Construction of Project Facilities Under Alternative 3

	Pinyon-juniper			Sagebrush Grassland			Salt Desert Shrub			Barren and Urban			Agriculture			Riparian			
Facility	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**Total**
North Area																			
Wells	0.0	4.1	4.1	0.0	2.8	9.6	0.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.2
Roads	0.05	7.9	3.4	1.0	5.1	13.4	0.1	9.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.5
CPFs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CSs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	0.0	12.1	7.5	1.0	7.8	23.1	0.1	14.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.6
South Area																			
Wells	0.0	52.3	26.2	0.0	56.5	13.8	0.0	15.2	13.8	0.0	1.4	0.0	0.0	0.0	5.5	0.0	0.0	2.8	187.3
Roads	0.0	96.5	18.8	2.1	151.1	25.3	0.0	52.2	25.1	0.0	0.7	0.0	0.0	0.0	3.9	0.1	0.0	1.2	377.3
CPFs	0.0	0.0	6.2	0.0	0.0	12.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2	0.0	0.0	0.0	24.8
CSs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	0.0	148.9	51.1	2.1	207.6	51.5	0.0	67.6	38.9	0.0	2.1	0.0	0.0	0.0	15.7	0.1	0.0	4.0	589.4
Pipeline																			
Pipeline	11.7	2.7	36.0	33.6	0.0	34.1	17.0	0.0	48.5	0.0	0.0	1.3	0.0	0.0	73.7	0.0	0.0	2.8	261.4
Subtotal	11.7	2.7	36.0	33.6	0.0	34.1	17.0	0.0	48.5	0.0	0.0	1.3	0.0	0.0	73.7	0.0	0.0	2.8	261.4
Total	11.7	163.7	94.6	36.7	215.4	108.7	17.1	82.4	87.5	0.0	2.1	1.3	0.0	0.0	89.4	0.1	0.0	6.8	917.4

Table 4–11
Vegetation Disturbed for the Life-of-Project Facilities Under Alternative 3

	Pinyon-juniper			Sagebrush Grassland			Salt Desert Shrub			Barren and Urban			Agriculture			Riparian			
Facility	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**BLM**	**State**	**Private**	**Total**
North Area																			
Wells	0.0	2.5	2.5	0.0	1.7	5.8	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.7
Roads	0.0	4.1	1.7	0.5	2.6	6.9	0.1	4.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.7
CPFs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CSs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	0.0	6.6	4.2	0.5	4.3	12.7	0.1	8.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.5
South Area																			
Wells	0.0	31.4	15.7	0.0	33.9	8.3	0.0	9.1	8.3	0.0	0.8	0.0	0.0	0.0	3.3	0.0	0.0	1.7	112.4
Roads	0.0	49.5	9.6	1.1	77.5	13.0	0.0	26.9	12.9	0.0	0.4	0.0	0.0	0.0	2.0	0.0	0.0	0.6	193.5
CPFs	0.0	0.0	6.2	0.0	0.0	12.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2	0.0	0.0	0.0	24.8
CSs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	0.0	80.9	31.5	1.1	111.4	33.6	0.0	36.0	21.1	0.0	1.2	0.0	0.0	0.0	11.5	0.0	0.0	2.3	330.7
Pipeline																			
Pipeline	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	87.5	35.7	1.6	115.7	46.3	0.1	44.1	21.2	0.0	1.2	0.0	0.0	0.0	11.5	0.0	0.0	2.3	367.2

4.5.3 Mitigation

No additional mitigation is recommended.

4.5.4 Unavoidable Adverse Effects

Unavoidable direct and indirect adverse effects would occur under each of the three alternatives. In each case, at least 917 acres of vegetation types would be directly disturbed. The areal extent of disturbance would be greatest with Alternative 1 and smallest with Alternative 3. Furthermore, the acreage that would be disturbed under each alternative would be subject to a higher potential for the invasion of noxious weeds and would require annual attention and, possibly, treatment to prevent the spread of these weeds. Revegetation could take several years to complete.

4.6 RIPARIAN AREAS

4.6.1 Direct and Indirect Effects

4.6.1.1 Alternative 1 — Proposed Action

Under the Proposed Action, approximately one well pad would be placed on private land and three well pads would be placed on public lands in the riparian communities defining Huntington Creek and Cottonwood Creek. Additionally, several access roads and the transmission pipeline would cross riparian areas. One compressor station would be placed very near to a privately-owned portion of the Cottonwood Creek riparian area.

Impacts associated with the placement of these facilities would be both short and long term. Construction of the four well pads, access roads, and transmission pipeline would disturb about 5.5 acres, 2.0 acres, and 2.8 acres of riparian areas, respectively. About half of this disturbance would occur on State and privately-owned lands. Following the successful completion of these wells, part of the pads (about 3.3 acres for the four wells), part of the ROWs for the access roads (about 1.0 acres of the access roads' ROWs), and the ROW for the transmission pipeline would be reclaimed. However, this reclamation would not replace any of the larger trees removed for construction. Thus, these reclaimed areas would not return to a state similar to that present in the existing environment until the new trees had the time to grow and mature, which would be many years after the project's expected life. Additionally, the disturbance would increase the potential opportunities for noxious weeds to move in, which would affect the natural structure of the understory and the diversity native species present in the areas.

Under the Proposed Action, no specific reclamation is proposed for riparian areas that are disturbed by facility placement, and thus it is anticipated that long-term impacts to the Huntington Creek and Cottonwood Creek riparian communities would occur as a result of the project. Long-term impacts to the riparian areas would result primarily as a result of the removal of mature woody over story. Over the 20-year life of the project, this removal of mature trees would change the microclimate (temperature, moisture retention) of the community, modifying the vegetative productivity of the area and hindering the potential recovery of the riparian understory. Furthermore, the associated increase in sedimentation and water temperature brought on by a reduction of vegetation coverage in riparian areas is often associated with the degradation of the a

stream bank. The loss of overstory trees also would have a limited effect on species of wildlife that inhabit riparian areas, especially birds that nest or forage in the overstory that would be removed.

4.6.1.1.1 Electric Power Option

Implementation of the this option would result in minimal additional effects to riparian areas. Disturbance associated with construction of the 94 miles of aboveground power lines located away from access roads may affect minor portions of riparian areas, depending upon the final alignments of the power lines. However, these effects would be limited and probably avoidable with minor relocations of the power lines.

4.6.1.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

Under Alternative 2, disturbances to riparian areas would be slightly less than those expected for the Proposed Action. About 6.4 acres of riparian areas may be affected by the construction of three wells and access roads and 2.8 acres would be affected by the construction of the transmission pipeline. About 2.6 acres of the disturbance would occur on federal lands. Although an environmental protection measure was developed to encourage avoidance of wetlands and riparian areas by avoiding disturbances within 220 feet of streams/riparian areas, the 9.2 acres potentially affected under this alternative may be difficult to avoid. With reclamation of parts of the well pad and road disturbances, the understory on about 5.6 acres of riparian areas disturbed for the construction of the well pad and access roads would be redeveloped. However, the woody species (e.g., cottonwood trees) are unlikely to become reestablished before the end of the project's 20-year life. Thus, the effects of the disturbance would be long term in nature and would affect both the vegetative and wildlife communities.

The indirect effects of implementing this alternative would be similar to those identified for Alternative 1. An increase in the potential for the establishment of noxious weeds would occur and the loss of the overstory may have relatively minor effects on local water quality and wildlife.

4.6.1.2.1 Electric Power Option

Implementation of the this option would result in minimal additional effects to riparian areas. Disturbance associated with construction of the 59 miles of aboveground power lines located away from access roads may affect minor portions of riparian areas, depending upon the final alignments of the power lines. However, these effects would be limited and probably avoidable with minor relocations of the power lines.

4.6.1.3 Alternative 3 — No Action

Under this alternative, only a very small amount of riparian areas (0.1) on federal lands would be affected. Construction of well pads and access roads on privately-owned lands may directly affect about 4.0 acres of riparian areas and construction of the transmission pipeline may directly affect about 2.8 acres of riparian areas. The loss of this acreage of riparian areas would long term in nature, primarily because of the length of time needed to reestablish the woody species.

Although the BLM and Forest Service would have no jurisdiction over the well constructed under this alternative, they assume the other landowners would require reclamation and these efforts would begin the first fall after the well goes into production and continue through the development period and beyond, as necessary. Assuming the disturbances associated with the well pad and roads would be reduced as soon as

the wells are completed and brought on line, reclamation would begin on most (4.5 acres)of the 6.9 acres of riparian areas disturbed under this alternative.

4.6.2 Impacts Summary

All three alternatives would adversely affect riparian areas present in the South Area (no riparian areas are present in the North Area). However, the areal extent of riparian areas affected would range from about 6.9 acres (Alternative 3) to 10.3 acres (Alternative 1). Essentially, the disturbances would be limited to the Huntington Creek and Cottonwood Creek drainages.

4.6.3 Mitigation

Reclamation of roads and facilities that includes planting of seedlings would speed up the reclamation of riparian areas. No additional mitigation is proposed, beyond the avoidance of riparian areas to the extent practical. The essence of this measure is contained in the Environmental Protection Measure for wetlands and riparian areas included under Alternative 2. The application of this measure as mitigation for Alternative 1 also would minimize the adverse effects to riparian areas. This Environmental Protection Measure cannot be added to Alternative 3 as mitigation because the location of almost all the roads and the one well on state and private lands would be determined through negotiations between the landowner and specific company involved.

4.6.4 Unavoidable Adverse Impacts

Unless the BLM is able to move all well pads and access roads outside of riparian areas during the APD process, at least a few acres of riparian areas would be disturbed by construction of each of the three alternatives. The amount of this disturbance may reach as high as about 10.3 acres of riparian areas in the Huntington Creek and Cottonwood Creek drainages.

4.7 WILDLIFE

4.7.1 Introduction

Several direct and indirect effects to aquatic species are of primary concern with natural gas development projects, such as the Ferron Natural Gas Project, and were considered in this analysis. They include changes in the timing and amounts of runoff, increases in sedimentation and concentration of salts of streams, accidental spills of fuels or drilling fluids, and the loss of or reduction in the function of springs or seeps. Increased sedimentation can affect aquatic resources by filling inter-gravel spaces and pool habitats. This filling can reduce available aquatic habitat, thereby reducing spawning habitat, rearing habitat, and macroinvertebrate production (the fishery's primary food supply). Increases in salts can alter the algae and macroinvertebrate composition and, if severe enough, alter the abundance and diversity of fish species. Spills of fuels or drilling fluids could affect the aquatic resource by killing fish and macroinvertebrates. The level and downstream extent of such a kill would depend on the volume spilled, distance the spill occurs from surface water, and the ability of the particular surface water to dilute the spill. The loss of or reduction in function of springs or seeps could reduce the volume of water in the stream or reduce the quality of water downstream of the spring or seep. It also could eliminate the aquatic invertebrates that depend on the system for survival, thereby, eliminating a portion of the adjacent fishery's food supply.

The principal impacts to terrestrial wildlife likely to be associated with the proposed project include: (1) the loss of certain wildlife habitats due to the development of drilling and production operations, (2) habitat fragmentation, (3) the displacement of some wildlife species, (4) an increase in the potential for collisions between wildlife and motor vehicles, and (5) an increase in the potential for illegal kill and harassment of wildlife. The magnitude of impacts to wildlife resources would depend on a number of factors including the type and duration of disturbance, the species of wildlife present, time of year, and implementation of recommended and required mitigative measures. Mule deer and raptors are the wildlife species that would be most adversely affected by the development under all alternatives. Adverse effects are primarily associated with disturbances on, and displacement from winter ranges.

4.7.2 Direct and Indirect Effects

4.7.2.1 Alternative 1 — Proposed Action

4.7.2.1.1 Aquatic Species

As discussed under Water Resources (**Section 4.2**), no substantial long-term, direct or indirect effects to surface water quality are anticipated under this alternative. Similarly, no depletions of surface water are expected. Consequently, long-term, direct or indirect effects to aquatic species caused by adverse changes in the quality or quantity of water in the Project Area's streams also are not expected over the long term.

Although long-term, direct or indirect effects to aquatic species are not anticipated, short-term direct or indirect effects would occur in the South Area and along the corridor for the transmission pipeline. Impacts to the aquatic resources within the North Area would be less than those in the South Area. This is because the Proposed Action has no wells or facilities have been proposed adjacent to perennial streams or 100-year floodplains within the North Area. Five wells are proposed in intermittent or ephemeral channel beds, which would produce substantial sediment loss through those facilities during precipitation events. However, no fish populations occur within the North Area and, as a result, impacts to the fisheries would only occur downstream where fish occur.

Impacts to the aquatic resources in the South Area would be greater than those in the North Area. This is primarily because four existing wells and twelve proposed wells will likely occur in floodplains adjacent to perennial streams in the South Area (which include acreage outside of riparian areas). Furthermore, 17 proposed wells and six existing wells are in the middle of intermittent or ephemeral channel beds in the South Area.

Potential impacts to aquatic resources could result from increased sedimentation, temperature, and potential impacts resulting from spills. Increased sedimentation can affect aquatic resources by filling inter-gravel spaces and pool habitats. This reduces available aquatic habitat, thereby reducing spawning habitat, rearing habitat, and macroinvertebrate production (the fishery's primary food supply). Increases in temperature could affect aquatic resources by altering the algae and macroinvertebrate composition and, if severe enough, altering the fish species abundance and diversity. Spills of fuel or drilling fluids could have an adverse effect to aquatic resources by directly killing fish and macroinvertebrates. The level and downstream extent of impact would be determined by the spill volume, distance from a surface water, and diluting ability of the particular surface water.

The pipeline would cross many ephemeral or intermittent washes and four perennial stream: Ferron, Cottonwood, Huntington, and Miller creeks. Stream sedimentation would exceed typical levels throughout

construction and for several days following installation. Sedimentation loss associated with underground utilities would be similar to those of the pipeline installation except that the right-of-way is only 10 feet rather than 30 feet.

4.7.2.1.2 Terrestrial Wildlife

Under the Proposed Action, 353 production wells and related facilities would be developed and interconnected within the Project Area over a five-year period. This development includes 80 wells within the North Area (15 existing and 65 proposed) and 273 wells in the South Area (53 existing and 220 proposed). The precise number of wells and their exact locations, however, would be determined subsequent to the EIS based on further refinement of environmental and engineering constraints at each site during the APD process as previously discussed in Chapter 1. By combining current approved spacing scenarios with information on existing well locations, the analysis of impacts to wildlife for the proposed project was based on reasonably foreseeable spacing and drilling projections into areas within the North and South project boundaries where the planned production and development activities would likely occur.

Implementation of the proposed 353-well program would result in the direct disturbance of 245 and 1,127 acres of general wildlife habitats in the North and South Areas, respectively, over five years of construction. Additionally, construction of the transmission pipeline would disturb another 261 acres.

During the production phase, the unused portions of well sites would be reclaimed. Following completion of production operations, the well field and ancillary facilities would be reclaimed and abandoned. Well pads would be removed and the areas revegetated with seed mixes approved by the BLM, some of which are specifically oriented to enhance wildlife use. The duration of impacts to vegetation would depend, in part, on the success of mitigation and reclamation efforts and the time needed for natural succession to return revegetated areas to pre-disturbance conditions. Grasses and forbs are expected to become established within the first several years following reclamation, however, an estimated 8 to 20 years would be required for shrub establishment and production of useable forage (Plummer et al. 1968, Environmental Studies Board 1974, Fisser 1981, and Wasser and Shoemaker 1982). Consequently, the disturbance of pinyon-juniper and sagebrush habitats within the Project Area would represent a long-term loss to those species that depend on such vegetation for forage or shelter.

Indirect effects due to displacement of wildlife also would occur, particularly during the construction phase. In response to the increase in human activity, equipment operation, vehicular traffic, and noise, wildlife would avoid or move away from the sources of disturbance to other habitats. This avoidance or displacement would result in under use of the physically-unaltered habitats adjoining the disturbances. The net result would be that the value of the habitats near the disturbances would be decreased, previous distributional patterns would be altered, and the habitats would not support the same level of use by wildlife as before the onset of the disturbance. Additionally, use of other habitats would increase as the animals move away from the disturbances and at least some degree of overuse and degradation of those habitats would occur. The amount of avoidance that would occur would vary by species and individual. The primary concern for displacement effects would be for mule deer and elk, which are discussed below.

The primary concern for displacement effects would be for mule deer and elk. Displacement of big game (mule deer and elk) has been documented by various studies, including Rost and Bailey (1979), Ward et al. (1980), and Lyon (1985) . These studies suggest disturbances associated with human activities and traffic on roads reduces the use of habitats near the activities by deer and elk. The distance the animals in the studies moved away from the disturbances ranges from about 660 feet (200 meters) for deer to more than

2,600 feet (800 meters) for elk. The actual distance the animals moved to avoid vehicular traffic and other human activities was influenced by topography, the presence of vegetation that screened the disturbance, the intensity of the activities or disturbance, speed of traffic, and the amount of out-of-vehicle activity.

Although deer and elk tend to avoid human activities and vehicular traffic, they do adapt to these disturbances to some degree. This is particularly apparent where the disturbances are predictable or constant in occurrence and no out-of-vehicle activity occurs. Additionally, non-migratory and non-hunted populations tend to adapt more readily (herds in the Project Area are migratory and are hunted).

Depending upon the carrying capacity of the habitats and the number of animals involved, displacement would likely result in the under utilization of habitats near the disturbances and overcrowding of habitats into which the animals are displaced. This overcrowding may cause an increase in competition for space and forage, increase in the animals stress, and a decrease in the animals physical condition. Also, winter mortality may increase and successful reproduction may decrease. The effects of displacement would be of greatest concern in the crucial and high priority winter ranges.

4.7.2.1.2.1 Mule Deer

All of the proposed new wells in the North Area would be drilled in crucial winter range or high priority winter range. Forty-six wells would be drilled within crucial winter range. The development of these wells and their associated roads and pipelines would directly disturb approximately 164 acres of crucial winter range, which represents about 1.4 percent of the 11,852 acres of crucial winter range delineated in the North Area. Additionally, the development of the other 19 wells and their associated roads and pipelines would directly disturb about 65 acres of high priority winter range. This accounts for about 1 percent of the 6,611 acres of high priority winter range delineated in the North Area.

An estimated 177 (80 percent) of the 220 new wells proposed for drilling in the South Area would be drilled in crucial winter range or high priority winter range for mule deer. Ninety-nine wells would be drilled within crucial winter range. The development of these wells and their associated roads and pipelines would directly disturb about 500 acres of this crucial winter range, which is less than 2 percent of the 31,290 acres of crucial winter range delineated in the South Area. Another 78 wells would be drilled within high priority winter range and would disturb approximately 390 acres of this range. These wells and their associated roads and pipelines would disturb about 1.5 percent of the 26,124 acres of high priority winter range delineated in the South Area.

Construction of the transmission pipeline would not disturb any mule deer crucial or high priority winter range.

Reclamation efforts would proceed beginning the first fall after wells go into production and continue through the five-year development period and beyond. Such reclamation includes pipeline and utility ROWs, partial restoration of active well pads, and total restoration of abandoned well sites and associated roads. Projected reclamation efforts associated with wells and roads would reduce direct disturbance (short-term) of crucial winter range in the North Area (164 acres) and in the South Area (500 acres) to 90 acres and 269 acres, respectively, over the life of the project. Similarly, reclamation efforts would reduce direct disturbance of high priority winter range in the North Area (65 acres) and in the South Area (390 acres) to 36 acres and 210 acres, respectively, over the life of the project.

Indirect effects to mule deer include displacement of animals from winter range that is not physically disturbed, deer-vehicle collisions, and poaching. Displacement of mule deer has been documented by various studies, including Rost and Bailey (1979), Ward et al. (1980), and Lyon (1985) . These studies suggest disturbances associated with human activities and traffic on roads reduces the use of habitats near the activities by deer. The distance deer in the studies moved away from the disturbances ranged up to about 660 feet (200 meters). The actual distance the animals moved to avoid vehicular traffic and other human activities was influenced by topography, the presence of vegetation that screened the disturbance, the intensity of the activities or disturbance, speed of traffic, and the amount of out-of-vehicle activity. Within the Project Area, agricultural areas in particular would likely experience an increase in use by deer displaced from crucial winter and high priority winter ranges. This displacement could continue longer than the life of the project due to habituation of deer to use of these agricultural areas.

Assuming the use of winter range within 660 feet of the project's facilities would be reduced by some unknown amount, the areal extent of effects would increase from the direct effects described above. In the North Area, proposed facilities would indirectly affect 2,819 acres of crucial winter range and about 1,416 acres of high priority winter range, in addition to the direct disturbance identified above. Thus, directly and indirectly, this alternative may affect about 24 percent of crucial winter range and 22 percent of high priority winter range present within the North Area. In the South Area, the project's facilities would indirectly affect about 7,533 acres of crucial range and 5,972 acres of high priority winter range. When considered with direct effects, about 26 percent of crucial winter range would be directly or indirectly affected over the life of the project. Similarly, about 24 percent of the high priority winter range delineated in the South Area would be affected directly or indirectly for the life of the project. The "loss" of these indirectly-affected acreages may cause the deer to remain on ranges on the Manti-La Sal National Forest later into the winter than the deer may otherwise, which would affect the availability of forage on the Forest. Big game winter range could be fragmented if connections between winter range are disturbed.

Although deer and elk tend to avoid human activities and vehicular traffic, they do adapt to these disturbances to some degree. This is particularly apparent where the disturbances are predictable or constant in occurrence and no out-of-vehicle activity occurs. Use of telemetry by Texaco would reduce the levels of human activities and vehicular traffic in Texaco's portion of the Project Area. Additionally, non-migratory and non-hunted populations tend to adapt more readily (herds in the Project Area are migratory and are hunted).

The direct and indirect disturbances of crucial winter and high priority winter ranges combined with the increase in human activities and vehicular traffic are likely to decrease the ultimate carrying capacity of the Project Area for mule deer. However, the amount of this decrease cannot be projected effectively due to the large number of variables that affect carrying capacity. Depending upon the final degree of this likely decrease in carrying capacity, the UDWR may not be able to attain its current management objectives for the populations of deer in the four herd units that encompass the Project Area. As a consequence, UDWR may not be able to meet its management objectives for harvests in these units.

Although the project is unlikely to affect predators of mule deer presently occupying the Project Area, it could indirectly affect the ultimate size of their future populations. If UDWR cannot attain its management objectives for populations of mule deer in the herd units encompassing the Project Area, the ultimate number of predators supported by mule deer in the Project Area also could be reduced. As a result, the number of predators supported by local populations of mule deer may not grow as much as they might without the project.

Depending upon the carrying capacity of the habitats and the number of animals involved, displacement would likely result in the under utilization of habitats near the disturbances and overcrowding of habitats into which the animals are displaced. This overcrowding may cause an increase in competition for space and forage, increase in the animals stress, and a decrease in the animals physical condition. Also, winter mortality may increase and successful reproduction may decrease. The effects of displacement would be of greatest concern in the crucial and high priority winter ranges.

The potential for vehicle collisions with mule deer, especially during the spring, summer, and fall months, would increase with the creation of 15 and 83 miles of new access roads in the North Area and South Area, respectively. The potential would be highest during construction of the wells due to the larger number of vehicles involved. Although the higher potential would continue throughout all phases of the well operations, it would be at a lower rate.

The short-term influx of temporary construction workers and the long-term increase in the use of the area by gas field employees could increase the potential for poaching and general harassment of mule deer. However, because the companies have committed to not allowing workers to carry firearms in the Project Area and to informing workers of the adverse effects of harassing wildlife, the potential increase in poaching and general harassment would be limited. The potential for poaching and harassment could increase over current conditions with implementation of this alternative.

Public vehicle use on roads built to access gas wells can have a similar, additive, or possibly a synergistic influence on reducing mule deer use of adjacent habitats, as well as causing additional impacts. Public access to isolated road systems in the Project Area increases the potential for poaching and general harassment of deer.

4.7.2.1.2.2 Elk

Under this alternative, an estimated 37 of the 220 proposed wells (17 percent) would be drilled within crucial winter range for elk in the South Area. No crucial or high priority winter ranges have been delineated in the North Area or along the pipeline corridor. The development of these wells along with associated road and pipeline installation would initially disturb an estimated 173 acres of habitats. An additional 13 wells would be drilled in high priority winter range resulting in the disturbance of approximately 34 acres of this range. The remainder of the proposed wells are not in designated elk winter ranges. Following the initial construction period (5 years) and reclamation, disturbance would be reduced to 93 and 19 acres in crucial winter range and high priority winter range, respectively.

Indirect effects to elk include displacement of animals from winter range that is not physically disturbed, elk-vehicle collisions, and poaching. Displacement of elk has been documented by various studies, including Rost and Bailey (1979), Ward et al. (1980), and Lyon (1985) . These studies suggest disturbances associated with human activities and traffic on roads reduces the use of habitats near the activities by elk. The distance elk in the studies moved away from the disturbances ranged up to about 2,600 feet (800 meters). As with deer, the actual distance the animals moved to avoid vehicular traffic and other human activities was influenced by topography, the presence of vegetation that screened the disturbance, the intensity of the activities or disturbance, speed of traffic, and the amount of out-of-vehicle activity.

Assuming the use of winter range within 2,600 feet of the project's facilities would be reduced by some unknown amount, the areal extent of effects would increase from the direct effects described above. Overall, the project's facilities could indirectly affect the entire 8,989 acres of crucial range and 2,980 acres of high

priority winter range delineated in the South Area, depending upon topography and other considerations. The project may indirectly influence the winter ranges on the Forest. As was discussed with mule deer, the "loss" of these indirectly-affected acreages may cause the elk to remain on ranges on the Manti-La Sal National Forest later into the winter than the elk may otherwise, which would affect the availability of forage on the Forest. Big game winter range could be fragmented if connections between winter range are disturbed.

Displacement of the elk from crucial winter range may result in a substantial adverse effect because the number of elk that would be involved is sufficiently large. Within the Project Area, agricultural areas in particular are likely to experience an increase in use by elk displaced from crucial winter and high priority winter ranges. However, vehicle collision and poaching/harassment impacts to elk are expected to be minimal. Limited adverse impacts to elk are expected as a result of direct habitat disturbance under this alternative because of the relatively small total area involved and habitats similar to those impacted are readily available in surrounding areas.

As with mule deer, the direct and indirect disturbances of crucial winter and high priority winter ranges combined with the increase in human activities and vehicular traffic are likely to decrease the ultimate carrying capacity of the Project Area for elk. However, the amount of this decrease cannot be projected effectively due to the large number of variables that affect carrying capacity. Depending upon the final degree of this likely decrease in carrying capacity, the UDWR may not be able to attain its current management objectives for the populations of elk in the herd units that encompass the Project Area. As a consequence, UDWR may not be able to meet its management objectives for harvests in these units.

4.7.2.1.2.3 Antelope

Implementation of this alternative is not expected to result in adverse effects to antelope. Unlike the situation with mule deer and elk, facilities comprising this alternative do not involve any crucial or high priority ranges for antelope. Additionally, the Project Area does not support any populations of antelope.

4.7.2.1.2.4 Raptors

Potential impacts of the Proposed Action on raptors are: (1) territory abandonment, nest desertions and/or reproductive failure caused by project-related disturbance, (2) increased public access and subsequent human disturbance resulting from new road construction, (3) temporary or permanent reductions or changes in prey populations, and (4) increases in the sizes of raptor territories. Based on aerial inventories conducted in the spring of 1997 and 1998, 140 raptor nests were identified within the Project Area.

4.7.2.1.2.4.1 Nesting-Related Impacts

When human activities occur within the zone of influence of raptor nests during the breeding/nesting season, stress from increased human activity and increased noise levels may result in nest abandonment, lowered productivity levels, or abandonment of the entire territory. Potential effects that human disturbance can have on nesting raptors include nest desertion, damage to eggs or young caused by frightened adults, overexposure of eggs or young to heat or cold, missed feedings, premature fledging of young, and possible increased predation (Fyfe and Olendorff 1976). The nest construction and egg laying phases in Buteo nesting cycles are considered to be a very sensitive time for disturbance. Later in the nesting cycle, however, tolerance to humans is much greater (Call 1978). The potential for these impacts would greatest during the construction phase when human activity levels are highest, and would generally decrease during production.

Wells, access roads, or other facilities would be constructed within 0.5 mile of the nest under Alternative 1. No facilities would be constructed within 0.5 mile of a raptor nest in the North Area or along the ROW for the transmission pipeline. With the seasonal restriction (discussed below), breeding birds would not be disturbed.

4.7.2.1.2.4.2 Buffer Zones

Construction activities near active nests in the Project Area would be subject to seasonal restrictions as specified in the management plans and would be protected until raptor use for nesting that season was determined. For purposes of analysis in this EIS, buffer zones extend outward from each nest ½-mile in all directions. However, final shapes of zones would be determined in coordination with USFWS and UDWR on a site-specific basis based on the degree of visual screening associated with each nest. Where there is no visual screening, zone widths are at the ½-mile maximum; where visual obscurity is provided by topography, zone widths could be reduced to something less than ½ mile, if approved by the Authorizing Officer in coordination with the USFWS and UDWR. The exclusionary time window for all species of raptors nesting activities would extend from February 1 through August 15. If no nesting activity is observed by June 1 (after the annual raptor survey is completed), it can be concluded that it is almost certain that the given nest would not be used during the current nesting season and the BLM could authorize construction activities to proceed at such sites.

Once a well is constructed within the buffer zone for a specific nest, various activities would occur irrespective of the nest's occupancy status. The Companies' field personnel would conduct daily well inspections and maintenance on an as-needed basis. The daily disturbance by the field personnel could prevent raptors from utilizing the established nest locations and raptors may abandon the nesting territory altogether. As adjacent habitats become increasingly fragmented due to concentrated well densities in portions of the Project Area, the availability of alternative nest sites could become limited. Maintenance, such as workovers or other activities that involve noisy, heavy equipment or a continuous human presences may result in abandonment of the nest and loss of eggs or young.

According to the radius applied on the raptor nests identified for analysis under this alternative, approximately 22,663 acres in the South Area and 3,407 acres in the North Area (associated with 111 nests and 29 nests, respectively) could be subject to seasonal restrictions (however, all but 81 of these nests do not have any facilities proposed within their 0.5-mile buffer zones). The combined extent of all buffer zones would variously affect an estimated 59 of the 285 proposed well site locations (21 percent) within the Project Area.

4.7.2.1.2.4.3 Prey-Related lmpacts

The development of proposed well pads and associated roads and pipelines within the South Area would initially disturb an estimated 1,633 acres of potential habitats for several species of small mammals that serve as prey items for raptors. This short-term moderate impact would affect approximately 1.5 percent of the Project Area and is not likely to be the determining factor in the level of use the Project Area receives by raptors because the small amount of short-term change in prey base populations is minimal in comparison to the overall status of the rodent and lagomorph cycles, which is controlled over the region and state by natural forces. While prey populations on the Project Area would likely sustain some stress during the initial phase of the project, prey numbers are expected to soon rebound to approximate pre-disturbance levels following reclamation of approximately 50 percent of the total initial disturbance area involving pipelines, unused portions of well pads and roads, and wells that are no longer productive. Although the long-term

disturbance of habitats would be slight, some small changes or shifts in the prey base are likely to occur as a result. These changes or shifts may cause a slight change or shift in the populations of raptors inhabiting the Project Area. However, once reclaimed, the disturbed areas would likely promote a density and biomass of small mammals that is comparable to those of undisturbed areas (Hingtgen and Clark 1984). For these reasons, implementation of the Proposed Action is not expected to produce any appreciable long-term negative changes to the raptor prey base within the Project Area.

4.7.2.1.2.4.4 Other Impacts

The creation of new roads outlined in the Proposed Action would increase public access to areas within the Project Area. As use of the Project Area by both workers and recreationists increases, the potential for encounters between raptors and humans would increase and could result in increased disturbance to nests and foraging areas, vehicle collisions, and shooting incidences.

4.7.2.1.2.5 Upland Game Birds

4.7.2.1.2.5.1 Mourning Dove

Since mourning doves are found on the Project Area it is likely that at least some breeding and nesting activity occurs there. Therefore, there is a possibility that mourning dove nests occur within the 1,633 acres of habitats that would be directly disturbed by the proposed construction. Because of the low density of doves in the area and the availability of comparable habitats in the area, the disturbance of 1,633 acres of possible dove habitat would not be a substantial impact.

4.7.2.1.2.5.2 Ring-necked Pheasant

Because pheasants are found in the Project Area, some breeding and nesting activities likely occur there. Therefore, the possibility exists that nests of ring-necked pheasants occur within the 1,633 acres of habitats that would be disturbed under the Proposed Action. Because of the low density of pheasants in the Area and the availability of comparable habitats in the Area, the disturbance of 1,633 acres of potentially-suitable habitats for ring-necked pheasants would only be a minor effect of the Proposed Action.

4.7.2.1.2.6 Other Species

As discussed in Chapter 3, a variety of other groups of species occur or potentially occur within the Project Area. They include furbearers, predators, small mammals, waterfowl and shorebirds, songbirds, reptiles and amphibians. Implementation of the Proposed Action is likely to displace or remove at least some individuals of species in these groups through the removal of existing habitats during direct disturbance of the 1,633 acres. However, the effects of these displacements and removals are not expected to be substantial or long term because species in these groups are highly mobile or have very high reproductive rates. The highly mobile species would experience displacement and would adjust to the loss of 1,633 acres by moving away from the disturbance. The less mobile species, which usually have higher reproductive rates, would experience the loss of individuals, but would compensate for the loss through their reproductive rates. Overall, these species would experience some reduction in numbers due to the loss of habitats.

4.7.2.1.3 Electric Power Option

Under the Proposed Action, all electric lines would be installed above ground on poles, primarily along existing and new roads. The installation of electric power above ground lines would have few effects on terrestrial wildlife. The primary concerns involve birds in general and raptors specifically. The power lines would pose a hazard to birds flying by and could pose an electrocution hazard to raptors. Some birds would likely not see the conductors suspended between poles and fly into them resulting in some undeterminable number of deaths annually. Electrocution is a well documented source of mortality for raptors and most electrocutions involve electric distribution lines rather than high-voltage transmission lines (Avian Power Line Interaction Committee [APLIC] 1996). However, the potential for electrocution would be minimized because any power lines installed for this project would be designed using the Suggested Practices for Raptor Protection on Powerlines: the State of the Art in 1996 (APLIC 1996).

4.7.2.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

This alternative would incorporate very similar construction and operational components as the Proposed Action with additional environmental protection measures applied to those actions taking place on federal lands. Although levels of direct surface disturbance would be nearly the same as those under the Proposed Action, overall indirect impacts to wildlife and their habitats under Alternative 2 would be lower than those resulting from the Proposed Action. Resource-specific protection measures are described in detail in Chapter 2. These protection measures can be classified into three general categories as either exclusionary stipulations, avoidance stipulations, or timing stipulations.

Exclusion Areas. An exclusion stipulation is intended for use only when other stipulations are determined insufficient to adequately protect specific resources. Exclusion means no surface occupancy that would prevent well pads, roads, and/or ancillary facilities from being constructed in specific areas. Preclusion of oil and gas activities would be limited to slopes >25 percent, road grades in excess of 15 percent on critical soils, and zones around active raptor nests.

Avoidance Areas. An avoidance stipulations are intended for use when gas development activities are generally allowed on all or portions of the lease year-round, but because of special values, or resource concerns, lease activities must be strictly controlled. These stipulations would require careful siting of facilities and operating practices to minimize adverse effects. The primary example of this category of stipulation is the wildlife corridors resource protection measure.

Timing Limitations. Timing limitation stipulations would limit surface use during a prescribed period of time on all or a portion of the lease. Although surface disturbance and direct habitat loss would still occur, indirect impacts such as reduced habitat effectiveness and displacement would be greatly reduced. Direct loss of habitat would not be reduced.

4.7.2.2.1 Aquatic Species

The effects to aquatic species with implementation of this alternative would be slightly less than those described for Alternative 1. The primary difference between this alternative and Alternative 1 is the slight reduction in the potential for sedimentation of Cottonwood Creek. Due to environmental protection measures for the peregrine falcon (discussed below), six wells along Cottonwood Creek near the western boundary of the South Area would not be drilled under this alternative. Other than this slight reduction in the potential

for sedimentation of Cottonwood Creek, the effects of this alternative on aquatic species would be the same as those identified for Alternative 1.

4.7.2.2.2 Terrestrial Wildlife

Alternative 2 would impose similar levels of impact to terrestrial wildlife that are expected to occur during the short-term as those under the Proposed Action because traffic volumes, workforce numbers, and projected levels of surface disturbance would be similar. However, under this alternative, activities in wildlife habitats would be limited by stipulations specific to additional resource protection measures. Each of the measures is discussed below with the species to which it applies.

4.7.2.2.2.1 Mule Deer

As with Alternative 1, project facilities would be constructed in crucial and high priority winter ranges. All of the proposed new wells in the North Area would be drilled in crucial winter range or high priority winter range. Forty-three wells would be drilled within crucial winter range. The development of these wells and their associated roads and pipelines would directly disturb approximately 122 acres of crucial winter range, which represents about 1.0 percent of the 11,852 acres of crucial winter range delineated in the North Area. Additionally, the development of the other 18 wells and their associated roads and pipelines would directly disturb about 79 acres of high priority winter range. This accounts for about 1.2 percent of the 6,611 acres of high priority winter range delineated in the North Area.

In the South Area, initial disturbance for construction would involve 93 wells and about 435 acres of crucial winter range and 70 wells and 305 acres of high priority winter range. These acreages, which are only slightly less than those that Alternative 1 would disturb, account for less than 2 percent of the 31,290 acres of crucial winter range delineated in the South Area and about 1.2 percent of the 26,124 acres of high priority winter range delineated in the South Area.

Reclamation efforts would proceed beginning the first fall after wells go into production and continue through the five-year development period and beyond. Such reclamation includes road ROWs, pipelines and utility ROWs, partial restoration of active well pads, and total restoration of abandoned well sites and associated roads. Projected reclamation efforts associated with wells and roads would reduce direct disturbance (short-term) of crucial winter range in the North Area (122 acres) and in the South Area (435 acres) to 68 acres and 234 acres, respectively, over the life of the project. Similarly, reclamation efforts would reduce direct disturbance of high priority winter range in the North Area (79 acres) and in the South Area (305 acres) to 43 acres and 165 acres, respectively, over the life of the project.

Under Alternative 2, a timing limitation stipulation would be applied to all big game crucial and high priority winter range habitat. This would limit construction of facilities during the November 30 to April 15 critical wintering period for mule deer. Additionally, gates would be installed at selected locations to close areas of crucial and high priority winter ranges from vehicle access during this same period. These limitations would ensure deer occupying the crucial and high priority winter ranges would not be needlessly disturbed during their time on the winter ranges, which is when the animals are subject to the highest physiological stresses.

An additional environmental resource protection measure directed at protecting deer on their winter ranges identified big game wildlife corridors. New project-related disturbances within these drainages and critical areas would be avoided and where the disturbances cannot be avoided, their locations would be selected to

minimize environmental effects and maximize the maintenance of the corridor as a single unit. These corridors would connect big game winter range and reduce fragmentation of the winter habitat.

The re-establishment of crucial and high priority winter range would be an on-going process throughout the life of the well field and would, over time, replace lost acreage. However, under natural succession an estimated 8 to 20 years would be required for shrub reestablishment and production of usable forage. Reclamation rates would be accelerated under this alternative by the hand planting of seedling brouse plants and use of seedling protectors.

To offset direct impacts to crucial and high priority mule deer winter range that would be eliminated and disturbed by the construction and operation of wells and roads within these habitats, enhancement of an equivalent acreage of adjacent habitats should be completed, commensurate with the surface-disturbing activities, as identified in the governing land use plans. This planning provision could be satisfied by providing a monetary contribution into a dedicated account managed by the National Fish and Wildlife Foundation, under provisions of an agreement among the BLM, UDWR, and Companies. The mitigation would involve a one time payment of $1,301.26 (1998 dollars) per well on federal surface and/or subsurface ownership in all high priority or crucial big game winter range in the Project Area. Funds accumulated in this account would be used to enhance additional habitats within the herd units that would directly benefit big game and other wildlife species. Payment would be made to this fund for about 100 new wells (42 in the North Area and 58 in the South Area.

The analysis of potential indirect impacts to big game due to displacement, vehicle collisions, and poaching/ harassment are similar to those presented under the Proposed Action, but would be reduced due to implementation of the Environmental Protection Measures. In the North Area, proposed facilities would indirectly affect 2,283 acres of crucial winter range and about 1,251 acres of high priority winter range, in addition to the direct disturbance identified above. Thus, directly and indirectly, this alternative may affect about 20 percent of crucial winter range and 20 percent of high priority winter range present within the North Area. In the South Area, the project's facilities would indirectly affect about 6,378 acres of crucial range and 4,704 acres of high priority winter range. When considered with direct effects, about 22 percent of crucial winter range would be directly or indirectly affected over the life of the project. Similarly, about 19 percent of the high priority winter range delineated in the South Area would be affected directly or indirectly for the life of the project. The "loss" of these indirectly-affected acreages may cause the deer to remain on ranges on the Manti-La Sal National Forest later into the winter than the deer may otherwise, which would affect the availability of forage on the Forest. Big game winter range could be fragmented if connections between winter range are disturbed.

Additionally, the gating and closure of selected roads in big game winter range habitat would reduce the potential for adverse affects from disturbances and collisions in those areas.

4.7.2.2.2.2 Elk

Under Alternative 2, a timing limitation stipulation would be applied to all big game crucial and high priority winter range habitat. This would limit construction of facilities during the November 30 to April 15 critical wintering period for elk. The development of Alternative 2 would initially disturb an estimated 172 acres of crucial winter range. In addition, wells drilled in high priority winter range would result in the disturbance of approximately 24 acres of this range. The remainder of the proposed wells are not in designated elk winter ranges. Following the initial construction period and reclamation, disturbance would be reduced to 93 and 14 acres in crucial winter range and high priority winter range, respectively.

The analysis of potential impacts to elk due to displacement, vehicle collisions, and poaching/ harassment would be nearly the same as those presented under the Proposed Action except for the fact that the potential for impacts under Alternative 2 is reduced from that under the Proposed Action, since ten wells and their access roads would not be developed due to restrictions associated with other resources. In addition, the gating and closure of selected roads in big game winter ranges, application of wildlife corridors, and consideration of remote monitoring would reduce the potential for adverse affects from disturbance and collisions in those areas. Thus, about 8,482 acres of crucial winter range and 2,529 acres of high priority winter range would be affected indirectly.

4.7.2.2.2.3 Raptors

The types of potential nesting-related effects of Alternative 2 on raptors would be similar to those described for the Proposed Action, with one primary exception As described in Chapter 2, this alternative would provide continuous protection to active raptor nests and nesting habitat rather than protecting nesting raptors only during the nesting season. Under Alternative 2, stipulations specifying a seasonal ½-mile buffer would be expanded to a year-round ½-mile buffer for all nests active during at least one of the previous three years.

Buffers around active raptor nests provide insulation from facilities, human activity, and altered habitat. Buffer size and dates may vary, however, as determined by the BLM (in coordination with the USFWS' draft guidelines for raptor protection (USFWS 1998b) and UDWR, depending on the status of current use, species involved, and the arrangement and size of natural topographic barriers. The application of these spatial and temporal buffer zones to raptor nests under the Proposed Action would provide insulation from facilities, human activity, and altered habitat on a season by season basis, but would not provide long-term protection. An inherent problem with the seasonal buffer zone concept is that it only protects nesting raptors during the nesting season prior to or during the construction phase(s) of the project. Continuous protection of raptor nests and nesting habitat is not provided, since facilities may be constructed near formerly productive nests outside of the exclusionary period. Once facilities are established in an area, raptors may be deterred from using these nest sites again during subsequent breeding seasons. If the disturbance is sufficiently high, the birds may abandon their territory altogether. As adjacent habitats become increasingly fragmented due to concentrated well densities in portions of the Project Area, the availability of alternative nest sites could become limited. For these reasons, the implementation of temporal and spatial buffer zones alone, may not be enough to sufficiently offset impacts to local raptor populations under the Proposed Action.

According to the radius applied on the 140 raptor nests identified for analysis under this alternative, approximately 22,663 acres in the South Area and 3,407 acres in the North Area would be excluded from future development of surface facilities.

The application of the year-round ½-mile buffer zone, could eliminate as many as ten wells from development because they would be within ½ mile of a raptor nest (if the nests are active at least one of the previous three years before construction occurs). All other facilities were moved to avoid the ½-mile buffer zones around known raptor nests. Construction of the transmission pipeline would be limited by seasonal restrictions along those portions of the pipeline corridor extending into the Price CBM Project Area.

With regard to opportunities for raptors to hunt, potential impacts resulting from Alternative 2 would be less than described for the Proposed Action in that much of the available hunting habitat would be covered by other stipulations. For the same reasons as described under the Proposed Action, implementation of this alternative is not expected to appreciably affect populations of small mammals that serve as prey for raptors within the Project Area.

The analysis of potential impacts to raptors due to increased public access and potential for electrocution are identical to those presented under the Proposed Action except for the fact that the potential for impacts under Alternative 2 is substantially lower than for the Proposed Action, because there would be no new development of facilities or roads within ½-mile of an active nest.

4.7.2.2.2.4 Upland Game Birds

4.7.2.2.2.4.1 Mourning Dove

The analysis for this alternative is identical to that presented under the Proposed Action except for the fact that the potential for impacts under Alternative 2 is proportionately lower than for the Proposed Action, because nesting habitats within some of the acreage that would be disturbed under Alternative 1 would be avoided.

4.7.2.2.2.4.2 Ring-necked Pheasant

Because pheasants are found in the Project Area, some breeding and nesting activities likely occur there. Therefore, the possibility exists that nests of ring-necked pheasants occur within the 1,472 acres of habitats that would be disturbed under this alternative. Because of the low density of pheasants in the Area and the availability of comparable habitats in the Area, the disturbance of 1,472 acres of potentially-suitable habitats for ring-necked pheasants would only be a minor effect of the implementing Alternative 2.

4.7.2.2.2.5 Other Species

As discussed in Chapter 3, a variety of other groups of species occur or potentially occur within the Project Area. They include furbearers, predators, small mammals, waterfowl and shorebirds, songbirds, reptiles and amphibians. Implementation of Alternative 2 is likely to displace or remove at least some individuals of species in these groups through the removal of existing habitats during direct disturbance of the 1,472 acres. However, the effects of these displacements and removals are not expected to be substantial or long term because species in these groups are highly mobile or have very high reproductive rates. The highly mobile species would experience displacement and would adjust to the loss of 1,472 acres by moving away from the disturbance. The less mobile species, which usually have higher reproductive rates, would experience the loss of individuals, but would compensate for the loss through their reproductive rates. Overall, these species would experience some reduction in numbers due to the loss of habitats.

4.7.2.2.3 Electric Power Option

Under Alternative 2, about 97 miles of electrical power lines would be installed above ground on poles, primarily along existing and new roads. The rest of the power lines (73 miles) would be buried. As discussed under Alternative 1, the installation of electric power above ground lines would have few effects on terrestrial wildlife. The primary concerns involve birds in general and raptors specifically. The power lines would pose a hazard to birds flying by and could pose an electrocution hazard to raptors. Some birds would likely not see the conductors suspended between poles and fly into them resulting in some undeterminable number of deaths annually. Electrocution is a well documented source of mortality for raptors and most electrocutions involve electric distribution lines rather than high voltage transmission lines (APLIC 1996). However, the potential for electrocution would be minimized because any power lines installed for this project would be designed using the Suggested Practices for Raptor Protection on Powerlines: the State of the Art in 1996 (APLIC 1996). The burial of 73 miles of power lines is not likely to substantively affect

wildlife because the burial would occur along existing and proposed roads. Thus, the installation of buried power lines would not affect a large amount of habitats.

4.7.2.3 Alternative 3 — No Action

4.7.2.3.1 Aquatic Species

Under the No Action Alternative, no additional natural gas drilling would occur on federal land but drilling would likely still occur on State and private land. This would result in 222 total wells (including the 68 existing wells) and associated facilities, compared with 353 or 335 total wells for alternatives 1 and 2, respectively.

The potential for impacts to aquatic species from this alternative would be lower than alternatives 1 and 2 because of the lack of development on federal lands. However, because the State and private lands contain most of the wells proposed near perennial streams, the potential impacts would not be reduced substantially compared with the other two alternatives. That is, the level of impact reduction would not be reduced in direct proportion to the reduction in number of wells.

4.7.2.3.2 Terrestrial Wildlife

Implementation of the No Action alternative would result in fewer adverse effects to terrestrial wildlife than either Alternatives 1 or 2. None of the unconstructed facilities (wells, roads, compressors, and other ancillary facilities) comprising the project under Alternatives 1 or 2 that would involve federal lands would be constructed. Therefore, none of the effects associated with these facilities would occur. A total of 222 wells would be constructed under this alternative, which is less than the 353 or 335 wells that would be constructed under Alternative 1 or Alternative 2, respectively.

However, additional effects would occur with the 155 wells that could still be constructed on private and state lands. Overall, this alternative would disturb about 916 acres of habitats. The effects associated with the disturbance of this acreage would be similar to those described under alternatives 1 and 2.

4.7.2.3.2.1 Mule Deer

Implementation of the No Action Alternative would affect mule deer. However, the effects would be less than those associated with either Alternative 1 or Alternative 2. Of the 19 wells that would be constructed in the North Area under this alternative, eight would be in mule deer crucial winter range. Thus, about 24 acres (<1 percent) of the total crucial winter range delineated in the North Area would be disturbed. The remaining 11 wells and their associated roads and utilities would be constructed in mule deer high priority winter range, which would involve about 43 acres (<1 percent) of the 6,611 acres of high priority winter range delineated in the North Area.

Within the South Area, 106 of the 136 wells that would be constructed under this alternative would involve mule deer crucial winter range or mule deer high priority winter range. Sixty-nine wells and their associated access roads would be constructed in crucial winter range, which would involve about 307 acres (1 percent) of the 31,290 acres of crucial winter range delineated in the South Area. Thirty-seven wells would be constructed in high priority winter range. These wells and their associated roads and utilities would disturb about 122 acres (<1 percent) of the 26,124 acres of high priority winter range delineated in the South Area.

Although the BLM and Forest Service would have no jurisdiction over the 155 wells constructed under this alternative, it is assumed reclamation efforts would proceed beginning the first fall after wells go into production and continue through the development period and beyond. Using the same assumptions about reclamation applied to alternatives 1 and 2, long-term disturbance of crucial and high priority winter ranges in the South Area after the first five years would be reduced to 233 acres, on which on-going project activities would remain throughout the 20-year life of production. In contrast, long-term disturbance in the North Area would be reduced to about 88 acres.

In the North Area, proposed facilitites would indirectly affect 2,283 acres of crucial winter range and about 1,251 acres of high priority winter range, in addition to the direct disturbance identified above. Thus, directly and indirectly, this alternative may affect about 20 percent of crucial winter range and 20 percent of high priority winter range present within the North Area. In the South Area, the project's facilities would indirectly affect about 4,707 acres of crucial range and 2,137 acres of high priority winter range. When considered with direct effects, about 16 percent of crucial winter range would be directly or indirectly affected over the life of the project. Similarly, about 9 percent of the high priority winter range delineated in the South Area would be affected directly or indirectly for the life of the project.

4.7.2.3.2.2 Elk

Implementation of the No Action alternative also would affect elk and as with mule deer, the effects would be less than those associated with alternatives 1 or 2. Within the South Area, 46 of the 136 wells that would be constructed would involve elk crucial winter range or elk high priority winter range. Thirty-six wells would be constructed in crucial winter range, which would involve about 156 acres (about 1 percent) of the 16,410 acres of crucial winter range delineated in the South Area. Ten wells would be constructed in high priority winter range. These wells and their associated roads and utilities would disturb about 23 acres (0.3 percent) of the 7,940 acres of high priority winter range delineated in the South Area. Long-term disturbance of crucial and high priority winter ranges in the South Area after the first five years would be reduced to about 97 acres, on which on-going project activities would remain throughout the 20-year life of production.

The potential impacts to elk due to displacement, vehicle collisions, and poaching/ harassment would be less than those presented under the alternatives 1 and 2 due to the fewer number of wells that would be developed. About 7,920 acres of crucial winter range and 2,176 acres of high priority winter range would be affected indirectly.

4.7.2.3.2.3 Raptors

Twenty-two of the 155 wells that would be constructed under this alternative may occur within the ½-mile of a known raptor nest. Nineteen of the nests are in the South Area and three are in the North Area. Because the seasonal buffers would not apply under this alternative, these nests could be adversely affected and possibly abandoned if the companies construct facilities within ½ mile of the nests, especially if that construction occurs during the nesting season.

4.7.2.3.2.4 Upland Game Birds

4.7.2.3.2.4.1 Mourning Dove

The analysis for this alternative is identical to that presented under alternatives 1 and 2, except for the fact that the potential for impacts under Alternative 3 is proportionately lower because nesting habitats on federal lands would be avoided.

4.7.2.3.2.4.2 Ring-necked Pheasant

Because pheasants are found in the Project Area, some breeding and nesting activities likely occur there. Therefore, the possibility exists that nests of ring-necked pheasants occur within the 917 acres of habitats that would be disturbed under this alternative. Because of the low density of pheasants in the Area and the availability of comparable habitats in the Area, the disturbance of 917 acres of potentially-suitable habitats for ring-necked pheasants would only be a minor effect of the implementing Alternative 3.

4.7.2.3.2.5 Other Species

As discussed in Chapter 3, a variety of other groups of species occur or potentially occur within the Project Area. They include furbearers, predators, small mammals, waterfowl and shorebirds, songbirds, reptiles and amphibians. Implementation of Alternative 3 is likely to displace or remove at least some individuals of species in these groups through the removal of existing habitats during direct disturbance of the 917 acres. However, the effects of these displacements and removals are not expected to be substantial or long term because species in these groups are highly mobile or have very high reproductive rates. The highly mobile species would experience displacement and would adjust to the loss of 917 acres by moving away from the disturbance. The less mobile species, which usually have higher reproductive rates, would experience the loss of individuals, but would compensate for the loss through their reproductive rates. Overall, these species would experience some reduction in numbers due to the loss of habitats.

4.7.3 Impacts Summary

All three of the alternatives would involve similar types of effects. However, the magnitude of the effects would vary according to the number and distribution of facilities. All alternatives would involve construction of facilities within crucial and high priority winter ranges for mule deer and elk. Effects to elk and deer would occur from disturbance of habitats during construction, long-term occupancy of habitats by facilities, increased human presence and activities, increased public use of the expanded road network, and higher potential for animal-vehicle collisions.

All alternatives also would involve the construction of facilities within active raptor territories. The construction of these facilities and associated long-term occupancy of parts of territories would affect the foraging opportunities that exist on those territories. Also, the nests would be exposed to various effects, depending upon the alternative. Alternative 2 includes a year-round restriction on the construction of surface facilities within ½ mile of a nest active during at least one of the three previous years. Alternative 2 includes a seasonal restriction from constructing within ½ mile of an active raptor nest during the breeding season. Since Alternative 3 has no development of federal land, no seasonal or surface restrictions on the construction of facilities near a raptor nest would be applied.

Other species of aquatic and terrestrial wildlife present in the Project Area would experience varying degrees of effects from the implementation of the alternatives. These effects include the loss of habitats, displacement from presently-occupied habitats, and the loss of some individuals. Successful reclamation would minimize these effects.

With the electric power options for alternatives 1 and 2, additional disturbance would be minor. Also, the power lines would be constructed according to the APLIC's guidelines. Thus, the potential for electrocuting raptors would be minimized.

4.7.4 Mitigation

Elimination of loop routes to access a well would reduce human disturbance. The Companies could help reduce impacts to wildlife by not allowing the discharge of firearms by on-duty employees and contractors and by not allowing harassment of wildlife by employees and contractors. Scheduling routine, non-emergency visits to project facilities to avoid the low-light periods of sunrise and sunset also would help reduce effects to big game during the critical winter period.

4.7.5 Unavoidable Adverse Effects

Unavoidable adverse effects vary with the alternative considered. Under Alternative 1, unavoidable adverse effects would include the direct loss of aquatic habitats; loss of mule deer and elk crucial and high priority winter range habitats; the displacement of deer and elk from crucial and high priority winter ranges; reduced carrying capacity of mule deer and elk winter ranges in the Project Area for the life of the project and beyond; increased potential for wildlife-vehicle-related mortalities and poaching; and nest desertions and/or reproductive failures for raptors as a result of human disturbances in the vicinities of nests. With Alternative 2, unavoidable adverse impacts would be similar, but substantially less. Adverse impacts would be expected to aquatic habitats, big game habitats, big game populations, deer and elk carrying capacity and a reduction in raptor nesting in areas where mitigation via the environmental protection measures is not incorporated. Alternative 3 adverse impacts would be similar to those described for Alterative 1, but proportionately less.

4.8 SPECIAL-STATUS SPECIES

As discussed in Chapter 3 (**Section 3.8**), 53 species that have a special-status designation have at least some potential to occur in the Project Area. They include species of plants, reptiles, fish, birds, and mammals (**Table 4–12**).

Table 4–12
Summary of Direct and Indirect Effects to Special-status Species

	Alternative					
	1 — Proposed Action		2		3 — No Action	
Species	North Area[1]	South Area[1,2]	North Area	South Area	North Area	South Area
Barneby reed-mustard	UAA	UAA	UAA	UAA	UAA	UAA
Jones cycladenia	UAA	UAA	UAA	UAA	UAA	UAA
Last chance townsendia	UAA	UAA	UAA	UAA	UAA	UAA
San Rafael cactus	UAA	UAA	UAA	UAA	UAA	UAA
Winkler cactus	UAA	MAA	UAA	UAA	UAA	UAA
Wright fishhook cactus	UAA	UAA	UAA	UAA	UAA	UAA
Creutzfeldt-flower	UAIH	MAIH	UAIH	MAIH	UAIH	UAIH
Low hymenoxys	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Canyon sweetvetch	UAIH	MAIH	UAIH	MAIH	UAIH	MAIH
Silver milkvetch	MAIH	MAIH	MAIH	MAIH	UAIH	UAIH
Mussentuchit gilia	MAIH	MAIH	MAIH	MAIH	UAIH	UAIH
Psoralea globemallow	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Utah milk snake	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Bonytail chub	UAA	UAA	UAA	UAA	UAA	UAA
Colorado pikeminnow	UAA	UAA	UAA	UAA	UAA	UAA
Humpback chub	UAA	UAA	UAA	UAA	UAA	UAA
Razorback sucker	UAA	UAA	UAA	UAA	UAA	UAA
Roundtail chub	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Flannelmouth sucker	UAIH	MAIH	UAIH	MAIH	UAIH	UAIH
Bluehead sucker	UAIH	MAIH	UAIH	MAIH	UAIH	UAIH
Colorado River cutthroat trout	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
White-faced ibis	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Osprey	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH

Table 4–12 (continued)
Summary of Direct and Indirect Effects to Special-status Species

	Alternative					
	1 — Proposed Action		2		3 — No Action	
Species	North Area[1]	South Area[1,2]	North Area	South Area	North Area	South Area
Northern goshawk	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Ferruginous hawk	UAIH	MAIH	UAIH	MAIH	UAIH	UAIH
Swainson's hawk	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Northern harrier	MAIH	MAIH	MAIH	MAIH	MAIH	MAIH
Bald eagle	UAA	UAA	UAA	UAA	UAA	UAA
Peregrine falcon	UAA	UAA	UAA	UAA	UAA	UAA
Snowy plover	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Mountain plover	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Long-billed curlew	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Black tern	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Caspian tern	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Yellow-billed cuckoo	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Short-eared owl	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Burrowing owl	UAIH	MAIH	UAIH	MAIH	UAIH	UAIH
Bewick's wren	MAIH	MAIH	MAIH	MAIH	MAIH	MAIH
Loggerhead shrike	MAIH	MAIH	MAIH	MAIH	MAIH	MAIH
Common yellowthroat	UAIH	MAIH	UAIH	MAIH	UAIH	UAIH
Yellow-breasted chat	UAIH	MAIH	UAIH	MAIH	UAIH	UAIH
Grasshopper sparrow	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Lark bunting	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Brewer's sparrow	MAIH	MAIH	MAIH	MAIH	UAIH	UAIH
Dwarf shrew	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH

Table 4–12 (continued)
Summary of Direct and Indirect Effects to Special-status Species

	Alternative					
	1 — Proposed Action		2		3 — No Action	
Species	North Area[1]	South Area[1,2]	North Area	South Area	North Area	South Area
Spotted bat	UAIH	MAIH	UAIH	MAIH	UAIH	UAIH
Small-footed myotis	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Fringed myotis	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Townsend's big-eared bat	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Big free-tailed bat	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Brazilian free-tailed bat	UAIH	UAIH	UAIH	UAIH	UAIH	UAIH
Ringtail	UAIH	MAIH	UAIH	MAIH	UAIH	UAIH
Black-footed ferret	UAA	UAA	UAA	UAA	UAA	UAA

Notes:
1. UAA = Implementation of the alternative is unlikely to adversely affect this listed species.
MAA = Implementation of the alternative may adversely affect this listed species.
UAIH = Implementation of the alternative is unlikely to affect individuals or habitats occupied or potentially occupied by the species.
MAIH = Implementation of the alternative may affect individuals or habitats occupied or potentially occupied by the species, but would not likely contribute to a trend towards Federal listing or loss of viability of the population or species.
2. South Area includes the corridor for the gas transmission pipeline.

4.8.1 Direct and Indirect Effects

4.8.1.1 Alternative 1 — Proposed Alternative

4.8.1.1.1 Plant Species

Implementation of this alternative is not expected to result in substantive adverse effects to any of the 13 species of special-status plants considered in this analysis. Of the seven species listed as threatened or endangered or proposed for listing as endangered, only the Winkler cactus is known to occur in the Project Area. Although limited amounts of potentially-suitable habitats exist in the Project Area for the other six species, no occurrences of these species have been recorded. Thus, implementation of this alternative is unlikely to adversely affect any of these species.

Five locations for well pads have been sited near existing populations of the Winkler cactus in the South Area. Additionally, about 1,800 feet of access roads actually cross habitats for the cactus, the potential for direct adverse effects exists. Based on the 1997 surveys, construction of the access roads as proposed would directly disturb about 3.2 acres of habitats known to be occupied by the cactus. However, the BLM, in coordination with the USFWS, would require clearance surveys of all well pads, access roads, and pipeline corridors that cross known, suitable, or potentially-suitable habitats for the Winkler cactus on Federal lands before construction could begin. Surveys are difficult because of the cactus' unusual habit of shrinking underground during periods of unfavorable weather. Consequently, the Winkler cactus surveys can only be done from April 15 to May 1 during its flowering period.

If the surveys locate any plants, locations of the facilities would be changed to avoid disturbing the plants. This procedure has worked quite successfully in this general area and other areas. Thus, although the potential exists for direct adverse effects to the Winkler cactus in the South Area only, results of the clearance surveys and subsequent mitigation, such as relocating well pads or roads, would minimize adverse effects occur on Federal lands in the Project Area (**Table 4–12**). Because the BLM should be able to reroute the 1,800 feet of access roads around occupied habitats, implementation of this alternative is not expected to cause adverse effects to the known locations of Winkler cactus.

Implementation of the Proposed Action also would have limited potential to adversely affect several of the other special-status plants where potentially-suitable habitats may be disturbed. Of primary concern would be the locations of known populations of Creutzfeldt-flower and canyon milkvetch. Proposed locations for six well pads and about 6,120 feet of access roads have been sited in or near known existing populations of the Creutzfeldt-flower. If constructed as proposed, these facilities would disturb about 19 acres of habitats occupied by the Creutzfeldt-flower. However, as with the cactus, the BLM would require clearance surveys of well pads, access roads, and pipeline corridors that would cross known, suitable, or potentially-suitable habitats for the Creutzfeldt-flower or canyon milkvetch on Federal lands. If the surveys locate any plants, locations of the facilities may be relocated to avoid disturbing the plants or limiting the number of plants disturbed. Thus, the unlisted species of special-status plants may experience direct affects to individuals or habitats occupied or potentially-occupied by the species. However, implementation of the alternative would not likely contribute to a trend towards Federal listing or loss of viability of any populations or species.

The Proposed Action has a slight potential to indirectly affect special-status plant species present in the Project Area. Surface disturbances proposed by the project would disturb an average of 20 acres per section. Although localized, this disturbance would extend over a substantial portion of western Castle Valley in the South Area. As a consequence, the potential for noxious weed encroachment into the valley would increase.

The Proposed Action also would increase accessibility to more remote areas of western Castle Valley. Access roads to well pads would cross through several populations of Creutzfeldt-flower and Winkler cactus. Because these roads may be used by the public, they would increase the potential for several recreational-related impacts. For example, the roads would open up areas to all-terrain vehicle use, which has been known to severely affect the viability of populations of special-status plants. Also, the increased accessibility would increase the potential for collection by the public.

4.8.1.1.2 Wildlife Species

Implementation of the Proposed Action is expected to have limited direct and indirect effects on special-status species of wildlife (**Table 4–12**). The primary special-status species of concern are the bald eagle and peregrine falcon, which are listed as threatened and endangered, respectively. Because the territory of a pair of bald eagles encompasses parts of the South Area, the Proposed Action may cause the eagles to alter their patterns of foraging within the South Area (they feed on prairie dogs, coots, and other animals when they are on their territory). Although the birds may alter their patterns of foraging, implementation of this alternative is unlikely to cause them to abandon their territory or the parts of the territory within the South Area. Thus, implementation of this alternative overall is likely to affect, but not adversely affect, the bald eagle.

As proposed, a portion of the transmission pipeline would be constructed within 1.5 to 2 miles of the bald eagle's nest. However, construction of this segment of the pipeline is not expected to adversely affect the nest. Human activities associated with construction would be short-term in nature at this location. Additionally, Highway 10 and other human activities and man-made disturbances would occur between the pipeline and the nest. Because the pipeline's ROW would be more than one mile from the eagles' nest and the eagles tolerate the other disturbances and activities present within that 1-mile buffer zone, the short-term construction activities are not expected to affect the nest or the birds.

The peregrine falcon also is not expected to experience adverse direct or indirect effects under this alternative. The falcon aeries would not be affected by the activities comprising this alternative. The 1-mile buffer zone in combination with the aeries' locations would provide sufficient protection for the birds. Additionally, the falcons' hunting habitats are widespread on BLM-administered lands and National Forest System lands. Consequently, implementation of the Proposed Action is unlikely to adversely affect the peregrine falcon. Additionally, about 1,300 acres in the South Area and 500 acres in the North Area would be excluded from surface occupancy by the Companies as a result of the expanded 1-mile buffer zone for the peregrine falcon aeries, assuming they are active least one of the previous three years before construction occurs.

Some of the other special-status species of wildlife may experience limited effects from the implementation of this alternative (**Table 4–12**). Potentially-suitable habitats for some species would be disturbed for the long-term. However, most of the vegetation types disturbed by project-related activities would be those that are widely distributed and available throughout both the North Area and South Area. Disturbances to the more limited vegetation types, such as riparian areas, wetlands, mountain fir, spruce-fir, and ponderosa pine-mountain shrub, would be minor, if any. Additionally, the nests of the northern goshawk, ferruginous hawk, and Swainson's hawk would be surrounded by a seasonal buffer that would provide protection to the young-of-the-year. However, the nest could be abandoned in subsequent years as a result of project activities within ½ mile of the nest.

Overall, implementation of the Proposed Action is unlikely to affect individuals or habitats occupied or potentially occupied by special-status species with only very limited potentially-suitable habitats present in

the Project Area (**Table 4–12**). The Proposed Action may affect individuals or habitats occupied or potentially occupied by other species, such as the loggerhead shrike (**Table 4–12**). However, it would not likely contribute to a trend towards Federal listing or loss of viability of the populations or species because few individuals and only minor amounts of habitats would be involved.

Although no prairie dog colonies are known to occur along the transmission pipeline corridor, they may expand onto the corridor before the pipeline is constructed. If such a colony developed, it would be potentially-suitable habitat for the black-footed ferret. A survey for prairie dog colonies would be conducted as part of the pipeline's final permitting. If a colony is found and it meets the minimum requirements to be considered potentially-suitable habitat for the ferret, appropriate ferret surveys would be conducted.

4.8.1.1.3 Aquatic Species

As discussed in detail in Chapter 3, none of the four endangered Colorado River fish (Colorado River pikeminnow, humpback chub, bonytail chub and razorback sucker) are known or thought to occur within the Project Area. Therefore, no direct impacts to these endangered fish would occur from any of the action alternatives. The closest documented occurrence of any of the four endangered Colorado River fish is in the Price and San Rafael rivers downstream of the Project Area.

The water resource's analysis determined that about 84 acre feet of water depletions are expected to occur from the proposed project. However, it is below the threshold for requiring mitigation for the fish as presented in the USFWS' the "Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin" (USFWS 1987).

Indirect impacts within Colorado River fish habitat are also expected to be minor. These minor impacts, such as reduced water quality and increased sedimentation, would be similar (but less) than those described in the Aquatic Species Section above. Because the Colorado River fish do not occur within the Project Area, any impacts should be much less than those described for the aquatic species within the Project Area.

As discussed in detail in Chapter 3, sensitive fish species that occur or are likely to occur within the Project Area are bluehead and flannelmouth suckers. The other sensitive fish species, roundtail chub, Colorado River cutthroat trout, are not thought to occur in the Project Area, but do occur in Huntington Creek upstream of the Project Area. Therefore, impacts to the bluehead and flannelmouth suckers would be the same as those described for aquatic species in the Aquatic Species section and impacts to the roundtail and Colorado River cutthroat trout would be similar to those described for the endangered Colorado River fish in the Threatened and Endangered Species section.

4.8.1.1.3 Electrical Power Option

Installation of above ground power lines and electrical equipment would have little effect on special-status species. At most, only minor amounts of potentially-suitable habitats would be disturbed, primarily along existing and new roads, for construction of the power lines. The primary concerns involve the avian species. The power lines would pose a hazard to birds flying by and could pose an electrocution hazard to large birds, such as the bald eagle. Some birds would likely not see the conductors suspended between poles and fly into them resulting in some undeterminable number of deaths annually. Electrocution is a well documented source of mortality for raptors and most electrocutions involve electric distribution lines rather than high voltage transmission lines (APLIC 1996). However, the potential for electrocution would be minimized because any power lines installed for this project would be designed using the Suggested Practices for Raptor Protection

on Powerlines: the State of the Art in 1996 (APLIC 1996). Thus, use of an electrical system instead of natural gas to power wells and compressors would have little potential to adversely affect special-status species overall.

4.8.1.2 Alternative 2 — Proposed Action With Additional Environmental Protection Measures

4.8.1.2.1 Plant Species

The effects of implementing this alternative would be almost the same as those described for Alternative 1, the Proposed Action (**Table 4–12**). Clearance surveys of Federal lands for the Winkler cactus, Creutzfeldt-flower, and canyon milkvetch would still occur along with subsequent adjustments to the locations of project-related facilities to minimize effects. However, APDs for wells near known populations of Winkler cactus would have to be submitted before April 1 and if the weather is too dry that year, surveys may be postponed until the next year that conditions are suitable for conducting the clearance survey. Access roads would still cross about 3.2 acres of habitats occupied by the Winkler cactus and 17 acres of habitats occupied by the Creutzfeldt-flower. Also, the weed management plan that would be developed in coordination with the BLM and implemented on federal lands would reduce the potential for noxious weed invasions and control the establishment of weeds during the life of the project. Finally, the installation of gates on some roads (a wildlife protection measure) may also limit access to some populations of plants by off-road vehicles (during the winter and early spring only), which may help minimize indirect effects of recreational activities.

4.8.1.2.2 Wildlife Species

The effects of implementing this alternative would be very similar to those described for the Proposed Action. The bald eagle, peregrine falcon, and most of the other special-status species of wildlife would experience similar effects. The primary difference would involve any of the special-status species of raptors listed on **Table 4–12**. Under this alternative, a no occupancy environmental protection measure would be implemented that would not allow the construction of project-related facilities within a ½ mile of raptor nests active during at least one of the three years immediately prior to construction of the well. The seasonal buffer zone of Alternative 1 would be extended to a year-round exclusion area. Overall, the bald eagle and peregrine falcon are unlikely to be adversely affected and potential direct and indirect effects to the other special-status species of wildlife would not likely contribute to a trend towards Federal listing or loss of viability of the populations or species.

4.8.1.2.3 Aquatic Species

Impacts to the four endangered Colorado River fish species would be similar to those described for Alternative 1 except that the remote possibility of any adverse effect would be even further reduced because of implementation of the additional environmental protection measures on federal lands as described in the Water Resources Section. Impacts on the State and private lands would be the same as those described for Alternative 1 due to the lack of the additional environmental protection measures.

Impacts to the sensitive fish species from Alternative 2 would be similar to those described for Alternative 1 except that the likelihood of any effect would be reduced because of implementation of the additional environmental protection measures on federal lands as described in the Water Resources Section. Impacts on the State and private lands would be the same as those described for Alternative 1 due to the lack of the additional environmental protection measures.

4.8.1.2.3 Electrical Power Option

Under Alternative 2, about 97 miles of electrical power lines would be installed above ground on poles, primarily along existing and new roads. The rest of the power lines (73 miles) would be buried. As discussed under Alternative 1, installation of the electrical equipment would have little effect on special-status species. At most, only minor amounts of potentially-suitable habitats would be disturbed, primarily associated with the burial of power lines along existing and new roads. The primary concerns would still involve the avian species, although the concerns would be less because fewer miles of above ground power lines would be constructed. The power lines would pose a hazard to birds flying by and could pose an electrocution hazard to large birds, such as the bald eagle. Some birds would likely not see the conductors suspended between poles and fly into them resulting in some undeterminable number of deaths annually. Electrocution is a well documented source of mortality for raptors and most electrocutions involve electric distribution lines rather than high voltage transmission lines (APLIC 1996). However, the potential for electrocution would be minimized because any power lines installed for this project would be designed using the Suggested Practices for Raptor Protection on Powerlines: the State of the Art in 1996 (APLIC 1996). Thus, use of an electrical system instead of natural gas to power wells and compressors would have little potential to adversely affect special-status species overall.

4.8.1.3 Alternative 3 — No Action

4.8.1.3.1 Plant Species

Implementation of this alternative would eliminate all project-related activities on Federal lands and the direct and indirect effects associated with these activities. However, the development of wells, roads, and ancillary facilities on private and State lands would still occur. Populations of special-status plants, if present on the private and State lands, would still experience the same effects related to disturbance as would occur on these lands under alternatives 1 and 2. Additionally, the potential for indirect effects resulting from an invasion of noxious weeds would still occur. Overall, the levels of effects and the potential for adverse effects would be lower under this alternative than under either of the other alternatives, primarily because the areal extent of physical disturbance would be substantially reduced.

4.8.1.3.2 Wildlife Species

Implementation of this alternative would eliminate all project-related activities on Federal lands and the direct and indirect effects associated with these activities. However, the development of wells, roads, and ancillary facilities on private and State lands would still occur. Populations of special-status wildlife that may be present on the private and State lands would still experience the same effects related to disturbance as would occur on these lands under alternatives 1 and 2. Thus, the levels of effects and the potential for adverse effects overall would be lower under this alternative than under either of the other alternatives, primarily because the areal extent of physical disturbance would be substantially reduced.

4.8.1.3.3 Aquatic Species

The potential for impacts to the Colorado River fish from this alternative would be lower than Alternative 1 and 2 because of the lack of development on federal lands. However, because the State and private lands contain most of the wells that are proposed near perennial streams, the potential impacts would not be reduced substantially compared to the action alternatives. That is, the level of impact reduction would not be reduced in direct proportion to the reduction in number of wells.

Potential impacts to the Sensitive Aquatic Species from this alternative would be lower than Alternative 1 and 2 because of the lack of development on federal lands. However, because the State and private lands contain most of the wells that are proposed near perennial streams, the potential impacts would not be reduced substantially compared to the action alternatives. That is, the level of impact reduction would not be reduced in direct proportion to the reduction in number of wells.

4.8.2 Impacts Summary

Alternatives 1 and 2 would disturb habitats on BLM lands occupied by the Winkler cactus and Creutzfeldt-flower, if the access roads are constructed as proposed. In addition, several animal species may experience some minor effects due to loss of foraging habitats, breeding habitats, or both because habitats would be avoided to the maximum extent possible. However, with the necessary clearance surveys and coordination with USFWS and UDWR, none of the alternatives are expected to adversely affect listed or proposed species because habitat would be avoided to the maximum extent possible. Also, none of the alternatives are expected to contribute to a trend towards Federal listing or loss of viability of any population of sensitive species.

With the electric power options for alternatives 1 and 2, additional disturbance would be minor. Also, the power lines would be constructed according to the APLIC's guidelines. Thus, the potential for electrocuting raptors would be minimized.

Since the DEIS was published, the USFWS provided the BLM with its opinion on the alternatives' effects on federally-listed species of plants and animals (Harris 1999). The USFWS concurs with the BLM's conclusions that the project would have no effect on the black-footed ferret, Wright fishhook cactus, San Rafael cactus, Barneby reed-mustard, Maguire daisy, Jones cycladenia, and last chance townsendia. USFWS' biologists also concur with the conclusion that implementation of the alternatives would is not likely to adversely affect the peregrine falcon, bald eagle, and Winkler cactus, as long as the environmental protection measures and mitigation measures associated with Alternative 2 are followed. Finally, the USFWS concluded that with continued implementation of the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin as the reasonable and prudent alternative to avoid jeopardy to the endangered species of fish in the Upper Colorado River Basin, the project would not jeopardize the fish and the depletion fee could be waived (Harris 1999).

4.8.3 Mitigation

With the application of clearance surveys, agency coordination, and the resource protection measures already included, no additional mitigation measures are necessary.

4.8.4 Unavoidable Adverse Effects

Unavoidable adverse effects to special-status wildlife species would be a loss of some foraging and nesting habitats. Unavoidable adverse effects to special-status species of plants could result from construction and vehicular trampling of plants.

4.9 CULTURAL RESOURCES

The BLM has determined that the proposed Ferron Natural Gas project is a Federal undertaking in accordance with 36 CFR 800, the regulations implementing provisions of Section 106 of the National Historic Preservation Act. Any federal undertaking must consider potential effects to significant historic properties, and must conform to federal regulations (particularly 36 CFR 800) in determining effects that a project may have on significant cultural resources, and in the mitigation of effects determined to be adverse. Analysis and consideration of cultural resources, including Native American Traditional Cultural Properties (TCPs), conforms to the following federal laws, the National Historic Preservation Act of 1966, as amended (Public Law [PL] 89–665, PL 91–243, PL 93–54, PL 94–422, PL 94–458, etc.), the Archaeological Resources Protection Act (PL 96–95), the American Indian Religious Freedom Act (PL 95–341), other relevant state and federal statutes, policies and implementing regulations. The established procedures entail review by designated Federal and state agencies including, but not limited to, the Federal land managing agency, the State Historic Preservation Office, and the President's Advisory Council on Historic Preservation.

The Area of Potential Effect (APE) for this project is defined as lands within the project area boundary. This is the area where potential direct and indirect impacts could be likely to occur. The APE is larger than the area of direct surface disturbance. This affords consideration of indirect loss of important cultural materials due to private collection or vandalism, or where there may be direct or indirect disturbance or destruction of important Native American religious or culturally significant sites.

Adverse effects to significant historic properties would include physical alteration, damage or destruction, alteration of the character of the setting of a property which contributes to its significance, or neglect resulting in deterioration or destruction. All of these classes of potential adverse effects are of concern for archaeological, historical, or Native American traditional resources.

A complete inventory and analysis of the cultural resources of the APE is not feasible as the exact location of individual well and facility sites and roads is not known at this time. However, individual site, road and other linear right-of-way applications would not be approved until appropriate inventories are complete and clearances granted following procedures outlined in 36 CFR 800.4 through 800.6. However, since individual cultural resources consultations can result in long delays, the BLM is developing a Programmatic Agreement (PA) with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP) that would be designed to comply with cultural resource requirements. The PA would contain a management plan prepared by BLM and the Companies that would describe procedures to be followed in the project area to determine the effect an individual application may have on significant cultural resources. The management plan would also specify how significant cultural resources are to be treated, including site avoidance, recordation, protection measures, monitoring and mitigation of adverse effects. The PA will achieve the Federal agencies' compliance with the National Historic Preservation Act for this EIS and will be completed and signed prior to the ROD of this EIS.

4.9.1 Direct and Indirect Effects

Cultural resources are sensitive and non-renewable resources that can be irreversibly damaged by ground-disturbing activities, such as site and road construction and by secondary surface activities, including vehicular and pedestrian traffic. Many archaeological sites in the general area of the project are shallow and cultural deposits could be damaged or destroyed by vegetation clearing, right-of-way blading, or excavation of soils. Standing historic buildings or structures are more visible than archaeological deposits, and are more easily avoided by ground-disturbing activities.

Historic and prehistoric cultural resources may also be subject to increased indirect impacts, such as vandalism, surface artifact collection, excavation and off road traffic, because of improved access to the area from new and upgraded roads. Indirect impacts may consist of inadvertent damage, destruction or removal of significant scientific information, or destruction of the character or setting of a site. These indirect effects can be short term or occur in the future as long as improved access is available.

The numbers and types of significant cultural sites within the APE is presently unknown and cannot be statistically predicted, as neither an area wide cultural resource inventory, nor random sampling have been completed. Therefore, in order to estimate the number of cultural resources that could be discovered and/or impacted by the Proposed Action, certain assumptions were made.

Assumptions developed in the San Rafael Resource Area RMP (BLM 1991c) are used to estimate site density and impacts in the project area. Although it is known that sites are generally concentrated in certain areas such as water sources and ledges, it is necessary to assume that site location is random. Number estimates in the analysis should not be construed as exact, but they can be used for comparison and indication of what could happen to cultural resources under the various alternatives.

It is assumed that a density of 18 sites per square mile or 0.05 sites per acre could be located within the Project Area. The number of sites within an affected area can be calculated by multiplying 0.05 by the number of acres involved. The North Area is estimated to have 917 sites. The South Area is assumed to contain 4,658 sites and the transmission corridor would have 8 undiscovered sites. Based on professional experience of BLM archaeologists, it is expected that as many as one-half of these sites could be considered eligible for the National Register of Historic Places.

Combined direct and indirect impacts are estimated based on the assumption that projects subject to standard operating procedures would avoid or mitigate the impacts to 9 out of 10 sites within their affected area. Impacts would be expected to occur in 1 out of 10 sites despite mitigation or avoidance measures. This could be due to inadvertent destruction of sites not identified during inventory or indirect impacts.

The potential for direct impacts from surface disturbances of wells, facilities, access roads and pipelines can be estimated by factoring the 0.05 sites per acres assumption with anticipated surface disturbances of each alternative (**Table 2–16**) plus transmission line disturbances. Direct disturbances to sites would be expected to occur in one out of 10 of these sites.

Finally, it is assumed that any required on-the-ground cultural resource inventories for individual site/road applications would include a 300-foot-wide corridor centered on proposed permanent linear disturbance, such as access roads and pipelines, and a minimum of ten acres centered on proposed well sites or support facility sites. Temporary linear disturbances, such as the transmission lines, would have a 200-foot-wide survey corridor. Factoring the 0.05 site per acre assumption with the survey acreage provides an estimate of the number of sites that may be identified.

The site number estimates derived through this analysis serve best for comparison of various alternatives. In practice, on the ground activities are designed to take all necessary measures to avoid impacts to cultural resources.

4.9.1.1 Alternative 1 — Proposed Action

Based on assumptions made for this EIS, it is estimated that 92 sites could be impacted directly and indirectly in the North Area. In the South Area, 466 sites could be affected, and one site impacted in the transmission line corridor. This results in a total of 559 sites in the project area that could be affected by direct and indirect impacts. Of these sites, approximately one-half or 280 sites could be anticipated to be eligible for nomination to the National Register.

The estimate of actual surface disturbances for the Proposed Action would result in a probability of 77 sites that could be directly affected in the APE during life of the project. Of these 77 sites, it is anticipated that eight sites could be impacted from inadvertent destruction of the sites, and up to four of these sites could be expected as eligible for the National Register.

On the ground, Class III cultural resource surveys would be conducted on approximately 8000 acres in the APE. Thus, there is a potential that 400 sites could be identified.

4.9.1.1.1 Electric Power Option

Under the electric power option, an additional six sites could be affected directly and indirectly. Only one additional site would be anticipated to be affected by inadvertent destruction.

4.9.1.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

Under Alternative 2, 18 fewer wells and associated access roads would be constructed in the project area. Combined direct and indirect impacts would be anticipated to be essentially the same as Alternative 1. Approximately 559 sites could be affected with 280 sites anticipated for National Register eligibility.

There would be a probability that 69 sites could be directly affected based on anticipated surface disturbances from wells, roads, facilities, pipelines and the transmission line. It is anticipated that seven sites would be impacted from inadvertent destruction, with up to four of these sites eligible for the National Register.

Approximately 7,760 acres of land would be surveyed under this alternative with a potential of identifying 388 cultural sites.

4.9.1.2.1 Electric Power Option

Under the electric power option, three additional sites could be affected directly and indirectly. Based on the analysis' assumptions, one additional site would be affected by inadvertent destruction.

4.9.1.3 Alternative 3 — No Action Alternative

The No Action Alternative would entail drilling of 155 wells on State and private lands and installation of the transmission line. Surface disturbances are estimated at 811 acres. This represents nearly a 48 percent decrease from the Proposed Action. While the project area boundary would remain the same, activities would be reduced substantially from the Proposed Action. For the sake of analysis, it is assumed that direct and indirect impacts would reduce accordingly. Therefore, approximately 290 sites would be impacted with about 145 of those sites eligible for the National Register.

There would be a probability that 40 sites could be directly impacted, with four sites impacted by inadvertent damage. Two of these sites would be anticipated as eligible for the National Register.

Even though there would be no wells drilled on Federal lands with Alternative 3, Rights-of-Way would be necessary for roads that cross Federal lands to access State and private leases. Any new construction or reconstruction of access roads could require completion of Class III pedestrian surveys as the surface disturbances would constitute a Federal action. It is estimated that about 6,000 acres of cultural surveys could be required. Thus, under analysis assumptions, there would be a potential to identify 315 sites during the surveys.

4.9.2 Impacts Summary

Direct impacts to cultural resources occur from ground disturbing actions, such as construction. Indirect impacts are caused by vandalism, artifact collection and secondary activities, such as vehicular and pedestrian traffic. Indirect effects can be short term or long term. That is, they could occur immediately or in the future.

Cultural resource sites in the project area are unknown and cannot be statistically predicted. However, assumptions were made following values identified in the San Rafael Resource Area RMP to estimate site density and potential impacts from the alternatives. This estimation method also assumes that cultural resource sites are randomly distributed, although, it is known that sites are generally concentrated in certain areas. The number if sites estimated should not be construed as exact or fact, but they can be used for comparison purposes among the various alternatives.

Based on the general assumptions made for analysis of potential impacts to cultural resources and comparison of alternatives, it is anticipated that direct and indirect impacts from both Alternatives 1 and 2 could affect 558 sites in the Project Area. Of these sites, about 279 sites could be anticipated to be eligible for nomination to the National Register of Historic Places. There is a probability that 77 sites could be directly affected under Alternative 1, with up to four National Register eligible sites impacted from inadvertent destruction. With the electric power option, an additional six sites could be affected. Alternative 2 could result in a probability of affecting 69 sites directly. Approximately four National Register eligible sites could be inadvertently damaged or destroyed. Alternative 3, No Action, has the potential to affect approximately 290 cultural sites with up to half of them eligible for the National Register. There is a probability of 40 sites that could be directly affected with a potential for one National Register eligible site impacted by inadvertent damage.

Essentially, these assumption estimates identify that Alternatives 1 and 2 could directly affect nearly two times as many sites as Alternative 3. The ratio of indirect site impacts for Alternative 3 is higher.

4.9.3 Mitigation

Potential effects to significant cultural resources resulting from direct and indirect project impacts would be mitigated through development of a Programmatic Agreement between BLM, SHPO, and the Advisory Council. The agreement would contain a management plan developed by BLM and the Companies that would detail strategies proposed to minimize or mitigate the effects of the undertaking. Following is a general description of the procedures and elements that are detailed in the Cultural Resources Management Plan.

4.9.3.1 Inventory

- All proposed actions require cultural resource surveys for consideration of effects to historic properties. Various process steps would be followed for individual applications for well sites, facilities roads and pipelines, etc.

- The first step is a file search and literature review (Class I survey) to determine if previous surveys have been completed and to identify known sites or properties that could be affected and may be eligible for, or are listed on the National Register of Historic Places. Known cultural resource sites within the APE that could be affected by the proposed action have been identified and are listed in **Section 3.9**.

- If previous surveys were not completed, an on-the-ground Class III pedestrian survey would be completed for any individual application that would involve ground disturbance. The survey would include a 300 foot wide corridor centered on proposed narrow linear disturbance, such as access roads, pipelines, or transmission line corridors, and a minimum of ten acres centered on proposed well sites or support facility sites.

4.9.3.2 Evaluation

- All discovered sites would be evaluated for their eligibility as National Register of Historic Places historic properties. Criteria for evaluation would be developed in the Cultural Resource Management Plan through a research design identifying the significant characteristics or research data of the known site types expected in the area. This research design should be kept current by a synthesis and review of collected information every five years.

- The Programmatic Agreement would outline the consultation process, with the SHPO and/or the Advisory Council needed for each action.

- If no historic properties are identified during the surveys, a "no effect" determination could be made by the authorizing agency (BLM) and the proposed action may proceed.

- For historic properties eligible for the National Register, several options are available.

    - The first option is avoidance, or to move or alter the proposed action in such a way as to avoid any effects. Avoidance of sites is BLM policy in accordance with current instructions for cultural resources and oil and gas development.

    - If avoidance of an eligible site would not be possible, a site specific treatment plan would be completed and implemented. This is a lengthy process, dependant on the nature, character and degree of significance of a site and could entail excavation for informational values.

    - In some cases, minimal data recovery recondition of a National Register eligible site may be preferred rather than avoidance. This would be the option of the proponent and would be completed according to the research designs specified in the Cultural Resources Management Plan.

- If historic or archaeological materials are uncovered or discovered during construction, operations would cease to avoid further disturbances and the authorizing agency would be notified. The site would be evaluated for eligibility to the National Register, and mitigation would be developed for implementation

before the site could be used. Relocation of development activities to avoid mitigation or delays would be an option for the proponent.

4.9.3.3 Monitoring

- Monitoring of sites eligible for the National Register that are identified during surveys, and avoided by construction or nearby disturbed areas would be one method of mitigating indirect impacts. A monitoring plan should include provisions for site investigation, identification of any changes to the sites and provisions for making determinations of the causes for the change. Monitoring could also result in changes in management that would insure protection of the resource.

4.9.3.4 Miscellaneous

- Indirect impacts to archaeological resources could be mitigated by providing a training/orientation program for employees/contractors to inform them of cultural resource laws and reasons for protection.

- Conducting inventories on areas larger than proposed disturbed areas would mitigate indirect impacts by identifying sites thus allowing monitoring.

4.9.4 Unavoidable Adverse Effects

Most direct adverse effects to cultural resources would be mitigated. It is possible, however, that inadvertent destruction of some cultural resources could occur. Based on assumptions made for analysis comparison purposes only, there is a potential for a few archaeologic or historic sites to be damaged. In reality, on-the-ground activities would be designed to avoid damages to cultural resources. Indirect impacts, such as vandalism, artifact collection and off road traffic could also result in adverse impacts to cultural resources. Archaeological surveys covering areas in excess of actual planned disturbances would help to identify sites for monitoring. This could ultimately result in a reduction of indirect effects. Physical damage to a cultural site and archaeological data recovery (excavation) of a cultural resource site are irreversible commitments of a non-renewable resource.

4.10 LAND USE

The Project Area consists of public, state, and private lands in the South Area, North Area and the Pipeline Corridor, as shown in **Plate 2–1**. Land use in the Project Area is primarily grazing, wildlife habitat, and to a small extent, residential. Direct impacts to land uses result from the removal of land from existing uses on public lands by the disturbance areas required by proposed coal bed methane facilities. Indirect effects to land use would include the effects on existing land uses on private lands in the Project Area.

A small portion of the wells proposed are split estate (private or State surface ownership and federal minerals ownership). For wells planned under FLPMA requirements, BLM is responsible for both considering the impacts and approvals in land use planning, as well as managing the impacts. However, this responsibility is only for public lands, defined as any land and interest in land owned by the federal government. With respect to split estate lands, the federal government only has an interest in the minerals and not the surface. Activities and use of the surface are not subject to FLPMA planning requirements, and BLM has no authority under FLPMA over use of the land by the land owner. However, the impacts to surface resources and surface uses from BLM-authorized mineral development must be considered under NEPA.

BLM procedures for APDs on split estate leases are contained in Onshore Oil and Gas Order No. 1., Section VII. Through Order No. 1, BLM requires an operator to obtain a private surface owner agreement. If agreement cannot be reached it is up to the operator to pursue legal action, usually, through the provisions of 43 CFR 3814, involving the Federal right of reentry from the Stock Raising Homestead Act).

Each action alternative would consist of natural gas wells and associated facilities in the North and South Areas, as described in Chapters 1 and 2. The proposed Pipeline Corridor parallels the existing Questar ROW in Emery County. Long-term impacts to existing land uses would occur from the implementation of any action alternative in the Project Area.

During the construction phase of the project under any alternative, existing land uses would be temporarily disrupted as properties are entered by construction crews in order to assemble and install the new structures. Residents of the area would be impacted by the sights and sounds of construction. Public access would also be temporarily disrupted at some locations. Short-term disruption during construction would consist of the physical intrusion of the crew and equipment, the generation of dust and noise, and the obstruction of traffic.

Long-term, permanent effects on land use in the Project Area would result from the installation and operation of the proposed facilities. Existing land uses would be displaced by project facilities over the lifetime of the project under any action alternative. The only change to existing land uses from the installation of the gas transmission line in the proposed Pipeline Corridor would be that no structures could be constructed on the permanent ROW.

Public access opportunities would also increase as a result of the development of new and upgraded access roads. These effects would occur under any action alternative.

Maintenance of each well and other facilities would occur over the life of the facility, or approximately 20 years. Maintenance activities would consist of daily inspections trips to each well site, periodic inspections of CPF and compressor stations, and workovers at well sites. These inspections would result in periodic disturbances of noise, dust, and traffic, and possibly restricted access to properties located adjacent to the wellpads and other facilities.

4.10.1 Direct and Indirect Effects

4.10.1.1 Alternative 1 — Proposed Action

4.10.1.1.1 Land Ownership

Land ownership in the Project Area consists of BLM-administered federal lands, Manti-La Sal National Forest lands, private lands, and state lands. It is not anticipated that land ownership would change as a result of the implementation of any action alternative. Easements on private lands would be negotiated with the landowners and secured through the permitting process of the appropriate state and local agencies.

The number of acres of long-term disturbance on public and private lands for each alternative is summarized in **Table 2–16**. Long-term disturbance would consist of well pads, new road construction, and land disturbed by CPFs and compressor stations. Land disturbed by the installation of the natural gas transmission line in the proposed Pipeline Corridor comprises temporary construction disturbance that would be reclaimed to pre-existing surface conditions.

The rights of private property owners would not be affected by any element of the proposed project. The location of any proposed facility, and the mitigation required for each facility on private lands would be negotiated with the individual property owner.

4.10.1.1.1.1 North Area

The long-term disturbance area required for the 65 proposed wells and associated access roads in the North Area totals 125 acres. There are 84 acres of disturbance proposed for BLM lands, or about 67 percent of the total proposed disturbance. Disturbance on private and state lands account for the remaining 41 acres. The access roads and the adjacent rights-of-way required for gathering lines and water lines would be 78 feet in average width. There would be a total of 14.8 miles of new road and pipeline rights-of-way.

Other facilities, including one CPF and 3 compressor stations, would require an additional 15.5 acres. The total proposed long-term disturbance for the North Area would be 141 acres. The number of proposed and existing facilities by land status shown in **Table 4–13**.

4.10.1.1.1.2 South Area

The total long-term disturbance area required for the 220 proposed wells, access roads, and facilities on public, state, and private lands in the South Area totals 622 acres, an increase of about three times the approximate existing disturbance of 230 acres from 47 existing wells and access roads. There are 259 acres of well pad and access road long-term disturbance proposed for BLM lands, or about 42 percent of the total proposed long-term disturbance for the South Area of 622 acres. Long-term disturbance on private and state lands account for the remaining 363 acres. The number of proposed and existing facilities, according to land status, are shown in **Table 4–14**.

Table 4–13
Number of Facilities in North Area by Land Ownership

Facilities	Private	BLM	State	Total
Wells				
existing	0	7	8	15
proposed	10	46	9	65
Central Production Facilities				
existing	0	0	1	1
proposed	0	0	1	1
Compressor Stations				
existing	0	0	0	0
proposed	0	3	0	3
Roads (miles)				
existing	17.5	48.8	11.9	78.2
proposed	2.7	9.6	2.5	14.8

Table 4–14
Number of Facilities in South Area by Land Ownership

Facilities	Private	BLM	State	Total
Wells				
existing	20	23	10	53
proposed	44	85	91	220
Central Production Facilities				
existing	3	0	0	3
proposed	4	0	0	4
Roads (miles)				
existing	61.6	144.2	19.5	225.3
proposed	11	38.8	33.4	83.2

4.10.1.1.2 Land Management Plans

NEPA implementation regulations require discussion of possible conflicts with Federal, regional, state, and local land use plans (40 CFR 1502.16(c)). Land management plans provide a framework for development within various government jurisdictions.

All action alternatives would be in conformance with multiple use Federal land management plans covering the Project Area. The Proposed Action and alternatives were reviewed against provisions of the Price River MFP, San Rafael RMP, and the Manti-La Sal National Forest's LRMP. Within the Project Area, oil and gas leasing was identified as a primary land use. Leases have been issued with restrictions (stipulations) as identified in the governing land use plans.

The San Rafael RMP states that no management restrictions are necessary in Recreation Opportunity Spectrum (ROS) areas classified as Roaded Natural, Rural, and Urban. Specific conditions were identified in the plan for maintenance of areas assigned Primitive and Semi-primitive Nonmotorized classifications, however, no special conditions were identified for Semi-primitive Motorized designations, which occur in the Project Area. The analysis supports the assertion that lands would be subject to leasing without any stipulations in Semi-primitive Nonmotorized areas.

The provision for year-round protection of raptor nests as specified in Alternative 2 is inconsistent with the raptor protection prescription of the San Rafael RMP. The plan prescribes seasonal buffer zones around known raptor sites to protect them from human disturbance to the greatest extent possible. With the increased development proposed for coal bed methane production, the analysis supports the need for protection consistent with the raptor protection provisions of the Price River MFP while meeting the goals of the San Rafael RMP. Therefore, year-round buffer zones around "occupied" raptor nests were prescribed as an Environmental Protection Measure for the entire FNG Project.

Land management plans and zoning ordinances have been implemented by Carbon and Emery counties. The action alternatives would be compatible with the planning and zoning of both counties. The Proposed Action would not be consistent with some of the provisions of the Carbon County Trails Plan (see **Section 1.5.5**).

Both the Proposed Action and Trails Plan intend to develop the same area for separate uses. Alternative 2 offers to diminish the inconsistency by including measures to study the development of alternative trails that could offset impacts.

4.10.1.1.2.1 South Area

Most of the proposed wells (220) and 7 CPFs are in the Emery County zoning district M&G–1 — Mining and Grazing (**Plate 3–8**). Production wells are a Permitted Conditional Use of the zoning district that is subject to the prior approval of the County Commission.

Agricultural lands along creeks that run through the South Area are in the A–1 — Agricultural District. There are 29 wells and three CPFs proposed for the A–1 district. Exploratory, oil and gas wells are a Permitted Administrative (Planning Commission) Conditional Use requiring a Small Site Plan Approval. Production wells are a Permitted Legislative Conditional Use requiring a Large Site Plan Approval.

There are no facilities proposed for the I–1 Industrial zone or the CE–1 Critical Environmental zone district.

4.10.1.1.2.2 North Area

All of the proposed facilities are within the Carbon County zoning district M&G–1 — Mining and Grazing (**Plate 3-8**). Production wells are Permitted Non-Conditional Use of the zone. There are no facilities proposed for the R–1–8 zone in Kenilworth or the small area of CE–1 — Critical Environmental zone in the northeast part of the North Area.

4.10.1.1.2.3 Transmission Line Corridor

The Transmission Line Corridor consists of lands in Emery County's A–1 and M&G zoning districts. In Emery County, major utility transmission lines in an A–1 zone are a Permitted Legislative Conditional Use requiring a Large Site Plan Approval. Major lines in the M&G zone are a Permitted Conditional Use of the zoning district that is subject to the prior approval of the County Commission.

4.10.1.1.3 Land Use

Short-term construction disturbance would consist of acreage for each facility sufficient to accommodate construction equipment and activities, and store construction material. Subsequent to installation, disturbed land required for construction would be reclaimed and revegetated back to pre-existing uses, leaving only the long-term, permanent disturbance area required for operation and maintenance over the life of the proposed project. The natural gas transmission line proposed for the Transmission Line Corridor would not result in a long-term permanent disturbance area. Surface disturbance within pipeline construction right-of-way would be reclaimed and revegetated to pre-existing land uses.

Land uses within the proposed disturbance areas would shift to natural gas extraction for the life of the project. Areas surrounding active operations would continue to serve the existing land uses during project operations. Reclamation and final closure of the proposed operations would re-establish the land uses of cropland, grazing and wildlife habitat in the disturbance areas under any action alternative. There are no project facilities proposed for Forest lands in the Project Area, therefore no impacts to existing land uses would occur from the proposed project on Forest lands.

4.10.1.1.3.1 North Area

As shown on **Plate 3–7**, existing land uses in the North Area consist of rangeland and urban uses. No croplands and wetlands occur in the North Area. There are three soil types in the North Area that are prime farmland when irrigated. None of the land in the North Area is irrigated, therefore prime farmland soils would not be disturbed by proposed project facilities. Land would be temporarily removed from existing rangeland in the North Area by proposed natural gas facilities in all action alternatives. No facilities would be located within the urban land use area of Kenilworth. Recreation in the North Area is limited to trails and roads, as described in the Recreation section of Chapter 3. Impacts to recreational uses are described in **Section 4.12**.

4.10.1.1.3.2 South Area

Land would be temporarily removed from existing uses of rangeland and agriculture (croplands) in the South Area by proposed natural gas facilities under all action alternatives (**Plate 3–7**). Existing land uses of urban, industrial, and recreation areas would not be affected by any proposed facility. **Table 4–15** summarizes the acres of land removed from existing uses for each affected land use type that occurs in the South Area. Impacts to recreational uses are described in **Section 4.12.**

Table 4–15
Proposed Disturbance in South Area by Land Use

	Rangeland		Cropland		Total	
Facility	Number of Facilities	Disturbance (acres)	Number of Facilities	Disturbance (acres)	Number of Facilities	Disturbance (acres)
Well pads	215	296	5	7	220	303
CPF	5	31	1	6	7	37
New roads (miles)	82.5	783	0.7	7	83.2	790
Total	-	1,110	-	20	-	1,130

4.10.1.1.3.3 Transmission Line Corridor

Land uses in the transmission line corridor consist of cropland (agriculture), rangeland and urban uses. The natural gas transmission line would not require long-term permanent disturbance. Surface disturbance within pipeline construction right-of-way would be reclaimed and revegetated to pre-existing land uses. Approximately 1.3 acres of croplands would be temporarily disturbed by installation of the pipeline in the transmission line corridor. The remainder of disturbance would occur in rangeland. The disturbance acres by vegetation type, including agriculture, are described in **Section 4.5.**

4.10.1.1.3.4 Residential

Impacts to residential uses by well facilities can occur when the sights and sounds from the operation of a well intrude on residential uses and during construction of the well, road, compressor facilities and other

associated facilities, which would result in temporary increases in noise, dust, odors, and traffic. The impacts to residences in the Project Area would be similar for each action alternative.

Proposed wells within a one-mile zone of residences in the South Area occur along SR 31 (Huntington Canyon Road) and near the towns of Huntington, Orangeville and Clawson. In the North Area, residences would be affected in Kenilworth, Price and Spring Glen. Approximately one-half of the wells located within one mile of any residence would be located on BLM lands, as shown in **Table 4–16**. In general, proposed wells nearest to residences (within one-half mile) in the Project Area would be located on private lands.

Table 4–16
Number of Wells Within One-Half Mile and One Mile of Residences in North and South Areas

Distance from Residence	BLM	Private	State	Total
North Area				
½ mile	1	2	0	3
1 mile	6	6	1	13
South Area				
½ mile	4	18	1	23
1 mile	27	25	1	53

Impacts to residential areas would consist of increased traffic levels at concentrated points of entry and departure from the Project Area. Impacts from traffic levels would consist of increased noise, dust, and the potential for a higher rate of traffic accidents. Most impacts would occur during the construction phase. These impacts would decrease after the construction phase. Fewer vehicles would be required and the use of large construction-related vehicles and trucks would be minimal.

4.10.1.1.3.5 Transportation

In general, impacts on the transportation system and traffic levels in Carbon and Emery counties would be construction related and short term in nature. Traffic on roads crossed by any of the proposed pipelines would experience relatively minor delays during construction by lane closures. The remaining lanes would be capable of handling the expected traffic levels. Impacts to transportation would be similar for any action alternative.

The Utah Statewide Transportation Improvement Program has scheduled projects on roads in Carbon and Emery counties for the fiscal years 1998 through 2002. SR 29 through the South Area is scheduled for widening and overlay (Project No. SP–0029(14)10).

Project-related traffic would not conflict with existing traffic or existing uses of the road. There would be a small increase in the traffic level of the primary access routes, however, any increase in traffic levels at any one time on the roads would most likely fall within capacity of the roads. Construction-related traffic would consist of an average of 85 trips per day in the South Area and 25 trips per day in the North Area that would

transport personnel and equipment to any project site during the annual eight-month construction period. Construction-related traffic to any site within the Project Area would occur only over the period of time it would take to install the facilities. Each well would require approximately 20 days to install. The average increase of one percent to the traffic levels near the South Area and five percent near the North Area would probably lead to a proportional increase in the risk of traffic accidents. These risks would probably occur during the morning and evening hours when most of the construction vehicles are traveling to and from construction sites.

An existing transportation-related problem is the need for improved road conditions and improved signage on the primary transportation routes such as SR 10 and on the roads that connect with the highway. The addition of trucks hauling equipment over local roads to sites within the North and South areas could result in the further deterioration of road conditions, as heavy trucks and heavy equipment have a disproportionate effect on road conditions relative to small and lighter passenger vehicles. There would also be potential for conflict at road intersections where project-related traffic turns onto highways from access roads.

There are currently no maintenance or roadway plans or schedules in place for any state routes that access the North and South areas. Carrying capacities and vehicle weight restrictions have not been determined for any of these state routes. Maintenance on the highways generally occurs on an as-needed basis. Maintenance activities are usually scheduled between the months of May and September.

Seasonal weight restrictions do occur on the highways and are implemented only when conditions require them. Restrictions are generally implemented during spring freeze and thaw cycles. Heavy vehicles can cause the edge of the pavement to crumble at intersections where they turn onto the highway, therefore UDOT requires access roads to be constructed with a flat surface at the intersection with the highway to minimize damage. Each access road should be paved back at least 50 feet from the intersection. The Companies would be required to pave the 50 feet of adjoining access along U.S. 6 and SR 57 and County Roads 31 and 29. Permits for each access road are issued on a case-by-case basis (Stapley 1998).

4.10.1.1.3.5.1 North Area

The maximum possible number of vehicles along U.S. 6 would constitute a small percentage of the total average daily traffic (ADT). The 1996 average daily traffic count on U.S. 6 between Price and Helper ranged between 6,095 to 10,070 trips per day, as shown on **Table 3–26**. The addition of project vehicles to the highway would result in a less than one percent increase in traffic levels on U.S. 6 during the eight-month annual construction period. The average number of 25 trips per day would result in an increase in traffic levels of nearly five percent on SR 157 to Kenilworth (555 ADT) for the duration of the installation of proposed facilities accessed by this road.

Project-related traffic involved in operations and maintenance over the life of the project would not result in a noticeable increase in traffic levels on U.S. 6 and SR 157. There would be a maximum of 5 trips per day, resulting in an insignificant increase of traffic on U.S. 6 and a one percent increase of traffic on SR 157.

4.10.1.1.3.5.2 Impacts to Airports

Federal Airport Regulation Sub-Part 77 (FAR Part 77) establishes standards for determining obstructions to air navigation. The standards apply to existing and proposed manmade objects, objects of natural growth, and terrain. Any structure would be an obstruction to air navigation if it is of a height that is 200 feet above

ground level or above the established airport elevation, whichever is higher, and within 3 nautical miles of the established reference point of an airport.

The Federal Aviation Administration (FAA) would require notification at least 30 days before proposed construction takes place near an airport (FAA Form 7460–1 "Notice of Proposed Construction or Alteration") under certain situations. Construction or alteration requires notice in the event that the construction/alteration is of greater height than an imaginary surface extending outward and upward at one of the following slopes:

1) 100 to 1 for a horizontal distance of 20,000 feet from the nearest point of the nearest runway of each airport (public use or military) with at least one runway more than 3,200 feet in actual length, excluding heliports.

2) 50 to 1 for a horizontal distance of 10,000 feet from the nearest point of the nearest runway of each airport (public use or military) with its longest runway no more than 3,200 feet in actual length, excluding heliports.

3) 25 to 1 for a horizontal distance of 5,000 feet from the nearest point of the nearest landing and takeoff area of each heliport (public use or military).

The Carbon County Airport is located partially within the North Area. Runway 18/36 is 8300 feet x 100 feet in size and is oriented in a southwest–northeast direction. There are four wells located under the approach and takeoff flight path of the runway between one and three miles from the end of the runway. The maximum elevation of the top of the pump unit at one mile from the runway can be about 50 feet higher than the runway. The pump unit at this well would be approximately 20 feet in height, located at an elevation of approximately 40 feet higher than the runway elevation, for a total height of 60 feet greater in elevation than the end of the runway. The FAA Form 7460–1 "Notice of Proposed Construction or Alteration" would need to be submitted to the FAA at least 30 days before installation of the well. All other wells under the flight path would be within the height restriction.

Runway 14/32 is oriented in a southeast–northwest direction. There are two existing and three proposed wells located beneath the flight path between 0.9 and 5.0 miles from the end of the runway. Strobe lights on the top of drill rigs at these three well sites would be required by the FAA during the drilling process. The elevation of the nearest well site is approximately 20 feet higher than the end of the runway. If the pump unit is 20 feet tall, then the total elevation of the top of the pumping unit would be about 40 feet higher in elevation than the runway. At 0.9 miles, the maximum elevation of the top of the pump must be under 46 feet higher than the end of the runway elevation. The pumping unit at the well site is within the height restriction.

The approach and takeoff flight path for runway 07/25 is oriented in an east–west direction. There are no proposed wells located under the flight path of the runway.

The well rigs that would be used to install every proposed well under approach and takeoff flight paths would be approximately 100 feet in height. All rigs within 20,000 feet (3.8 miles) pose a potential hazard to aircraft, therefore the FAA form 7460–1 "Notice of Proposed Construction or Alteration" would need to be submitted to the FAA at least 30 days before construction.

4.10.1.1.3.5.3 South Area

The maximum possible number of vehicles along a primary transportation route such as SR 31 or SR 10 would constitute a small percentage of the total average daily traffic. The 1996 ADT count on SR 10 between Price and Ferron ranged between 3,250 to 6,780 trips per day, as shown on **Table 3–26**. The addition of project vehicles to the highway would result in a one to three percent increase in traffic levels on SR 10 over the five-year construction period. The average number of 85 trips per day would result in an increase in traffic levels of about two percent on SR 31 (ADT between 3,445 and 4,125) between the junction with SR 10 and the Huntington power plant. SR 57, which provides access to the Wilburg Mine, had an ADT of 865 in 1996. The 85 maximum number of trips would result in a ten percent increase of traffic along this road for the duration of the installation of proposed facilities accessed by this road.

Project-related traffic involved in operations and maintenance over the life of the project would not result in a noticeable increase in traffic levels on any of the primary transportation routes that access the South Area. There would be a maximum of 5 trips per day, resulting in a less than one percent increase of traffic on SRs 10, 31, 29, and 57.

4.10.1.1.4 Electric Power Option

Under the Proposed Action, 187 miles of aboveground power lines would be installed. Half of these power lines would be installed outside of the access road ROW resulting in a temporary disturbance of 113 acres (93.5 miles X 5,280 feet/mile X 10-foot-wide ROW), or 7 percent of the 1,633 short-term disturbance to construct all other facilities within the Project Area. Clearing of vegetation along the ROW would be minimal and only limited blading of vegetation is likely to occur. Construction of the power lines would result in disturbances to the local land uses during installation. However, the effects of these disturbances would be minimal and short term in nature. Because no long-term clearance of vegetation would occur, long-term effects to land uses, such as grazing, are not expected.

4.10.1.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

Alternative 2 is similar to Alternative 1 in the siting of project facilities and the acreage of land to be disturbed for each facility. This alternative differs from Alternative 1 in that Environmental Protection Measures have been developed for critical resources, as described in **Section 2.2**. Critical resources that may pose constraints to the siting of some proposed facilities consist of water resources, soils, wetlands/riparian, wildlife habitats, and visual resources. Implementation of Alternative 2 would result in the development of 18 fewer wells in the Project Area and many well locations would be moved to areas where wells could be assessed without crossing slopes greater than 25 percent. Therefore, the effects on existing land uses, land ownership, public access opportunities, the transportation system and traffic levels from the implementation of Alternative 2 would be slightly less than those described for the Proposed Action.

Gates would be placed at certain points on proposed constructed roads on BLM land in the Project Area to prevent public traffic uses during the periods when big game occupy winter range areas. The gates would not be placed on county roads because only the County officials have the authority to close county roads. This period would be from December 1 through April 15. The purpose of the road gates would be to restrict public use along these public roads to reduce impact to big game in their winter range habitat. The main impact to land use would be the restriction of motor vehicle traffic during these times. Other recreational users, such as hikers, horse riders, and bike riders would still be able to access the lands. Because the

incidence of motor vehicles is probably smaller during the winter than during the rest of the year, the gating should not have a significant effect on land use during the winter range period. However, after a period of time when people become acquainted with using these new roads for recreational activity, the closures could become noticeable.

4.10.1.2.1 Electric Power Option

Under Alternative 2, about 97 miles of aboveground power lines would be installed, or 90 miles less than under the Proposed Action. Half of these power lines would be installed outside of the access road ROW resulting in a temporary disturbance of 59 acres (48.5 miles X 5,280 feet/mile X 10-foot wide ROW), or about 4 percent of the 1,472 short-term disturbance to construct all other facilities within the Project Area. Clearing of vegetation along the ROW would be minimal and only limited blading of vegetation is likely to occur. Construction of the power lines would result in disturbances to the local land uses during installation. However, the effects of these disturbances would be minimal and short term in nature. Because no long-term clearance of vegetation would occur, long-term effects to land uses, such as grazing, are not expected.

Approximately 73 miles of power lines would be buried within the access road ROW. Therefore, no additional short- or long-term disturbance to soils would occur with the installation of buried power lines.

4.10.1.3 Alternative 3 — No Action Alternative

No direct or indirect impacts to existing BLM land uses from the proposed project would occur under this alternative. No wells or facilities would be constructed on BLM lands. Less than one mile of new roads could be constructed on BLM land to give reasonable access to valid leases on State and private land. Therefore, the land use on these lands would be very temporarily interrupted during the construction of these roads. The existing condition of BLM lands in the Project Area would be maintained under the current management direction as defined in the BLM San Rafael and Price management plans currently in effect. There would continue to be natural gas development on private and State lands within and adjacent to the North and South areas. Effects to the State and private land use would be the same as described under the action alternatives.

A maximum of 155 wells could be drilled on state and private lands under the No Action Alternative. The construction of these 155 wells would probably be completed within three to four years assuming a level of development of about 40 wells per year. Traffic levels for this construction phase would probably be near the same levels as the Proposed Action for these two years. After development of the state and private leases, traffic levels would decrease to pre-construction levels. However, traffic conflicts would be expected to increase in the future under current road conditions as a result of population growth and continued resource development in the counties, including natural gas production.

4.10.2 Impacts Summary

The majority of land use within the Project Area is within the Mining and Grazing land zoning category. The short-term disturbance within the Project Area under the Proposed Action would be would be 1,633 acres, and then reduced to 763 acres after interim reclamation of well pads, facilities, and construction disturbance along roads. The disturbance along the pipeline corridor would be temporary (2 to 4 months). Thus, the total long-term disturbance would be 0.7 percent of the 111,500-acre Project Area and 261-acre pipeline corridor, combined. Most of the disturbance would occur on lands dedicated to grazing activities. Traffic would be elevated 2 to 5 percent during the construction period. It is anticipated that the accident rate may increase

a corresponding 2 to 5 percent during this period. The potential for increased traffic accidents would most likely occur at the key locations along U.S. 6 and SR 10 where vehicles would enter and exit the Project Area. Short-term disturbance under Alternative 2 would be 1,472 acres and then decrease to 679 acres (0.6 percent of the Project Area). The potential increase in traffic accidents would be equivalent to the Proposed Action. Under the No Action alternative, short-term disturbance would be 917 acres and then decrease to 367 acres (0.3 percent of the Project Area).

4.10.3 Mitigation

All new roads across BLM or national forest system lands should be constructed to the standards of the BLM or Forest Service.

4.10.4 Unavoidable Adverse Effects

There would be unavoidable effects from noise associated with the use of roads and lands near residential areas. The potential for traffic accidents would increase slightly at locations along U.S. 6 and SR 10 where vehicles enter and exit the Project Area. This potential would be the highest during construction periods.

4.11 LIVESTOCK MANAGEMENT

4.11.1 Direct and Indirect Effects

4.11.1.1 Alternative 1 — Proposed Action

Implementation of this alternative would cause direct and indirect effects on the management of livestock as a result of the construction and operation of the project. However, most of these impacts would be limited to the life of the project. Long-term impacts are not anticipated to occur once vegetation productivity is restored after closure of the project.

Three general types of direct impact are anticipated to occur. They are the disturbance or removal of forage, increased difficulty in managing livestock, and increased potential for the establishment of new populations of noxious weeds. Construction of the project's proposed facilities would disturb and/or eliminate native vegetation used for grazing forage (**Section 4.5**). By reducing the amount of forage available, the overall level of livestock production would decrease. This decrease in the grazing resource has been estimated in AUMs for each grazing allotment. About 70 AUMs (49, BLM) would be lost in the Project Area during construction of the project (**Table 4–17**). The long-term operational loss would be approximately 46 AUMs (33, BLM).

The Proposed Action would increase the difficulty of managing livestock by directly affect range improvements, stock watering, and facilities related to the control of livestock movement. The number of gates to control livestock would increase with the level of project-related facilities and access roads. This increase, in tandem with the increased traffic levels, would increase the potential for gates to be left open and livestock to get out of the allotment. In their study, Fowler and Witte (1985) also found that ranches had increased labor requirements from activities, such as gathering cattle, fixing fences, closing gates, removing litter and repairing vandalism damages that occurred during the occupation of oil and gas development.

Table 4–17
Impacts to Grazing Allotments

Allotment Name	Acres per AUM	Acres Affected/ AUMs lost											
		Construction						Operation					
		Public		State/Private		Total		Public		State/Private		Total	
		Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost
SOUTH AREA													
Clawson Dairy	28	23	0.82	0	0.00	23	0.82	12	0.43	0	0.00	12	0.43
Cowley	7	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Cox (Don)	7	12	1.71	1	0.14	13	1.86	6	0.86	1	0.14	7	1.00
Cox (John)	9	84	9.33	6	0.67	90	10.00	45	5.00	3	0.33	48	5.33
Deep Wash	148	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
East Grimes	14	95	6.79	29	2.07	124	8.86	50	3.57	15	1.07	65	4.64
Humphrey	4	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Jensen	26	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
N. Huntington	12	0	0.00	99	8.25	99	8.25	0	0.00	53	4.42	53	4.42
Northwest Ferron	17	11	0.65	0	0.00	11	0.65	6	0.35	0	0.00	6	0.35
North Wolf Hollow	11	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Peacock	56	35	0.63	0	0.00	35	0.63	19	0.34	0	0.00	19	0.34
Reid	17	5	0.29	3	0.18	8	0.47	3	0.18	0	0.00	3	0.18
Rock Canyon	12	0	0.00	0	0.00	0	0.00	0	0.00	2	0.17	2	0.17
South Wolf Hollow	25	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
West Grimes	15	61	4.07	1	0.07	62	4.13	32	2.13	1	0.07	33	2.20
West Huntington	87	5	0.06	192	2.21	197	2.26	2	0.02	104	1.20	106	1.22
West Orangeville	21	3	0.14	5	0.24	8	0.38	2	0.10	2	0.10	4	0.19
Wilberg	16	135	8.44	87	5.44	222	13.88	72	4.50	46	2.88	118	7.38
Total		469	32.93	423	19.26	892	52.18	249	17.48	227	10.36	476	27.84

Table 4–17 (continued)
Impacts to Grazing Allotments

Allotment Name	Acres per AUM	Acres Affected/ AUMs lost											
		Construction						Operation					
		Public		State/Private		Total		Public		State/Private		Total	
		Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost	Acres Impacted	AUMs Lost
NORTH AREA													
Coal Creek	18	160	8.89	30	1.67	190	10.56	160	8.89	30	1.67	190	10.56
Hayes Wash	18	46	2.56	10	0.56	56	3.11	46	2.56	10	0.56	56	3.11
Wood Hill	16	80	4.44	0	0	80	4.44	80	4.44	0	0	80	4.44
Total		286	15.89	40	2.23	326	18.11	286	15.89	40	2.23	326	18.11
FOREST SERVICE ALLOTMENTS - SOUTHERN AREA ONLY													
East Mountain	9	0	0	0	0	0	0	0	0	0	0	0	0
Horn Mountain	16	0	0	0	0	0	0	0	0	0	0	0	0
Gentry Mountain	6	0	0	0	0	0	0	0	0	0	0	0	0
Trail Mountain	6	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0

Furthermore, the increase in the number of roads constructed to access wells within allotments and the associated use of these roads would increase vehicular traffic within allotments. Although these roads would be constructed for use by the Companies, the public likely would use many of the roads for recreation. This increase in use would increase the potential for collisions with livestock and harassment of livestock. Additionally, in their study of the effects of oil and gas operations on New Mexico ranch operations, Fowler and Witte (1985) determined an increase in vehicular traffic was responsible for decreases in calving percentage and calf market weight.

The increased potential for noxious weed invasion resulting from project construction and operations could impact the grazing resources within the Project Area. Noxious weeds are generally unpalatable to livestock and, thus, their establishment results in the reduction of available forage. Unless new populations of noxious weeds are actively controlled or managed, they could become a problem for livestock managers.

These indirect impacts would be eliminated upon the closure and reclamation of the facilities. No long-term impacts would occur to grazing resources within the Project Area. However, restoration of grazing potential is based upon reclamation success (see **Section 4.17**). The reclamation efforts could take several decades to restore vegetation.

4.11.1.1.2 Electric Power Option

Installation of above ground power lines and poles would have a minimal impact on livestock. During installation of poles and power lines, there would be a short-term disturbance, about the five days required to install one mile of line, on grazing activities due to the presence of vehicles and equipment. After installation activities, there would be a slight long-term loss of forage around the pole locations.

4.11.1.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

Impacts to grazing resources and their management under Alternative 2 are expected to be the same as those described in Alternative 1 with the following exception. Alternative 2 proposes that all range improvements would meet BLM or Forest Service standards as applicable (BM 1741, FSM 2242.03, and BLM Price Field Office and Manti-La Sal National Forest policies). This action would help to keep the livestock within the allotment and reduce the potential for conflict with traffic. However, long-term impacts to the grazing management and grazing facilities may occur with reduced forage production and the potential for noxious weeds on disturbed land.

4.11.1.2.2 Electric Power Option

Installation of above ground power lines and poles would have a similar minimal impact on livestock as the Proposed Action. However, under Alternative 2, 97 miles of aboveground lines would be installed instead of the 187 miles under the Proposed Action. Therefore, the slight impacts described under the Proposed Action would be about 52 percent less for Alternative 2.

4.11.1.3 Alternative 3 — No Action Alternative

No additional wells would be developed on federal lands. However, road rights-of-way may be issued to provide access to state or private leases. The companies would be required to construct gates and cattleguards where needed. Impacts of fugitive dust, disruption of livestock operations, and noxious weeds

also would occur at a reduced level of activity. Thus, most of the 49 AUMs that would be lost to construction of the project under alternatives 1 and 2 would not occur with implementation of Alternative 3. The approximately 21 AUMs lost on state and privately-owned lands still would occur under Alternative 3.

4.11.2 Impacts Summary

Alternatives 1 and 2 would reduce grazing by about 70 AUMs (49 BLM). Most of this loss would occur in the South Area (52 AUMs). Long-term losses would be 46 AUM (33, BLM). Also, both alternatives would experience an increase in the difficulty of managing livestock and a potential project-related increase in the establishment on new populations of noxious weeds. Alternative 3 would remove only minor amounts of grazing land and few AUMs on federal lands. However, 21 AUMs on state and privately-owned lands would be lost under all three alternatives.

4.11.3 Mitigation

Landowners and livestock permittees should be notified by the Companies prior to any surface activities and/or disturbances of existing livestock facilities. Additionally, mitigation measures for other resources, such as vegetation and soils also would help mitigate the direct and indirect effects identified for livestock management.

4.11.4 Unavoidable Adverse Effects

Disturbance of vegetation would occur under each alternative. Thus, a loss of forage production and a reduction in AUMs supported by several allotments also would occur. An increased potential for livestock-vehicle collisions and livestock harassment also would occur under each alternative, at least to some small degree.

4.12 RECREATION

The potential effect of the construction and operation of the proposed facilities on recreation resources is related to how much recreation opportunity is being created by the proposed project versus how much opportunity is being lost for recreation pursuits. Local residents, especially in Price and Kenilworth, value the federal lands for recreational activities because of the proximity to their homes and the relative solitude that can be achieved within a short distance from their homes. The main recreational issue identified in the scoping process is the alteration of the recreational experience for local users resulting from the change in solitude and the natural setting. The visual character of the surrounding landscape is also an important element in the quality of a recreation experience. The Project Area is predominantly rural in character with some industrial-type modifications from existing wells. The structures proposed for each well in the Project Area may constitute an intrusion that would impact the ambience sought by recreationists. The construction and operation of the proposed facilities can also affect recreational activities by changing access opportunities and by directly disrupting existing recreation activities.

Direct impacts to recreation occur by the displacement of acreage from existing uses by proposed natural gas facilities. Impacts to recreation resources are considered significant if they change the recreational opportunities. The impacts are also significant if BLM or county objectives for recreation cannot be met. The

main impact of the proposed natural gas activities would be an alteration of the recreational experience for people living near the Project Area, especially the North Area because of the denser population.

Indirect impacts to recreation would occur if the proposed facilities resulted in a change in the level of visitation into the area or if the project would affect growth in Carbon and Emery counties, thus, changing the utilization of existing recreation facilities and other land uses.

4.12.1 Direct and Indirect Impacts

4.12.1.1 Alternative 1 — Proposed Action

The Proposed Action would be constructed and operated on public, state, and private lands in the North and South Areas and the Pipeline Corridor. The Proposed Action would impact dispersed recreational opportunities in the North and South Areas. The primary effect of the natural gas development in the North and South Areas would be the change of the recreational experience on trails and roads used for recreation. The solitude and natural setting now being experienced on these trails would be affected by construction activities during the five-year construction period. To a lesser degree, the loss in solitude could continue through the life of the project by the presence of facilities, the operational and periodic maintenance needed at well sites and CPFs, and the traffic to the facilities. The change in the natural setting would continue through the life of the project. The Carbon County Commission has proposed a trail system that includes some roads in the North Area. This trails system, shown on **Plate 3–10** has not been ratified by the Commission nor has it been coordinated with land owners and land managers. Nevertheless, it does represent, at the present, an informal trail system used by residents of Carbon County for recreational purposes. The informal trail system used by mountain bikers, horse riders, OHV users, hikers, cross-country skiers, and wildlife viewers could be altered by pad and road construction. In addition, the users would experience conflict with project vehicle traffic and experience more noise and airborne dust than is now encountered.

Short-term impacts to recreation within and adjacent to the Project Area would result from all phases of the construction process. Activities associated with the installation of the proposed wells, including construction of roads, gathering lines and water lines, and possibly aboveground electric lines, would temporarily alter the use of affected roads and trails for the duration of construction activities. Construction activities can be expected to occur over a period of five years over the entire Project Area. Activities typically take place seven days a week from April through November, depending on weather and soil conditions. During this time period, there would be disturbance to the existing landscape character. Noise and dust from construction activities would be evident. Traffic associated with moving equipment over public highways and local roads would potentially conflict with recreational uses as they would be visually and audibly apparent. However, since the construction activities would be spread out over a five-year period, approximately 20 percent of the Project Area would be affected by construction activities in any given year.

A total of 83.2 miles of new roads would be constructed in the South Area and 14.8 miles in the North Area. Road construction is expected to require 4 days per mile, or a total of approximately 333 days in the South Area and 59 days in the North Area. The road construction in the Project Area would occur over a five-year period as required to access wells, averaging 67 days of construction per year in the South Area and 12 days per year in the North Area. Generally, road construction would occur during the eight-month (240 days) annual construction period from April through November. Recreationists would encounter road construction during that period of time. The loss of solitude, the natural experience, and trail accessability would affect local users in the particular area of construction. Additionally, the muscle-propelled recreationists (bikers

and hikers) would be especially affected by temporary, but short-term, increased dust levels when riding behind vehicles or when vehicles pass them.

Pipeline and power line installation along existing road rights-of-way would temporarily inconvenience recreationists who use the roads to gain access to recreational activities in the area. Construction activities would also impede recreation use of existing roads and trails, as well as, degrade the visual quality of the recreational experience. The loss of solitude along these roads would continue through the construction period.

Project construction would result in increased, but temporary, noise levels in surrounding areas from blasting and heavy equipment. Construction-related noise could reduce the quality of the recreational experience in general. However, as discussed in the noise impacts section, construction-related increases would be short-term and, with the exception of blasting, generally restricted to the immediate vicinity of the work. Noise from blasting would be sporadic and of short duration. Potential long-term increases in noise levels would result from the operation of gas-powered pumping units. Noise from operation of proposed facilities is discussed in **Section 4.14.**

The general season dates for big game hunting occur from late August (archery) through early November. The hunting season occurs during the proposed construction period. Hunting activities would be affected primarily at project sites that are undergoing installation or construction activities. Because the construction activities would be evenly distributed over a five-year period, approximately 20 percent of hunting opportunities would be affected in any year.

State lands in the Lower Huntington Wildlife Management Area (WLMA) and the Upper Huntington WLMA (shown as state wildlife reserves on **Plate 2–1**) are hunted for upland game birds. One well is proposed for the Upper Huntington WLMA, which would impact hunting opportunities for pheasant, mourning dove, and quail.

In general, the quality of the recreational experience would decline in the Project Area for the local users. The nature of the experience would be changed in the immediate areas disturbed by the project activities because there would be less opportunity to experience an isolated and natural setting. Recreationists using the area may be displaced by facilities or change their patterns of use for the duration of the proposed activities. Recreationists who seek a primitive experience characterized by a high degree of natural integrity and appearance and solitude may seek them elsewhere within the Project Area or on other public lands in Carbon and Emery counties. These alternative opportunities would not be in close proximity to residential areas, as is the case currently.

4.12.1.1.1 North Area

The North Area consists of BLM, state, and private lands. Recreational uses consist of dispersed activities such as mountain bike riding, horse riding, hiking, wildlife viewing, and OHV use. There are no developed recreational areas within or near the North Area. As a result, the Proposed Action would have no effect on developed recreational areas.

The Proposed Action in the North Area would consist of 65 wells, one new CPF, three compressor stations, and associated transportation infrastructure, such as roads and pipelines, and possibly aboveground electric transmission lines. There are currently 15 existing wells located on state and BLM lands in the North Area. The BLM has inventoried public and private lands in the North Area with the Recreation Opportunity

Spectrum (ROS) system. The BLM manages federal lands in the North Area to meet the objectives of each ROS class. State and private lands are not managed to meet BLM objectives. However, the ROS inventory of these lands characterizes the setting and potential recreational opportunities. The total number of existing and proposed wells and other facilities in each ROS class on public and private lands in the North Area are summarized in **Table 4–18**.

BLM Recreation Management

There are 46 wells proposed for BLM lands in the North Area, as shown in **Table 4–18**. A total of 80 wells, including existing and proposed wells, would be operated in the North Area. The BLM ROS analysis was utilized to assess the significance of impacts to recreation resources on public lands. The public lands in the North Area are managed with the ROS classes Roaded Natural, Semi-primitive Motorized, and Urban. None of the proposed facilities would be in the Semi-primitive Motorized area.

Table 4–18
North Area Facilities in ROS Classes

	ROS Classes			
Facility	**Roaded Natural**	**Urban**	**Semi-primitive Motorized**	**Total**
Wells				
BLM				
Proposed	45	1	0	46
Existing	7	0	0	7
Private				
Proposed	6	4	0	10
Existing	0	0	0	0
State				
Proposed	9	0	0	9
Existing	8	0	0	8
Total	75	5	0	80
Roads (miles)				
Proposed	13.0	1.8	0	14.8
Existing	72.9	4.6	0.7	78.2
Total	85.9	6.4	0.7	93.0

Most of the 46 wells on BLM lands would be on lands classified ROS Roaded Natural, which is characterized by a predominantly natural environment. Evidence of resource utilization should be moderate and in harmony with the natural environment. The addition of proposed facilities to the landscape would result in a modification of the natural environment. Aboveground power lines would be a visual intrusion into the natural setting. BLM objectives for Roaded Natural would be met if measures are taken to blend the facilities with the surrounding environment. There would be one well proposed for BLM lands in the ROS Urban area. This class is characterized by a highly-modified environment. The operation of one well on urban lands would be consistent with BLM ROS management objectives.

Private and State Lands

Recreation is not a significant use of most private lands in the North Area, but some roads across State and private lands provide access to BLM lands. Recreation on State-owned lands consists of dispersed trail-related activities similar to those described for BLM lands. Nineteen wells, or approximately 30 percent of the proposed wells, would be located on private and state lands. Currently, county roads that cross through private lands to reach public lands are part of the proposed Carbon County Trails Plan and the informal trail system. Access roads that cross private lands would be constructed or improved to accommodate project-related traffic. Any recreation use on roads across private and State roads would be affected similarly to roads across BLM lands.

Recreational Opportunities

The Kenilworth Trail forms a loop between Price and Kenilworth. Under the Proposed Action, there would be 13 wells within the foreground and middle ground views from the trail. The trails shown on **Plate 3–10** have historically been used by Carbon County residents for recreational opportunities. The Carbon County Commission has issued a the Carbon County Trails Plan that incorporates these trails as formally designated trails. However, the plan has not been ratified with individual land owners or land managers. The loss of solitude and the natural setting would be experienced along the Kenilworth Loop and the informal trail system, especially during the construction period. Some trail users who value the natural environment and solitude as integral to the recreation experience would probably seek recreational opportunities outside of the North Area, although it would result in less convenience to local users because these opportunities would be farther from their homes.

A sledding hill is located on private lands on a slope facing the south side of Kenilworth. The nearest well to the sledding hill is between ¼ to ½ mile north of the slope. The primary impact to sledders would be the sight and sound of the pumping unit.

The proposed access road improvements of existing roads in the North Area could be detrimental to some existing trail-related recreation activities. Mountain bikers generally prefer routes that provide a challenge to biking skills. Surface trail characteristics such as roughness, winding curves, and changes in gradients provide change and variety in the trail that challenge the mountain biker. However, the proposed road improvements may enhance other activities such as OHV use and hunting because public access into the area would be improved.

4.12.1.1.2 South Area

The South Area contains BLM, National Forest, state, and private lands. The Proposed Action in the South Area would consist of 220 new wells, four new CPFs, and associated transportation infrastructure such as roads, pipelines, and possibly aboveground electric transmission lines. There are 53 existing wells in the South Area. The total field development including proposed and existing facilities would consist of 273 wells.

BLM Recreation Management

As shown in **Table 4–19**, 85 wells would be constructed on BLM lands, including existing and proposed wells. The BLM ROS was utilized to assess the impacts to recreation resources on public lands. The BLM

Table 4–19
Proposed South Area Facilities in ROS Classes

Facility	ROS Classes				Total
	Roaded Natural	Urban	Semi-primitive Motorized	Rural	
Number of Wells					
BLM					
Proposed	18	0	67	0	85
Existing	4	0	19	0	23
Total	22	0	86	0	108
Private					
Proposed	38	0	1	5	44
Existing	21	0	2	0	23
Total	59	0	3	5	67
State					
Proposed	53	0	38	0	91
Existing	4	0	3	0	7
Total	57	0	41	0	98
Total	138	0	130	5	273
Roads (miles)					
New Roads					
BLM	5.8	0.0	33.0	0.0	38.9
State	16.7	0.0	16.3	0.3	33.4
Private	8.9	0.1	1.2	0.7	10.9
Total	31.5	0.1	50.5	1.0	83.2
Existing	140.2	9.4	48.0	27.7	225.3
Total	171.7	9.5	98.5	28.7	308.5

lands in the South Area are managed with the ROS classes Roaded Natural, Semi-primitive Motorized, Rural and Urban. There are no facilities proposed for BLM lands in the ROS classes of Urban and Rural.

On BLM lands identified as Semi-primitive for ROS, 67 wells and 33.0 miles of new access road would be constructed. Within ROS Roaded Natural, 18 wells and 5.8 miles of new access roads would be installed. Aboveground power lines also may be constructed and would generally parallel access routes. The proposed project would result in modification of the natural environment. Well sites and facilities, access roads and aboveground lines would result in visual intrusions to the natural setting and could affect the solitude sought by some recreationists. The levels of change to the environment would be moderate, but the Semi-primitive Motorized objectives would not be met, as opportunities for isolation from the sights and sounds of man would be affected in areas where development is concentrated. BLM objectives for the Roaded Natural areas would be met if measures are taken to blend the facilities with the surrounding landscape. **Section 4.14** describes measures proposed by the Companies and identifies mitigation that would reduce visual impacts of facilities.

Private and State Lands

Recreation is not a significant use of most private lands in the South Area. A portion of the Huntington Lake State Park is located within the South Area. The nearest proposed well to the park is approximately 1.3 miles to the west. The Proposed Action would not affect recreational opportunities in the park. The visual impact of proposed facilities to visitors in the park is assessed in **Section 4.13** and the noise impact is assessed in **Section 4.14**. The project would not affect recreational opportunities or public access to the Mill Site State Park, which is adjacent to the South Area. Recreation on other State-owned lands consists of dispersed activities similar to those described for BLM lands. Access roads that cross through private lands would be improved to accommodate project-related traffic.

The Bear Canyon Campground is an Emery County-owned facility in Huntington Canyon near the northwest boundary of the South Area. There is one well proposed for private land adjacent to the campground. The well would be visually and audibly evident to campers and picnickers. There is also potential that the well facilities would pose a danger to campground visitors in the small probability of a well explosion or fire.

Recreational Opportunities

Dispersed recreation is not a primary use of public or private lands in the South Area. Some groups, for example, the Southeast Utah OHV Club, have expressed an interest in developing an OHV access trails network using the existing roads and the roads that the Companies would construct. If the OHV network is fully developed, there could be an increase of OHV use in the South Area. There would be little change in existing levels of dispersed recreational activities on public lands surrounding the South Area as a result of the development under the Proposed Action. It is anticipated that similar levels of recreational activities, including hunting, would continue on these lands.

Hunting is the primary dispersed recreation opportunity available on public lands in the Project Area. There are an additional 83.2 miles of roads proposed for the South Area, which would increase the total miles of roads by 36 percent, from 225.3 miles (including jeep and foot trails) to 308.5 miles. The potential for illegal hunting activities may increase as public access opportunities increase as a result of the proposed access roads into the South Area.

The Castle Valley Pageant site is located on State lands seven miles west of Castle Dale within the South Area. The pageant would occur annually over a period of eight nights in late July and early August. More than 20,000 people attend the pageant to view a portrayal of the Mormon settlement of Castle Valley. The primary effects to the pageant would be visual and are analyzed in **Section 4.13**. There is also potential that the noise from the pumping units would be intrusive to the pageant experience during the eight-day event.

Any change in the water quality of the San Rafael river downstream of the proposed project could result in impacts to water-based and water-enhanced recreational uses of the river, such as rafting, fishing, hiking, and wildlife observation. However, it is not anticipated that downstream flows would vary significantly from existing flows or that water quality would be adversely impacted by project activities (see **Section 4.2**).

4.12.1.1.3 Transmission Line Corridor

The proposed gas transmission line would be constructed on public, State of Utah and private lands adjacent to the existing Questar right-of-way. There would be no long-term impacts to recreational uses within the

existing pipeline right-of-way. Once the pipeline is installed and the land within the right-of-way is reclaimed, recreational activities would return to pre-existing levels of use.

4.12.1.1.4 Electric Power Option

A description of impacts from electric power lines has been incorporated into the analysis presented in **Section 4.12.1**.

4.12.1.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

Under Alternative 2, four fewer wells would be constructed and operated in the North Area and 14 fewer wells would be drilled in the South Area. This alternative differs from Alternative 1 in that protection measures have been developed for critical resources. The impacts to recreational opportunities from Alternative 2 would be similar as described in the Proposed Action, however, affects could be lessened if the agreement to study offsetting trails as identified in the Environmental Protection Measure would result in the development of additional trails. Visual Resource Environment Protection Measures would mitigate some of the concerns about the loss of the natural setting. The effects of the visual Environmental Protection Measures are described in **Section 4.13.**

Under Alternative 2, approximately 43 percent of the power lines would be buried. Therefore, the indirect impact to the natural setting and loss of solitude described for the Proposed Action would be proportionately less along the roads where power lines would be buried.

4.12.1.3 Alternative 3 — No Action Alternative

No direct or indirect impacts to existing developed and dispersed recreation resources on BLM lands would occur under this alternative. The existing condition of BLM lands in the Project Area would be maintained under the current management direction as defined in the BLM San Rafael RMP and the Price River MFP currently in effect. Natural gas development would continue on private lands within and adjacent to the Project Area. Rights-of-way may be issued across BLM lands to grant access to a private or state leases. Less than two miles of new roads would be constructed on BLM lands. Recreational opportunities would not be affected by changes in public access.

4.12.2 Impacts Summary

The main recreational uses in the Project Area is by local residents who use BLM lands for mountain bike riding, horse riding, OHV activities, hunting, cross-county skiing and hiking. The Proposed Action and Alternative 2 would result in similar localized adverse effects on the recreational experience through a loss in solitude and a change in the natural setting resulting from the construction and operation of natural gas facilities and roads. Noise and dust near construction activities and along roads, especially during the construction period, would also effect the recreational experience. The largest impact would be during the five-year construction period when vehicular traffic and construction activities would be at a maximum. After the construction period, the solitude factor would still be affected by the presence of well pads, pumping units and ancillary facilities. However, traffic would return to near pre-construction levels with the exception of pumpers' daily inspections and periodic maintenance activities. The natural setting would be altered by project facilities for the life of the project. The highest impact would be to the local residents of

Price and Kenilworth near the North Area because of the greater population and the immediate proximity of the North Area to their homes.

BLM management objectives for Semi-primitive Motorized ROS would not be met as opportunities for isolation from the sights and sounds of man would be affected in areas where development is concentrated. Roaded Natural ROS objectives would be met if measures are taken to blend the facilities with the surrounding environment. Reduction of the visual impacts of project facilities through Environmental Protection Measures and mitigation are described in **Section 4.13.**

4.12.3 Mitigation

Speed limits along project roads should be kept to a maximum of 25 miles per hour (unless otherwise posted) to reduce fugitive dust and minimize conflicts with recreationists utilizing project roads.

To diminish evidence of the sights and sounds of man in the Semi-primitive Motorized areas of the South Area (see **Plate 3–10**), any electric power lines to well sites should be buried, unless an exception is granted by the authorized officer. Exceptions would be considered for continuation of existing aboveground power lines to individual wells. In Semi-primitive Motorized areas, to reduce noise effects on recreationists, gas-powered pumping units should utilize sound-reducing technologies, such as mufflers, multi-cylinder muffled engines, or sound barriers.

During construction activities, the companies should install signs on access roads that are used for recreation to warn users of heavy equipment and truck traffic. Sign placement on BLM lands would be determined by the Authorizing Officer.

4.12.4 Unavoidable Adverse Effects

The loss of solitude and the change in natural setting in areas of concentrated development cannot be avoided with natural gas development. The construction of well pads, roads, and ancillary facilities would change the natural setting of the Project Area over the lifetime of the project and beyond until reclamation activities are complete. The loss of solitude for the recreational experience would be unavoidable during the construction period and remain to a lesser extent over the life of the project. In the South Area, Semi-primitive Motorized ROS objectives may not be met.

4.13 VISUAL RESOURCES

Development of natural gas in the Project Area would alter the physical setting and visual quality of the landscape, affect the landscape as experienced from sensitive viewpoints, including travel routes and popular use areas, and affect existing VRM designations. The landscape provides a scenic backdrop to recreational and residential uses of the area. The proposed facilities and associated access roads would introduce new elements into the landscape, and would alter the existing form, line, color, and texture which characterize the existing landscape.

Direct impacts to visual resources occur due to the disturbance of the landscape by project activities, and the addition to the landscape of proposed facilities, including the well pads, production facilities and associated pipelines, and access roads. Indirect impacts can be short or long term. Short-term impacts result from

temporary disturbances to visual resources, including construction and installation activities. Long-term impacts result from the addition of permanent structures to the landscape and the operation of facilities.

Impacts to visual resources are considered significant if they substantially change or degrade the character of the landscape as seen from sensitive viewpoints or if the allowable modification to the landscape prescribed for BLM VRM classifications cannot be met.

The analysis area for visual resources consists of the North and South Areas and the transmission line corridor located in the existing Questar Pipeline corridor between Ferron and the northern border of Emery County.

Key observation points (KOPs) were identified for the North and South Areas and are identified on **Plate 3–11**. The KOPs represent viewpoints from which proposed facilities and activities within the North and South Areas may be evident to the casual observer.

4.13.1 Direct and Indirect Impacts

4.13.1.1 Alternative 1 — Proposed Action

4.13.1.1.1 Construction Disturbance

During the five-year construction period, short-term impacts to the visual character of the landscape at each well site would result from well pad construction, gas well drilling and associated construction of ancillary facilities, such as well access roads and pipelines. Construction and installation of pipelines would immediately follow construction of access roads and well pads and coincide with well drilling. Power line construction would generally follow access road surfacing. The majority of gathering lines, water lines, high pressure gas lines and power lines would be located adjacent to road rights-of-way.

Well pad construction and well drilling activities would be accomplished using graders, drill rigs, dozers, and other heavy equipment. During the construction period, these activities would detract from the visual quality of the landscape. Construction activities would be spread over the five-year construction phase and generally occur in clusters. Therefore, approximately 20 percent of the Project Area would be affected in any one year. The visual intrusion of these activities would be site specific and not affect users outside of the viewshed of each construction site in the North and South areas.

Construction activities would primarily be evident to people using roads and trails within the North and South areas. Users of the areas would be impacted by the sight and dust of construction activities. In addition, the transportation of equipment, materials, and personnel to and from the North and South areas would be evident to other travelers on SR 10 and on local roads that would be used for access.

Drilling activities would typically be 24 hours per day for a one- to four-day period. Since drilling would be the only activity that would occur at night, lighting on drill rigs would be visible at residences with a direct line-of-sight to well sites.

4.13.1.1.2 Permanent Disturbance

The Proposed Action would constitute a change of the visual character of the existing rural landscape in the North and South areas. The addition of the well sites and associated access roads would result in a mixed

rural/industrial (mechanized) landscape. The components with the highest potential to adversely affect the visual character of the area are the well pad clearings, pumping units, and access roads. The operation of the proposed facilities would introduce new elements of form, line, color, and texture into the landscape and would essentially dominate foreground views and be obvious in some middle ground and background views.

Long-term impacts would result from the addition of the wells sites, facilities, and access roads to the landscape and any permanent disturbances associated with gathering lines or power lines. The most visible components of the proposed facilities are the pumping units at each well site.

Gathering and water lines would be buried adjacent to existing and new road rights-of-way. The combined right-of-way of each road and pipeline would be an average 78 feet in width. The pipeline right-of-way would be cleared of vegetation, resulting in an obvious clearing adjacent to each access road until revegetation is successful.

Electric power lines would be installed above ground on 30-foot tall poles every 300 feet. Power lines would generally parallel access roads and would result in a visual impact.

Each compressor would be lit at night with up to eight 250-watt, clear lamp lights. Each light would be mounted on a pole or building and directed downward to illuminate the facility. This type of night-lighting would minimize the night shine from each facility. However, the facilities nearest to residential areas would be visible at night.

4.13.1.1.2.1 North Area

The North Area contains BLM, state and private lands. The proposed development would consist of 65 wells installed in a 160-acre well density pattern, three compressor stations, two CPFs, and associated a transportation infrastructure, such as roads, pipelines, and utilities. There are currently 15 existing wells in the North Area. The 160-acre density pattern consists of a maximum of four gas wells per square mile. Each well pad would require a construction area of 200 feet by 300 feet (1.4 acres). Once the facilities are installed, each well pad would be reclaimed back to the permanent well pad size of approximately 0.8 acres. The number of wells and other facilities in each VRM class in the North Area for each alternative is summarized in **Table 4–20**.

4.13.1.1.2.1.1 BLM Lands

There are 46 wells proposed for BLM lands in the North Area. Lands affected by the Proposed Action are identified as VRM Classes III and IV (see **Plate 3–11**). Class III objectives provide for activities that may contrast with the basic landscape elements, but remain subordinate to the existing landscape character. Activities may be visually evident, but should not be dominant. Class IV objectives provide for major modification of the landscape, and allow management activities to dominate the landscape.

There are 32 wells and two compressor stations proposed for BLM's VRM Class III lands, which occupy the central portion of the North Area. The proposed project in the North Area would change the existing rural landscape to a rural/industrial landscape primarily because the 160-acre spacing of the wells would result in a noticeable density of gas-producing facilities. There is potential that Class III objectives would not be met because the facilities would not be subordinate to the existing landscape character. BLM objectives for some Class III areas could be met if every attempt is made to minimize the adverse visual impacts through

Table 4–20
Proposed and Existing North Area Facilities in VRM Classes

Facility	VRM Classes		Total
	Class III	Class IV	
Wells (number)			
BLM			
Proposed	32	14	46
Existing	1	7	8
Total	33	21	54
Private			
Proposed	4	6	10
Existing	0	0	0
Total	4	6	10
State			
Proposed	5	4	9
Existing	7	0	7
Total	12	4	16
Total	49	31	80
New Roads (miles)			
BLM	6.4	3.1	9.6
Private	1.1	1.6	2.7
State	1.4	1.1	2.5
Total	9.0	5.8	14.8

careful location of facilities, minimal disturbance of the site, and painting facilities so that they harmonize with the colors of the surrounding landscape.

Fourteen of the proposed wells are on BLM VRM Class IV lands in the northwest and northeast parts of the North Area. Class IV objectives provide for a level of change to the landscape that may be high and may be visually dominant. The construction and operation of each well and the ancillary facilities would be consistent with VRM Class IV management objectives and none of the disturbed acreage would be displaced from the existing BLM inventory of lands managed with VRM Class IV.

There would be a total of 14.8 miles of new well pad access roads constructed in the North Area. The access roads would be visible primarily in the foreground zones. Each road and the adjacent pipeline corridor would be constructed to an average width of 70 feet. Straight access roads that cut across the contours to the well pad, particularly on slopes, would have a greater visual impact than access roads that are aligned with the contours of the topography.

4.13.1.1.2.1.2 Private/State Lands

There are 19 wells, two CPFs, and three compressor stations proposed for private and state lands in the North Area. Private and state lands are included in the BLM inventory of visual resources in the North Area. The proposed facilities located on private and state lands are included in the total acres summarized in **Table 4–20**, however, the BLM does not manage visual resources on private and state lands. Wells on private lands would be located adjacent to Kenilworth and would be visible from Key Observation Point 1. Wells on state lands would be located primarily in the south and west parts of the North Area and would be visible from existing roads.

4.13.1.1.2.1.3 Key Observation Points (KOPs)

Key Observation Points (KOPs) were selected to simulate a representative, but not all inclusive, view of proposed natural gas facilities. KOPs were selected at key areas where the most people would view natural gas facilities from the most representative viewing angle. A 45- to 90-degree change in the viewing angle would obviously change the viewshed and the resulting visual simulation. The visual simulations were prepared to depict the most obvious and representative features of natural gas development. Other features may be visible in the background of these simulations, but features would be in the background and much less obvious to a casual viewer. Three KOPs located on roads or near residential areas have been selected for the North Area. Each KOP is representative of views similar to those seen from other locations in the North Area.

- KOP N1. The KOP is on a road at the south end of the town of Kenilworth. The simulation prepared for KOP N1 (**Figure 4–1**) provides a view to the southeast of the proposed well site nearest to Kenilworth. A well proposed for private lands on the south end of Kenilworth would dominate the view from the KOP and from other parts of Kenilworth. The visual impact of this well would be lessened if mitigation measures proposed for wells on BLM lands would be implemented for wells on private lands located near residential areas. Other wells proposed for BLM and private lands near Kenilworth would be screened by the topography.

- KOP N2. The viewpoint is on an improved, dirt-surfaced road that provides access to numerous proposed well sites. The road forms the east leg of the Kenilworth Loop recreation trail, and is a popular trail with local residents. The simulation (**Figure 4–2**) prepared for KOP N2 shows two proposed wells in the middleground zone of the view. The wells visible from KOP N2 are located on BLM lands managed with VRM Class III objectives.

- KOP N3. This viewpoint is located on a BLM road two miles southeast of Kenilworth. The road forms part of the Carbon County Trails network. The simulation in **Figure 4–3** shows one existing and one proposed well to the southwest of the KOP. The wells are on Class III managed lands.

Other viewpoints along the roads in the North Area would provide views of the CPF. The CPF would be located on private lands in the southeast part of the North Area. The site is located adjacent to a road that is part of the Carbon County Trails Network. The CPF would have a low profile and would not be easily visible in the middleground and background zones from viewpoints at similar or lower elevations. The CPF would be in the foreground zone as seen from adjacent roads and would be obvious to travelers on the roads. This can be mitigated somewhat by setting the CPF back from the road, leaving a buffer zone of the existing topography and vegetation. Mitigation measures such as painting facilities to harmonize with the surrounding landscape, and minimizing disturbance areas can be used to lessen the visual impact.

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Figure 4–1 KOP N1

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Click here to view Figure 4-2

Figure 4–2 KOP N2

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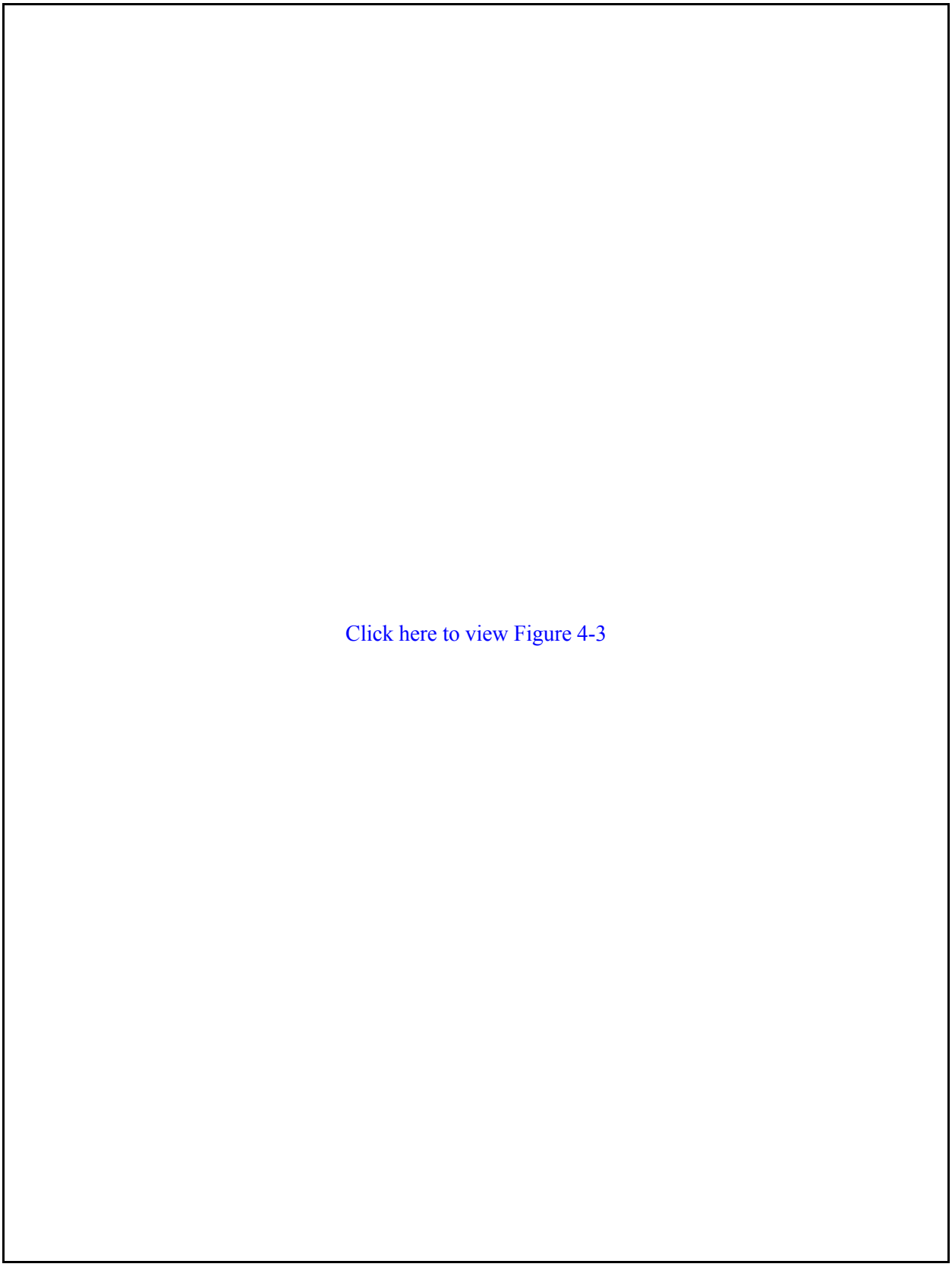

Figure 4–3 KOP N3

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4.13.1.1.2.2 South Area

The South Area contains BLM, National Forest, state, and private lands. The proposed South Area development would consist of 220 proposed wells installed in a 160-acre well density pattern, seven CPFs, and associated transportation infrastructure, such as roads, pipelines, utilities, and power lines, if installed. Existing facilities consist of 53 wells, three compressors, and three disposal wells. The number of wells and other facilities in each VRM class in the South Area are summarized in **Table 4–21**.

4.13.1.1.2.2.1 BLM Lands

There are a total of 84 wells proposed for BLM lands in the South Area. Lands affected by the Proposed Action are identified as VRM Classes III and IV (see **Plate 3–11**). Class III objectives are to provide for management activities that may contrast with the basic landscape elements, but remain subordinate to the existing landscape character. Activities may be visually evident, but should not be dominant. Class IV objectives provide for major modification of the landscape, and allow management activities to dominate the landscape.

There are 42 wells proposed for VRM Class III BLM lands in the South Area. These Class III lands are within the foreground to middleground zones of views from the primary transportation routes through the area, including SRs 10 and 29. The proposed project in the South Area would change the existing rural landscape to a rural/industrial landscape primarily because the 160-acre spacing of the wells would result in a high density of facilities that would be obvious to viewers from the KOPs, local transportation routes, and residences. There is potential that Class III objectives would not be met. BLM objectives for some Class III areas could be met if every attempt is made to minimize the adverse visual impacts through careful location of facilities, minimal disturbance of the site, and painting facilities so that they harmonize with the colors of the surrounding landscape.

There are 42 wells proposed for VRM Class IV lands, which occupy most of the south half of the South Area. The construction and operation of each well site and the ancillary facilities would be consistent with VRM Class IV objectives. Visual impacts could be minimized through careful location of facilities, minimal disturbance of the site, and painting facilities so that they harmonize with the colors of the surrounding landscape.

There would be a total of 39 miles of new access roads constructed on BLM lands in the South Area. The access roads would be visible primarily in the foreground zones. Each road and the adjacent pipeline corridor would be constructed to the standard width of 40 feet. The visual impact of each road can be lessened by aligning the road with the contours of the topography instead of cutting across the contours to the well pad, particularly on slopes. However, this method of aligning the roads may result in a greater area of disturbance.

Table 4–21
Proposed and Existing South Area Facilities in VRM Classes

Facility	VRM Class			Total
	Class II	Class III	Class IV	
Wells				
BLM				
Proposed	0	42	42	84
Existing	0	13	10	23
Total	0	55	52	107
Private				
Proposed	16	15	14	45
Existing	3	19	0	22
Total	19	34	14	67
State				
Proposed	1	16	74	91
Existing	0	4	4	8
Total	1	20	78	99
Total	20	109	144	273
New Roads (miles)				
BLM	0.0	18.8	20.0	38.8
Private	1.7	5.6	3.7	11.0
State	0.2	5.3	27.9	33.4
Total	2.0	29.7	51.5	83.2

4.13.1.1.2.2.2 Private/State Lands

Private and State lands adjacent to the BLM lands in the South Area are inventoried with VRM Classes II, III, and IV, as shown on **Plate 3–11** and **Table 4–21**. The BLM does not have jurisdiction over the visual resources of private and state lands, although the inventory reveals that the capability of these lands to absorb project modifications to the visual character is similar to the adjoining BLM lands.

The Huntington Canyon Road is a scenic byway that provides access to popular recreational areas on Manti-La Sal Forest lands west of the Project Area. The proposed wells along the byway are on private lands and state lands. These lands are within the foreground and middleground viewing distance zones along the highway and are sensitive to public view. Surface disturbances and facilities would alter the visual characteristics of the landscape adjacent to the road and would not meet objectives of the VRM II classification. Measures identified for Federal lands could reduce visual impacts of wells seen by travelers on the byway, if they were implemented.

4.13.1.1.2.2.3 Key Observation Points (KOPs)

- KOP S4. The KOP is located at the boat launch and other recreation facilities on the northeast side of Huntington Lake State Park. Views of the Project Area on the south and west sides of the park consist of the lake and surrounding parklands in the foreground zones, the flat to rolling terrain of the Project Area in the middle ground, and the steep rim of the dramatic Wasatch Plateau in the background. The simulation shown in **Figure 4–4** shows the lake in the foreground, and four proposed wells that are visible in the middleground zone beyond the southwest shore of the lake. The distance and the rugged topography would screen most of the wells from the KOP. The nearest well to the KOP is nearly two miles west of the Park. South Area wells in the middleground zone and the background zone would be screened from the KOP by the rolling hills of the area. The visible wells are on private lands and BLM has no jurisdiction over them.

- KOP S5. The KOP is on Huntington Canyon Scenic Byway (SR 31), which is part of a statewide system of scenic routes. KOP S5 is representative of views that would be seen by travelers along the entire byway through the South Area. There would be one well visible in the middle ground zone of the view from KOP S5. Most of the wells in the foreground and middleground distance zones are screened by vegetation along Huntington Creek and the road as seen from the KOP. Along the remainder of the road, the middleground zones are visible only to viewers along the east part of the road consisting in the three-mile segment west of Huntington. Wells in the background zone would be screened by the topography along the entire length of the road. In general, a maximum of three to four wells would be visible to viewers in a vehicle from any point along SR 31. Most viewers along the road would be traveling in a motorized vehicle, and the viewing zone would be a continually changing landscape limited to the area in front of and to the side of the vehicle visible to viewers at any point along the road, as shown in the simulation in **Figure 4–5**. Each well would be seen for a brief period of time before the moving vehicle moves beyond the line-of-sight to the well. All of the visible wells are on private and state-owned lands.

- KOP S6. This KOP is located on Huntington Canyon Scenic Byway (SR 31) near the west boundary of the South Area, approximately 10 miles west of Huntington. The nearest wells to the KOP are one mile to the southeast. However, the winding nature of the road and the steep canyon walls obstruct any views of the wells from this viewpoint, as shown on **Figure 4–6**. In general, any wells located along this portion of the byway on the west side of the South Area are very obvious to travelers on the road. The road is enclosed on either side by canyon walls, and wells must be sited close to the road, potentially dominating the surrounding landscape. These wells could be mitigated by siting each well to take advantage of the existing groves of trees along the Huntington Creek riparian zone to provide screening. The KOP is also representative of views seen from the nearby Bear Canyon Campground. There is one well proposed for the foreground distance zone on private land adjacent to the campground. The well would be visually and audibly intrusive to campers and picnickers.

- KOP S7. The KOP is located on SR 10 approximately 4.5 miles north of Castle Dale. The view is representative of views seen by travelers along the length of the highway adjacent to the east side of the South Area. There are no wells proposed for the foreground zone as seen from KOP S7 and from most of the length of the highway along the South Area. There are 4 wells that would be located on private lands north of Clawson that would be visible within foreground zone as viewed from SR 10, as shown on **Figure 4–7**. Most of the wells in the middleground and background zones would be screened from viewers along SR 10 by the rolling terrain characteristic of the South Area. The wells located on BLM lands managed with VRM Class IV. The well pad disturbances would be visible from the highway as a distinct, linear contrast between the light-colored tan bare soils and green vegetation.

- KOP S8. The Castle Valley Pageant site is located on State lands seven miles west of Castle Dale. The KOP is located on a ridge that provides panoramic views to the north, east, and south. There would be seven wells within foreground views of the KOP in all directions. The terrain is rugged surrounding the KOP and wells within the middleground are screened from view. **Figure 4–8** provides views of seven wells to the northeast of the KOP. This simulation from KOP S8 shows the view overlooking the proposed development to the northeast of the pageant site. The simulation also shows the power poles that would be constructed under the electric power option. The wells that are visible from the pageant site are on State lands designated with VRM Class IV objectives. The BLM objectives for VRM Class IV would be met by the development of most of the proposed facilities in the viewshed of the pageant site. However, the pageant is a spectacle that draws an estimated 20,000 visitors to the area every year. The area is therefore sensitive to any modification of the existing scenic landscape that provides a backdrop to the pageant. Although these lands are not managed by the BLM, the impacts could be reduced if the orientation of each well relative to KOP S8 would be evaluated prior to installation and appropriate mitigating measures would be implemented.

- KOP S9. This viewpoint is on SR 29 on the north side of Orangeville. The views of the South Area are to the west along Cottonwood Creek, and of agricultural lands to the north and south of the KOP. There are no wells within the foreground zone of views from KOP S9. shown in **Figure 4–9**. Wells in the middleground distances zone are screened by vegetation.

- KOP S10. This viewpoint is at a radio tower on a Wasatch Plateau escarpment within the Manti-LaSal National Forest. The site provides a vista of the Castle Valley, including the South Area, and is representative of the views seen by users of the four-wheel drive roads and trails along the rim of the plateau. The KOP is located at a higher elevation that the South Area. **Figures 4–10a** and **4–10b** are a simulation of the panoramic view of the proposed South Area development from KOP S10. Most of the facilities would be within the background zone of views from this KOP. The facilities in the background zones over 4 miles in distance appear to be too small to attract the attention of the casual observer. Existing modifications consisting of portions of SR 10 and the Huntington Power Plant are visible in the background zone. Three of the visible wells are proposed for BLM lands managed with VRM Class IV objectives. The wells in the middleground zone would be an obvious modification of the existing rural landscape, and BLM Class III objectives may not be met. BLM Class IV lands are the closest BLM lands to KOP S10. There would be nine wells visible at the KOP within Class IV lands.

4.13.1.1.2.2.4 National Forest

There are no wells proposed for public lands in the Manti-La Sal National Forest. The management of visual resources by the FS would not be affected by the proposed project.

Manti-La Sal National Forest lands on the east rim of the Wasatch Plateau overlook the South Area. Proposed facilities would be visible in the background zone of views from trails and roads along the rim. KOP 10S, discussed above, has been selected to represent views of the South area facilities and activities from the rim.

4.13.1.1.2.3 Transmission Line Corridor

The transmission line corridor would be located in an existing and new pipeline right-of-way on public and private lands in Emery County. Impacts to the characteristic landscape along the proposed pipeline route would be construction related and temporary. Once the pipeline construction disturbance is reclaimed and

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Figure 4–4 KOP S4

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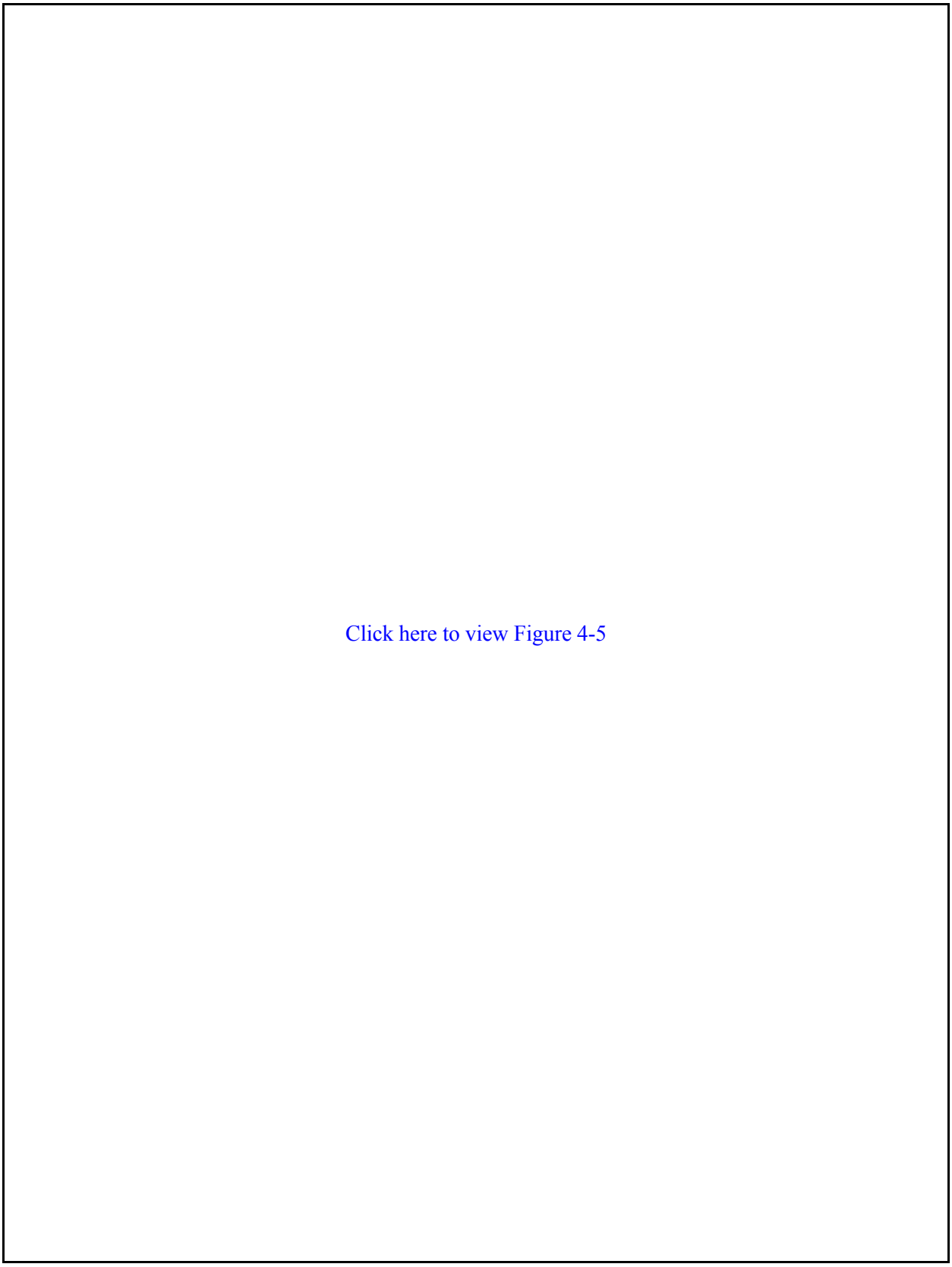

Figure 4–5 KOP S5

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Click here to view Figure 4-6

Figure 4–6 KOP S6

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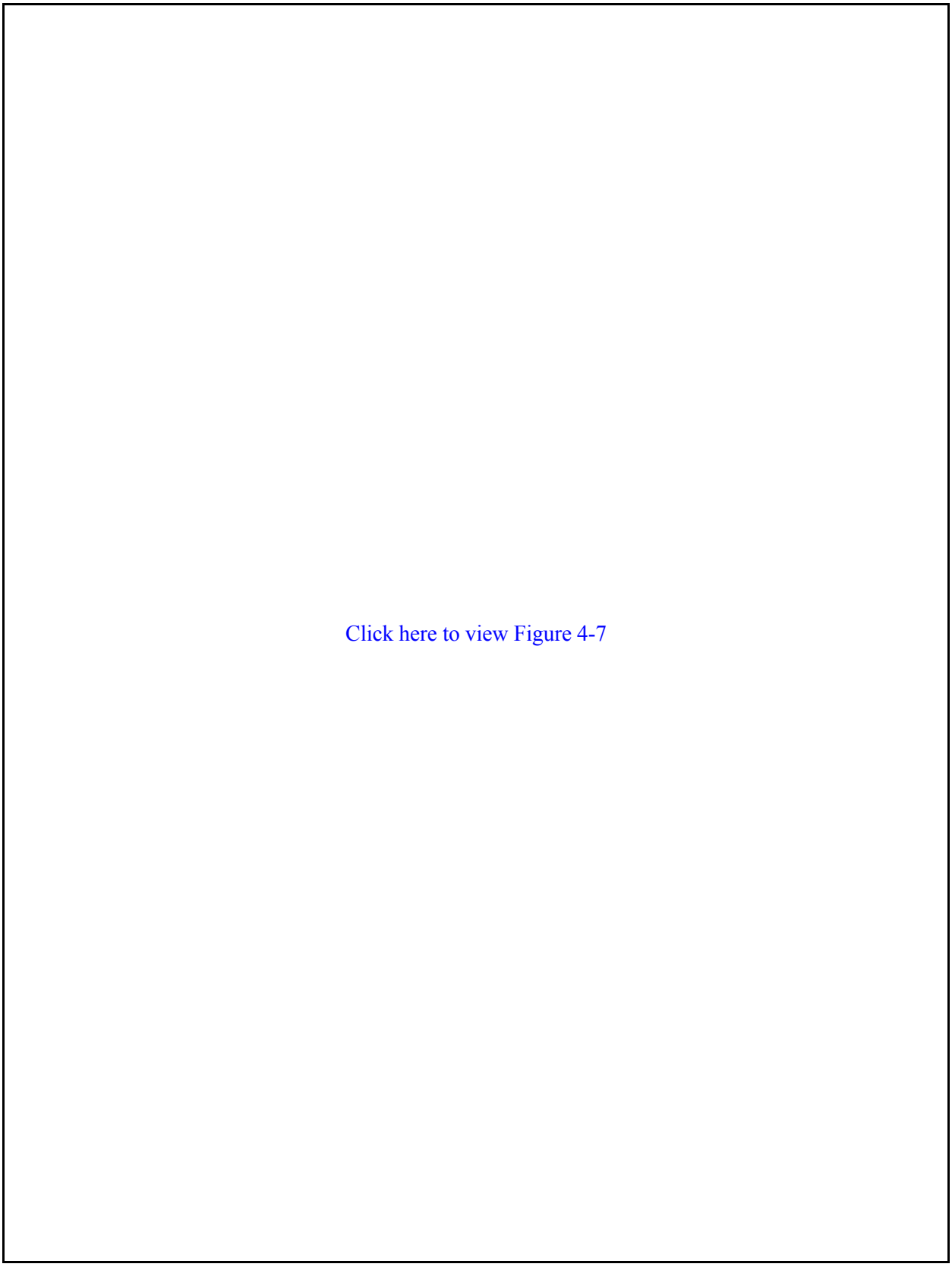

Figure 4–7 KOP S7

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Figure 4–8 KOP S8

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Click here to view Figure 4-9

Figure 4–9 KOP S9

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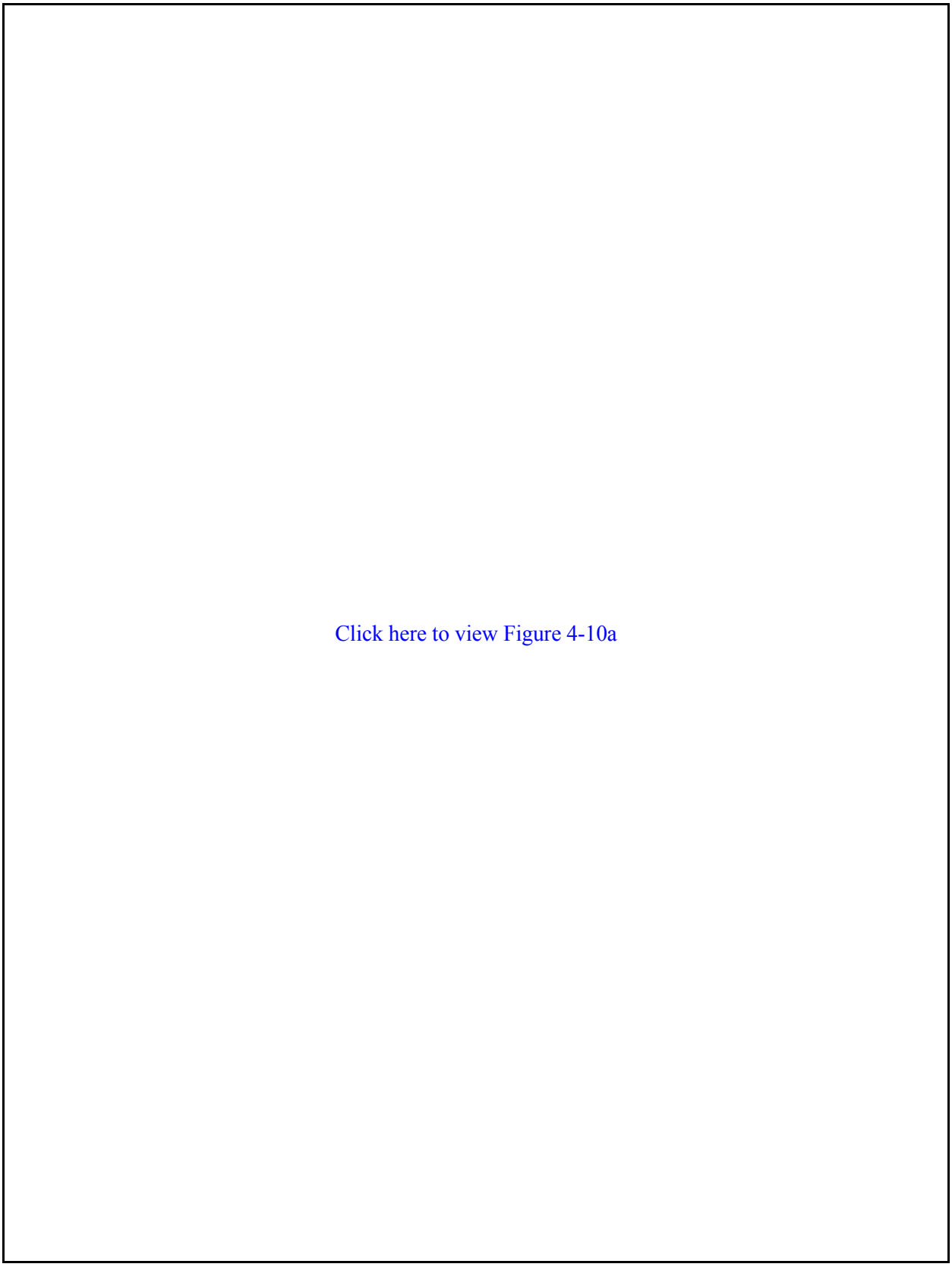

Figure 4–10a KOP S10a

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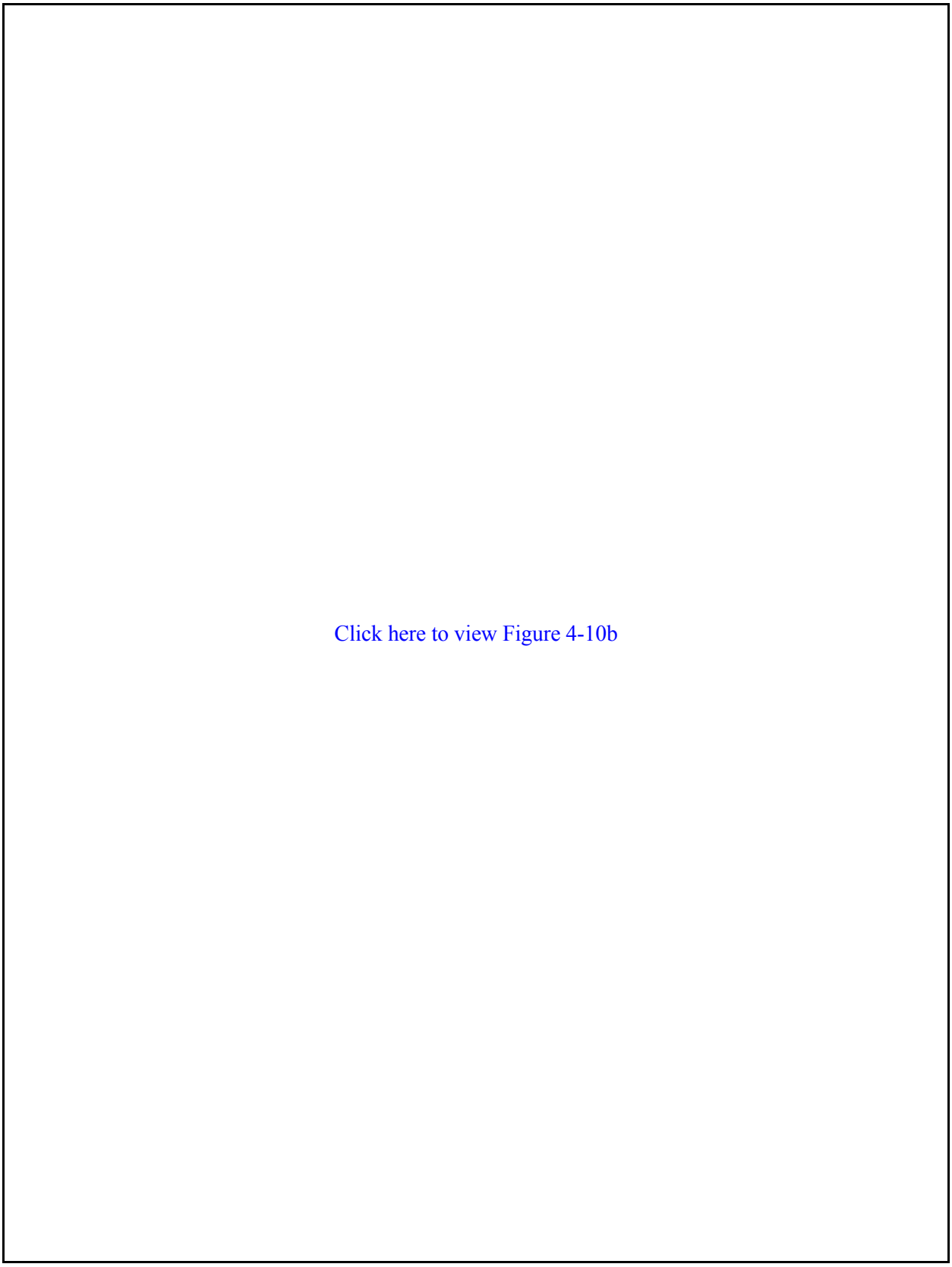

Figure 4–10b KOP S10b

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revegetated, the corridor would return to pre-project conditions. Most of the land along the pipeline right-of-way has a low potential for reclamation because of soil type. As a result, the construction right-of-way would be visible until reclamation is complete. There would be no long-term visual impacts from locating the route adjacent to an existing rights-of-way.

4.13.1.1.2.4 Electric Power Option

Under the Proposed Action, electric power would be supplied to Project facilities by aboveground power lines. The distribution of power lines, shown on **Plate 2–2**, was calculated in the manner described in **Section 2.1.1.1.1.4**. In the North Area, up to 43.3 miles of aboveground power lines would be installed on poles every 300 feet resulting in the addition of 762 poles. In the South Area, 144.3 miles of power lines could be installed along with 2,540 poles. Typically, the poles would be 30 feet high and similar to commonly seen telephone poles. Most of these power lines would parallel existing or newly constructed access roads, but, as described in the introduction to this chapter, aboveground power lines commonly follow relatively straight lines. They would not follow every curve in the access roads closely. Thus, parts of these aboveground power lines would extend away from the access roads' ROWs. As much as 50 percent of the ROW for the power lines could be away from the access roads' ROWs. Additionally, a few power lines may traverse cross country.

Table 4–22 shows the distribution of aboveground power lines for each VRM classification and land ownership in the Project Area.

Power lines would be visible to the casual observer, and would constitute a slight visual impact to BLM VRM III classifications. The poles would be the most visible intrusion but they would be placed 300 feet apart generally on the same side of the road along any given stretch of road. The most visible effect would be for an observer to view a long stretch of poles looking down a road or power line right-of-way. In this case, the series of poles would be a visual intrusion. Looking from this viewpoint, some segments of the

Table 4–22
Ferron Natural Gas Proposed Action
Distribution of Aboveground Power Lines by VRM Class and Land Ownership

	Miles of Power Lines				Number of Poles			
Location	BLM	State	Private	Total	BLM	State	Private	Total
North Area								
VRM II	0.0	0.0	0.0	0.0	0	0	0	0
VRM III	21.8	9.0	1.3	32.2	384	159	23	566
VRM IV	8.0	1.3	1.8	11.1	141	23	32	196
Total	29.8	10.3	3.1	43.3	525	182	55	762
South Area								
VRM II	0.0	0.8	5.1	5.9	0	15	89	104
VRM III	28.3	9.3	17.2	54.9	499	164	304	966
VRM IV	30.5	46.3	6.7	83.5	537	815	117	1,470
Total	58.9	56.4	29.0	144.3	1,036	993	510	2,540
Total	88.7	66.8	32.1	187.6	1,561	1,175	566	3,302

32.2 miles (21.8 miles on BLM land) in the North Area may not meet the VRM Class III that is managed for activities that may contrast with the basic landscape elements, but remain subordinate to the existing landscape character and may be visually evident, but should not be dominant. Looking from a viewpoint directly off the road, individual poles separated by 300 feet would be considerably less noticeable but the power lines would be noticeable. Therefore, the impact to visual resources would depend on the viewpoint. Visual impacts would not conflict with management objectives for the 11.1 miles (8.0 on BLM lands) of power lines across lands that are classified as VRM Class IV where the objective is to provide for management activities that may require major modifications to the existing landscape and the level of change to the landscape can be high and may be visually dominant.

In the South Area, 5.9 miles of power lines and 104 poles would be constructed on State and private lands identified as VRM Class II. Installation of power lines on these lands would not meet objectives for VRM Class II that provide for activities that would not be evident in the characteristic landscape and contrasts that are seen but must not attract attention.

The visual impacts for viewpoints along the 54.9 miles and 966 poles (28.3 miles of power lines and 499 poles on BLM lands) that would be installed on Class III VRM lands would be similar to those described for the North Area. Visual impacts would not conflict with VRM management objectives along the 83.5 miles of power lines and 1,470 poles (30.5 miles and 537 poles on BLM lands) on lands that are classified as VRM Class IV.

4.13.1.2 Alternative 2 — Proposed Action with Environmental Protection Measures

Alternative 2 is similar to Alternative 1 in the siting of project facilities and the acreage of land to be disturbed for each facility. This alternative differs from Alternative 1 in that environmental protection measures have been developed for critical resources, as described in **Section 2.2** and about one half of any power lines would be buried. Critical resources that may pose constraints to the siting of some proposed wells, roads, and facilities consist of water resources, soils, wetlands/riparian, wildlife habitat, and visual resources. Implementation of Alternative 2 would result in the development of 18 fewer wells. Many well locations also would be moved to areas where wells could be accessed without crossing slopes greater than 25 percent or be permanently located within ½ mile of an active raptor nest. These wells would be in locations generally unseen by the public.

The impacts to the existing landscape character of the Project Area would be less than the impacts described for the Proposed Action with implementation of Visual Resource Environmental Protection Measures. These measures would diminish the visual impacts through careful location of sites and facilities to blend with natural features, minimal disturbance of the site, and painting facilities so they harmonize with the colors of the surrounding landscape. Class III objectives could be met in the area as a whole, but there would be many localized areas where facilities would not be subordinate to the character of the landscape. Also, with the 160-acre well density pattern, clusters of wells, facilities, and roads would result in a noticeable change to the landscape. Therefore, in some areas, Class III VRM objectives would not be met. In Class IV VRM areas, activities would be consistent with management objectives.

4.13.1.2.1 Electric Power Impacts

Under Alternative 2, electric power would be supplied to project facilities by aboveground and buried power lines. The distribution of power lines shown on **Plate 2-5** was calculated in the manner described in **Section 2.2.1**. Since buried power lines would have effects similar to those previously described for pipelines, this

analysis focuses on aboveground power lines. In the North Area, 10.7 miles of aboveground power lines would be installed on poles every 300 feet resulting in the addition of 189 poles. This would be 32.6 fewer miles and 573 fewer poles than for the Proposed Action. In the South Area, 86.1 miles of aboveground power lines would be installed along with 1,515 poles. This would be 58.2 fewer miles and 1,025 fewer poles than for the Proposed Action. Most of the reduction would occur on BLM land in the southern portion of the South Area. **Table 4–23** shows the distribution of aboveground power lines for each VRM classification and land ownership in the Project Area.

Visual impacts to VRM Class III lands from aboveground power lines would be similar to those described for the Proposed Action, but proportionately less due to the reduced length and number of poles. Looking from the viewpoint down a road, some of the 7.3 miles (4.2 miles on BLM lands) of aboveground power lines in the North Area may not meet the VRM III classification objectives. Looking from a viewpoint directly adjacent to the road or power line ROW, individual poles separated by 300 feet would be considerably less noticeable. Therefore, the impact to visual resources would depend on the viewpoint. No conflicts to VRM management objectives for the 3.4 miles (2.2 miles on BLM lands) of lands that are classified as Class IV would occur.

In the South Area, 5.9 miles of power lines and 104 poles would be constructed on State and private lands identified as VRM Class II. Installation of power lines on these lands would affect VRM Class II visual management objectives that provide for activities that would not be evident in the characteristic landscape and contrasts are seen but must not attract attention. For viewpoints along the 24 miles (12.3 on BLM lands) of power lines that would be installed on BLM lands identified as VRM Class III, the visual impacts would be similar to those described for the North Area and may not meet the Class III objectives. No conflicts would be expected with management objectives for the rest of lands in the South Area that are classified as VRM Class IV.

Table 4–23
Ferron Natural Gas Alternative 2
Distribution of Aboveground Power Lines by VRM Class and Land Ownership

	Miles of Power Lines				Number of Poles			
Location	BLM	State	Private	Total	BLM	State	Private	Total
North Area								
VRM II	0.0	0.0	0.0	0.0	0	0	0	0
VRM III	4.2	2.7	0.4	7.3	75	48	7	130
VRM IV	2.2	0.0	1.2	3.4	38	0	21	59
Total	6.4	2.7	1.6	10.7	113	48	28	189
South Area								
VRM II	0.0	0.8	5.1	5.9	0	15	89	104
VRM III	12.3	6.5	5.2	24.0	216	115	91	422
VRM IV	10.9	39.5	5.8	56.2	192	695	102	989
Total	23.2	46.8	16.1	86.1	408	825	282	1,515
Total	29.6	49.5	17.7	96.8	521	873	310	1,704

Note: The differences of aboveground power line distances and numbers of poles on State and private lands between this table and Table 4–21 resulted from analysis assumptions that continuation of buried power lines would occur in several cases.

4.13.1.3 Alternative 3 — No Action

No impacts to existing visual resources on BLM lands would occur under this alternative. Visual impacts of activities on state and private leases would be similar to those described for the Proposed Action. Wells and facilities developed on State and private lands would not meet Class II and III VRM objectives.

4.13.2 Impacts Summary

The Proposed Action would result in a change of the visual character of the existing landscape since the construction of well pads, facilities, and roads would result in a mixed rural/industrial landscape. After the construction period, the visible components of the project would be well pads, pumping units, and access roads. Pumping units would be the most visible component of the project.

The 285 wells under the Proposed Action would be in areas identified as VRM Classes II, III, and IV. All wells in Huntington Canyon are on State and private lands and would not meet the VRM Class II objectives. VRM Class III areas on BLM lands are managed for activities that may contrast with the basic landscape, but should remain subordinate to the existing landscape character. Seventy-four wells on BLM lands and 40 on State and private lands would be constructed on Class III lands. Without mitigation, the VRM objectives would not be met for these wells. VRM Class IV lands are managed for major modifications of the landscape and management activities can dominate the landscape. The 56 wells proposed for BLM lands and the 98 proposed for State and private lands would meet the objectives of VRM Class IV.

Approximately 187 miles of power lines and 3,302 poles would be installed aboveground under the Proposed Action. Slight impacts to visual resources would occur on Class II and III VRM lands with the installation of 93 miles of line and 1,636 poles. The remaining 95 miles of power lines and 1,666 poles on VRM Class IV would not result in conflicts with visual management objectives.

The wells proposed under Alternative 2 would have visual protection measures applied. These measures would include: 1) positioning wells off ridgetops to prevent "sky lining"; 2) using existing vegetation and topographic features to screen wells, facilities, and roads; 3) position pumping units to be "in line" with Key Observation Points; 4) position pumping units that are visible from KOPs on roads parallel to the road, so that pumping units are in line with viewpoints of travelers on the road; 5) use non-reflective material on chain link fences that would be highlighted by sunshine glare from a distance; 6) avoid straight line-of-sight road construction; 7) design roads through wooded areas to take a curvilinear path; and 8) align roads with the contours of the topography rather than cutting straight across contours to the well pad. Application of these measures would reduce visual impacts, but in some areas, VRM Class III objectives would not be met.

Under Alternative 2, the amount of aboveground power lines would be about one-half of the level of the Proposed Action and the impacts to visual resources would be proportionately less. These impacts would occur on BLM lands identified as VRM Class III and IV. On Class III lands, visual resource objectives may not be met. Power lines and poles on BLM lands identified as VRM Class IV would not result in conflicts with visual management objectives.

4.13.3 Mitigation

Effects to visual resources could be reduced by completing the following measures where possible: minimizing pumping unit heights, using vegetative and topographic screening when siting well locations, avoiding highwall cuts, and shielding drilling rig lights.

The alignment of individual pumping units with respect to KOPs or other viewpoints along transportation routes and from residences or recreation areas should be reviewed during the pre-installation phase of well development. In general, each pumping unit should be aligned parallel to a road unless it has been determined that this type of alignment is not feasible. Facilities would be the most visible to travelers on the road during that period of time when the facility is within the line of sight as they travel towards the facility. Aligning pumping units parallel to roads would present travelers with a smaller surface area as the traveler approaches the pumping unit.

Burying power lines in areas designated Semi-primitive Motorized, as identified in **Section 4.12.3**, would reduce visual impacts and meet VRM III objectives.

Any power poles installed should be selected to blend in with the surroundings.

4.13.4 Unavoidable Adverse Impacts

Installation of as many as 74 wells on BLM land and 57 on State and private land identified as VRM Classes II and III would be an unavoidable impact on visual resources. Application of Visual Resource Environmental Protection Measures and recommended mitigation would lessen the impact. Mitigation and protection measures voluntarily applied by the Companies on the State and private land would lessen the impact on these lands.

4.14 NOISE

The noise impact assessment estimates noise levels resulting from construction activities, drilling, and the operation of pumping units and compressors. The EPA (Galloway et al. 1974) has established an average 24-hour noise level (L_{dn}) of 55 dBA as the maximum noise level that does not adversely affect public health and welfare. No definitive data have been established concerning noise levels that affect animals. However, no laws concerning quantitative noise levels have been established by the State of Utah, the BLM, or Carbon and Emery counties. Qualitative statutes concerning noise as a "nuisance factor" have been established by Carbon County. Although not specifically related to noise issues, Carbon County also has proposed a statute that no wells would be drilled within 660 feet of a private residence. Therefore, lacking any quantitative statutory guidelines, noise levels above 55 dBA are considered a noise impact for this analysis.

The ambient noise level at a given distance from a noise source can be estimated using the Inverse Square Law of Noise Propagation, stated that noise would decrease by 6 dBA with every doubling of distance from the source (Harris 1991). This methodology of estimating noise propagation is represented by:

$L_2 = L_1 - 20 \log (R_2/R_1)$

where:

L_2 = noise level at a selected distance R_2 from the source

L_1 = noise level measured at a distance R_1 from the source.

4.14.1 Direct and Indirect Impacts

4.14.1.1 Alternative 1 — Proposed Action

4.14.1.1.1 Construction Noise Impacts

Noise impacts during the construction phase would be temporary at any given location and would result from vehicles and the operation of construction equipment. The noise levels of various construction equipment are shown in **Table 4–24** along with the expected noise levels at 50, 500, 100, 1500, and 2000 feet from the equipment.

Not all construction equipment would operate continuously, so an average construction site noise level is assumed to be 85 dBA. Using the noise propagation formulation, noise levels would fall below 55 dBA at approximately 1,500 feet from the construction activities. Any residences within 1,500 feet of construction activities would experience temporary noise levels above 55 dBA during daylight hours. Nighttime noise levels would remain at existing levels.

Table 4–24
Noise Impacts of Various Types of Construction Equipment

	Noise Level (dBA) at:				
Equipment	**50 feet**	**500 feet**	**1,000 feet**	**1,500 feet**	**2,000 feet**
Crane	88	68	62	58	56
Backhoe	85	65	59	55	53
Pan Loader	87	67	61	57	55
Bulldozer	89	69	63	59	57
Fuel and Lubrication Truck	88	68	62	58	56
Water Truck	88	68	62	58	56
Motor Grader	85	65	59	55	53
Vibrator/Roller	80	60	54	50	48
Mechanic Truck	88	68	62	58	56
Flat Bed Truck	88	68	62	58	56
Dump Truck	88	68	62	58	56
Flat Bed Trailer	88	68	62	58	56
Tractor	80	60	54	50	48
Concrete Truck	86	66	60	56	54
Concrete Pump	82	62	56	52	50
Front End Loader	83	63	57	53	51
Road Scraper	87	67	61	57	55
Air Compressor	82	62	56	52	50
Average Construction Site	85	65	59	55	53

4.14.1.1.2 Drilling Noise Impacts

Noise levels during the drilling phase would also be elevated above pre-existing levels. Typically, the noise from a drilling rig is 74 dBA at 200 feet from the rig (Kruger 1981). Noise emanating from drilling rigs would decrease to 60 dBA at 1,000 feet, to 57 dBA at 1,500 feet, and to 54 dBA at 2,000 feet. Any residences within 1,500 feet of a drilling rig would experience noise above 55 dBA for the one to four days anticipated to drill the natural gas wells. **Table 4–25** shows the residences that would be within 1,500 feet of proposed well pads and may therefore experience temporary noise levels greater than 55 dBA when well pads and roads are constructed and the well is drilled. Most of the wells would be constructed on private land. Only five wells would be constructed on BLM land within 1,500 feet of an existing residence. Wells would be constructed on private lands that would result in excessive noise during the drilling and construction phase for 14 residences in the South Area and most residences in Kenilworth. However, the construction and drilling noise impacts would be short term and would only occur when the particular well or a series of closely located wells is constructed and drilled.

4.14.1.1.3 Operational Noise Impacts

Noise levels would decrease substantially after the well pads, roads and pipelines have been constructed and the wells have been drilled. Sources of noise would be periodic vehicle trips to the well sites and the pumping units. Typical noise from a pumping unit operating 24 hours per day would be 61 dBA at 100 feet (Kruger 1981). Noise emanating from pumping units would decrease to 55 dBA at 200 feet, and 47 dBA at 500 feet and to 41 dBA at 1,000 feet. Since no residences would be within 500 feet of a pumping unit, the

Table 4–25
Residences Within 1,500 Feet of Proposed Wells

	Number of Residences		
Legal Location of Residence	**BLM**	**Private**	**State**
South Area			
T17S, R8E, S14	1	-	-
T17S, R8E, S14	-	2	-
T17S, R8E, S15	-	2	-
T17S, R8E, S9	1	-	-
T17S, R8E, S9	-	2	-
T17S, R8E, S8	-	3	-
T17S, R8E, S5	-	1	-
T17S, R8E, S6	-	3	-
T17S, R8E, S24	-	1	-
T19S, R7E, S14	1	-	-
Total	3	14	0
North Area			
T13S, R10E, S21	-	Numerous in Kenilworth	-
T13S, R10E, S32	2	-	-
Total	2	Numerous in Kenilworth	0

noise impacts from all project pumping units would be below 55 dBA. However, the noise from a pumping unit would be rhythmic in nature rather than a steady noise level from smoothly running equipment. Therefore, while the noise level would be well below the 55 dBA criterion for significance, it may be as noticeable as higher noise levels for some people.

Noise levels from CPFs and compressor stations are expected to be about 87 dBA at 50 feet (Kruger 1981). However, the enclosed building in which the compressor would operate would reduce noise by about 30 dBA. Therefore, the effective noise level would be 57 dBA at 50 feet and decrease to 51 dBA at 100 feet. Since a distance of 100 feet would be within the enclosed fence boundary of a typical compressor station, the noise levels that the public may experience near compressor stations would always be below 55 dBA.

The noise effects from pumping units were evaluated for the Huntington State Park to determine the effects on developed recreational areas. As shown on **Plate 2–1**, nine wells would be within 2.2 miles of the recreation area (the east side of the lake) of Huntington State Park on the eastern edge of the South Area near Huntington, Utah. The closest four wells would be 1.75 miles west of the park, and the other five would be from 1.8 to 2.2 miles west. Each pumping unit would produce a noise of 20 to 22 dBA at the park. The noise produced at a given location by multiple sources is not a simple addition, but rather a logarithmic factor in the form:

$$L_{eq} = 10 * LOG (10^{L1/10} + 10^{L2/10} + ... + 10^{Ln/10})$$

where: L_{eq} is the average noise level for a given period, and
L1, L2, ..., Ln are the sound levels of individual co-located sources.

Based upon this formulation, the average noise level at the park would be 30.7 dBA, a level that is below a typical rural night level of 35 dBA. Therefore, it can be concluded that the noise from pumping units would not be heard above normal conversation levels at Huntington State Park.

4.14.1.1.4 Electric Power Option

Under the electric power option, compressor engines and pumping units would all be powered by electricity rather than natural gas combustion. Electric motors powering these types of equipment are inherently quieter than those powered by natural gas internal combustion. Since the noise analysis for the Proposed Action has demonstrated that no adverse noise impacts would occur from natural gas-powered facilities, it follows that no adverse noise impacts would occur from the quieter electrical equipment.

4.14.1.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

Under Alternative 2, the same number of wells and roads would be constructed and operated in the North Area. Because of other environmental restraints, four and 14 fewer wells would be drilled in the North Area and South Area, respectively. However, it is anticipated that the same number of CPFs and compressor stations would be constructed and operated. The wells drilled on BLM lands may be moved slightly to reduce the impacts on other resources. The relocation of these wells could reduce or increase the construction and drilling noise impacts depending upon where the well would be relocated. No wells can be drilled with 660 feet of a residence in the North Area because of Carbon County proposed restrictions. In the South Area, the three wells on BLM land that could be within 1,500 feet of a residence would not be eliminated as part of environmental protection measures. The BLM would not have jurisdiction over the

location of the private wells proposed to be within 1,500 feet of residences. As a result, noise impacts would be the same as the Proposed Action.

4.14.1.2.1 Electric Power Option

Under the electric power option, compressor engines and pumping units would all be powered by electricity rather than natural gas combustion. Electric motors powering these types of equipment are inherently quieter than those powered by natural gas internal combustion. Since the noise analysis for Alternative 2 has demonstrated that no adverse noise impacts would occur from natural gas-powered facilities, it follows that no adverse noise impacts would occur from the quieter electrical equipment.

4.14.1.3 Alternative 3 — No Action

No additional wells would be drilled on BLM lands under the No Action Alternative. Therefore, the residences that may experience excessive construction and drilling noise levels would not be affected by the No Action Alternative. However, a maximum of 155 new wells may be constructed on State and private lands. Therefore, the construction and drilling noise impacts could still occur at the previously described 14 residences in the South Area and in Kenilworth in the North Area.

4.14.2 Summary of Impacts

Noise impacts from construction activities would be above 55 dBA out to 1,500 feet from construction activities. Under alternatives 1 and 2, three wells in the South Area and two wells in the North Area would be constructed on BLM lands within 1,500 feet of a residence. Another 14 wells would be constructed on private lands in the South Area and one in the North Area within 1,500 feet of at least one residence. These people would experience noise levels at and above 55 dBA for the duration of the construction for the particular well. This activity would typically be about one to two weeks. However, construction activities would not occur at night. These residents would also experience noise levels above 55 dBA during the one to four days of drilling activities. This noise would probably be the most intrusive since drilling would occur 24 hours per day for a maximum of four days. Residences close to roads would also experience elevated noise levels from construction vehicles. This noise would be the loudest during the morning and evening times when workers and equipment are being transported to the sites.

During operations, noise from pumping units would exceed 55 dBA within 200 feet of a pumping unit. Noise from pumping units would not be significant since no residents would be within 200 of a well location. Incidental and recreation users would experience temporary increased noise as they would pass by pumping units.

Under the electric power options for both alternatives 1 and 2, no adverse noise impacts would occur because the electrical equipment would be quieter than the gas-fired equipment.

4.14.3 Mitigation

No mitigation is recommended.

4.14.4 Unavoidable Adverse Impacts

The noise disturbance from individual drilling operations would be a very short-term (one to four days) and unavoidable noise impact. Once drilling activities begin, the drilling must be continuous until the targeted reservoir is reached. This unavoidable impact would be most noticeable at night for residents close to drilling operations.

4.15 SOCIOECONOMICS

4.15.1 Direct and Indirect Impacts

4.15.1.1 Alternative 1 — Proposed Action

The following paragraphs provide an assessment of potential impacts on social and economic resources that may be experienced with the implementation of the Proposed Action and alternatives. The analysis focused on Carbon and Emery counties. For each socioeconomic element, standards have been utilized to measure the significance of impacts. These standards are defined in the discussion of each element.

4.15.1.1.1 Population

The proposed project is not expected to result in a significant short- or long-term impact to local population conditions. An estimate of the population increase anticipated with the project is demonstrated below. It is anticipated that the majority of new full-time workers would be recruited from communities within the Project Area and that construction employment and contractors also would be available in the region. Further description of project employment is provided in **Section 4.15.1.2**.

Significant gas exploration and development activities are currently ongoing in the Carbon and Emery counties. To the extent that additional non-local contractors or permanent employees are needed, they may relocate to the area for a limited period of time (2 to 5 years) during the major construction phase of the project. Therefore, it is expected that only a small to moderate increase in population growth would occur. Considering new permanent employment and using an average of 2.8 dependants per employee (average county household size), a population increase of 23 could be expected, equating to 0.1 percent of the current population of Carbon County and 0.2 percent of the Emery County population.

It is not anticipated that this project employment would significantly effect demographic characteristics of either Carbon or Emery counties.

4.15.1.1.2 Employment, Wages, and Local Economy

The proposal would be considered to have a significant effect if it would result in a negative change in local economic conditions or wages, result in a short- or long-term reduction in employment, or create the potential for a boom/bust employment cycle.

4.15.1.1.2.1 Natural Gas Employment

Implementation of the proposed project would create some additional employment opportunities in the Carbon and Emery counties region. Due to the long-term nature of the project, coupled with fluctuation in natural gas economics and the three Companies involved in the leases, developing exact projections of employment is difficult. Therefore, the following paragraphs provide a reasonable estimate of what can employment impacts can likely be expected with project implementation. While drilling activities would occur in both the North and South Areas, it is assumed that employee recruitment and other coordination activities would be handled in Price, the population and economic center of the region.

Both direct project employment (e.g. positions with one of the three Companies or contractors hired for construction for construction, production, and decommissioning) and indirect or secondary employment (jobs that become available in support industries as a result of project activities, such as parts and materials production, equipment refueling, etc.) would arise as a result of project activities.

Development of the FNG Project would be completed in approximately five years from project initiation and the production lifetime of the wells is expected to be in the range of 20 years. In the North Area, it is anticipated that about 13 wells would be constructed annually from 1999 through 2003, while projections for the South area suggest about 44 wells would be installed annually from 1999 through 2003 (**Table 2–1**). In addition, 68 wells have already been installed, 30 of which are located on federal land.

The primary influx of employment opportunities associated with the proposed project is expected to occur in the first five years of the project, during the development phase of the project. Once the natural gas wells have been installed, some level of sustained permanent employment (as described below) would be required for operation and maintenance of the wells and pipelines. The final stage of the project life cycle involves the reclamation and abandonment of facilities, which may also trigger 32 jobs (**Table 2–3**) for a period of two years, during which the various facilities would be dismantled and removed or abandoned in place and surface areas are reclaimed.

Projected work categories and associated man hours are provided in **Table 2–3**. A variety of labor categories would be utilized for project implementation. The percentage of workers hired from the local areas and those from outside the local area is shown on **Table 4–26**.

Employment opportunities are expected to be greatest in the first two years of the project, as construction activities kick-off. Employees and contractors would be hired by the applicants to construct and maintain roads and well pads, construct utility trenches, and install underground gas pipelines, water pipelines, and utility lines. Local contractor jobs would include gravel and water truck drivers, heavy equipment operators,

Table 4–26
Comparison of Local and Outside Project Area Employment

	Number of Workers Hired:		
Project Phase	**Locally**	**From Outside Local Area**	**Total**
Construction	39	59	98
Operations	37	6	43
Reclamation	13	19	32

and pipeline workers, comprised primarily of workers currently located within the Project Area (BLM 1997c). Additionally, some permanent employees would be necessary to perform operation and maintenance activities.

Some component of the project workforce would be non-local transient construction workers with specialized expertise required to drill and complete wells. It is assumed that these workers would reside in the Project Area for about six months each year (May through November) during the construction season. It is assumed that the majority of these workers would reside in motels while they are working in the area and would not bring families with them (BLM 1997c). Many of these contractors would leave the Project Area once the construction and development phase of the project is finished.

It is estimated that an average of 98 employees would be required annually during the first five years of development. Approximately 40 percent would be local hires and 60 percent would be hired from outside the area. However, all construction would be performed by third party contractors who would have ultimate control over employment decisions (Cox 1998). The average peak employment of 98 workers represents about 8 percent of 1995 employment in the mining/oil and gas/construction sectors in Carbon County and 9 percent of these sectors in Emery County. This figure represents one percent and two percent of the total non-agricultural labor employment for 1995 for Carbon and Emery counties, respectively. It should be noted that these employment numbers are estimates intended to present some representation of the impacts associated with the project, considering potential cumulative employment with other gas development projects in the area (BLM 1997c) more or fewer employees may be needed. Factors that would influence employment include timing of development, use of contractors, geographic location of concurrent development, as well as other factors.

Necessary skills would include: pump and pipeline maintenance, compressor and electric motor maintenance, and production monitoring. Many of these positions would likely be filled by former power plant and coal mine workers currently underemployed in service or trade sector jobs. Some jobs that require a higher or different level of expertise may be filled by non-local workers.

After the five-year well field development phase, employment would be related to maintenance and operation of the fields, as well as gradual reclamation of the inactive wells, and associated access roads. Only a small number of workers would be required to perform these functions. Approximately 43 workers would be required for the operation and maintenance phase and 32 for the reclamation and abandonment phase. Of this permanent employment, about 85 percent would be local hires and 15 percent would be hired from outside the area.

4.15.1.1.2.2 Questar Pipeline Construction Employment

Construction of the 27-mile long transmission pipeline would require a workforce of 75 persons, comprised of equipment operators, welders, and laborers. Questar expects that about 25 percent of the total work force would be hired locally (i.e., the Price area). It is expected that installation of the pipeline would be completed within 2 to 4 months. The anticipated operational life of the pipeline is 50 years; at that time the pipeline would be decommissioned and abandoned in place.

The 56 non-local employees required for pipeline construction would probably not affect population or have any significant impact to regional employment, considering the short-term nature of pipeline construction (two to four months). Either Questar employees or a contractor specializing in pipelines would be retained

for installation, completing the pipeline in a single spread and moving on to other contracts. It is assumed that these workers would reside in local motels or recreational vehicles.

4.15.1.1.3 Wages and Local Economy

The proposed project also would contribute to the local economy through the generation of earnings that would be spent on items such as housing, food, goods and services. In addition, economic benefits would occur as a result of the Companies spending on purchases of equipment and supplies from local area vendors. The Price CBM analysis utilized a regional input/output model developed by Utah Office of Planning and Budget to project economic and secondary impacts. This modeling effort has not been conducted for this project, so specific, long-term monetary projections are not available for this study.

It is estimated that the combined payrolls of the three gas development companies would amount to $914,400 annually (nominal dollars) in the first several years of the development stage. This payroll equates to 0.5 percent and 0.8 percent of total annual payrolls for Carbon and Emery counties, respectively. **Table 4–27** presents the estimated combined expenditures and production costs for the project. Included are annual payroll for permanent employees (non-contractors), operating costs excluding payroll, and construction costs. All construction would be performed by third party contractors and construction costs include labor, equipment rental, and materials (Cox 1998). Project payroll earnings would gradually increase to the peak level of employment and then start to decline as project activities slow, until all project earnings cease as the anticipated life span of the project comes to an end. As the project life expectancy nears completion, additional costs and expenditures would occur as wells are plugged and decommissioned. It is expected that this phase would occur sometime after 2020. Projections of these costs are unavailable at this time.

Direct project employment and associated earnings would also create new jobs in local area communities during the construction phase of the project. Secondary job creation would occur primarily in the service and trade sectors, with a few additional jobs in finance, insurance, and real estate, as well as transportation and public utilities. It is projected that about 25 secondary employment positions would be created as a result of project activities during peak employment. This calculation is based on the assumptions utilized in the Price CBM EIS (BLM 1997c). Since the vast majority of service and retail trade activity occurs in the Price area, it is assumed that most of these jobs would be created in Price or nearby communities in Carbon County.

Both expansion of existing businesses and creation of new business can be anticipated. However, once the development phase of the project is completed, a reduction in service and trade sector employment can be anticipated. Some additional earning from the indirect employment also can be expected and these earning would be spent in, and contribute to, the local economy. Once the development phase of the project is completed, indirect earnings from secondary employment would eventually be reduced.

4.15.1.1.4 Tourism, Recreation and Hunting

Another concern expressed during scoping related to the project's potential effect on tourism, in terms of tourism's economic impact on the region. Certain community groups have expressed an interest in diversifying the region's economy, and increasing the economic importance of tourism.

While the proposed project may reduce the attractiveness of the immediate development area for tourists, none of the major tourist attractions in the region (Ninemile Canyon, San Rafael Swell, Cleveland Lloyd Dinosaur Quarry, CEU Prehistoric Museum, etc.) would be impacted by the project because they are not

Table 4–27
Estimated Combined[1] Expenditures and Production Costs

Year	Annual Payroll[2]	Operating Costs[3]	Construction Costs[4]	Reclamation Costs	Total
1999	$640,000	$6,779,000	$28,744,000		$36,163,000
2000	$824,000	$7,838,000	$28,744,000		$37,406,000
2001	$966,000	$8,777,000	$18,372,000		$28,115,000
2002	$1,050,000	$9,395,000	$18,372,000		$28,817,000
2003	$1,092,000	$9,466,000	$18,372,000		$28,930,000
2004	$1,176,000	$9,997,000	$10,372,000		$21,545,000
2005	$1,176,000	$9,963,000	$10,372,000		$21,511,000
2006	$1,176,000	$9,830,000			$11,006,000
2007	$1,176,000	$9,315,000			$10,491,000
2008	$1,176,000	$8,341,000			$9,517,000
2009	$1,176,000	$7,271,000			$8,447,000
2010	$1,176,000	$6,303,000			$7,479,000
2011	$1,176,000	$5,440,000			$6,616,000
2012	$1,176,000	$4,678,000			$5,854,000
2013	$1,176,000	$4,006,000			$5,182,000
2014	$1,176,000	$3,398,000			$4,574,000
2015	$1,176,000	$2,841,000			$4,017,000
2016	$1,054,000	$2,391,000			$3,445,000
2017	$1,054,000	$1,791,000			$2,845,000
2018	$932,000	$1,401,000			$2,333,000
2019	$932,000	$1,090,000			$2,022,000
2020	$810,000	$908,000			$1,718,000
2021	$810,000	$707,000			$1,517,000
2022	$688,000	$687,000			$1,375,000
2023	$688,000	$629,000			$1,317,000
2024	$646,000	$589,000			$1,235,000
2025	$364,000			$606,000	$970,000
2026	$364,000			$606,000	$970,000
2027	$364,000			$606,000	$970,000
2028	$364,000			$606,000	$970,000
2029	$364,000			$606,000	$970,000

Notes:
1. Anadarko, Chandler, and Texaco.
2. Only includes permanent employees.
3. Excludes payroll.
4. Third-party contractor labor, equipment rental, and materials costs.

Source: Cox 1998

located in or near proposed development areas. It is unlikely that visitation at these sites would be affected. It is unlikely that the economy of Price, the center for tourist activity in the region, would experience any significant impact resulting from the project. Additional analysis of the potential affect on tourism has been provided in the Price CBM Project EIS (BLM 1997c).

Additionally, project activities and subsequent hotel stays and spending in restaurants would result in some increase in revenues generated from the transient occupancy tax and restaurant tax in both Carbon and Emery counties. These revenues received over a 20-year period would provide additional revenues available for the promotion of recreation and tourism in the region.

Project activities have the potential to impact recreational hunting in the region. **Section 4.12** and **Section 4.7** discuss these impacts. **Section 4.12** describes how big game hunting may be affected by construction activities. **Section 4.7** identifies the principal impacts to terrestrial wildlife and how displacement caused by construction would affect the species. **Section 4.7** states that displacement would be of greatest concern in the crucial and high priority winter ranges. A reduction of available habitat in winter months due to project activities would potentially lower the population of mule deer and elk resulting in a decrease of hunter success.

This reduction in success may result in some economic effect in Carbon and Emery counties, including decreased purchasing of goods and services, including fuel, ammunition, other hunting equipment, motel rooms, and meals. This economic loss would be experienced over the lifespan of the project, but the overall amount of this loss cannot be estimated.

4.15.1.1.5 Potential for Boom/Bust Cycle

Implementation of the proposed project would create both primary and secondary employment opportunities, contribute to the local economy, and provide a significant source of revenues for local agencies through the collection of royalty taxes. If current estimates and plans are realized by each of the three Companies involved in the proposal, employment opportunities would occur primarily in the first five years of the project, while revenues may extend for as long as 20 to 30 years. At this time, project activities and gas production would slow or cease and so would the associated economic benefits. Some concern was expressed during scoping related to the potential of project activities to create a boom/bust economic cycle similar to what was experienced in the area in the early 1980s.

The potential for the project to result in a significant economic boom/bust cycle is low. While this project, in conjunction with other CBM development activities (e.g., the Price CBM Project), would increase the importance of these sectors in the local economy, when compared to the overall economy these activities represent a relatively small share of the economy. Project activities are expected to begin and end in a gradual fashion, and a major lay-off or royalty reduction is not anticipated. Historically, the economies of Carbon and Emery counties have been subject to the fluctuations associated with resource extraction and are probably less sensitive to this phenomenon than other areas. In addition, there are a number of other ongoing economic activities and concerted efforts by local authorities to diversify the local economy. These factors all lead to the conclusion that while the conclusion of project activities would create a gap in employment and the economy, it is not expected that this gap would equate to the overall collapse of the region or a significant localized depression cycle. Although there is a risk for the oil and gas industry, there would be no risk to the overall economy.

4.15.1.1.6 Housing

To the extent that project-created employment results in a concentrated housing demand or shortage, either short or long term, the effect of the proposal would be considered to be significant. Effects shall be measured on both a local and regional level. If transient housing, e.g. man camps or motel rooms, would be required for short-term accommodations for construction or other laborers that are currently not available, the effect is deemed significant.

Because 39 of the 98 workers recruited for project development are expected to be local, existing residents, it is not expected that a marked demand for housing would be experienced. Also, project activities would be spread out over a two-county area and workers and their families would likely choose homes close to work sites. Therefore, it is unlikely that the 59 workers hired from outside the local area would be seeking homes in one particular location simultaneously.

Use of non-local contract workers for specialized construction activities may increase the demand for, and availability of, temporary housing. It is not expected that this demand would represent a significant impact as most of these workers would not have dependants accompanying them and they would most likely stay in motels, recreational vehicles, and mobile homes. Many of these workers may already be in the Project Area constructing wells on state and private lands, reducing the likelihood of a major influx of workers all seeking temporary housing at one time.

4.15.1.1.7 Community Facilities and Services

The proposal may affect local community facilities and services in two ways. The project may have utility and service requirements directly that may affect capacity. Second, project-generated employment and their dependants may increase demands on local community facilities and services, affecting capacity of the local service provider.

4.15.1.1.7.1 Roads, Water and Wastewater Systems, and Solid Waste Disposal

Access to portions of the Project Area from state and federal highways would require the use of certain county roads. Project activities could potentially result in increased traffic and use of roads, including additional wear and tear from heavy vehicles. The increased use of county roads may increase maintenance costs to county special districts. Both paved and non-paved roads may be affected. The project's effects on roads and the subsequent financial consequences to Carbon and Emery counties are described in further detail in **Section 4.15.1.1.8**.

Water would be required for construction and operation of the proposed project. Water requirements are detailed on **Table 2–4.** Total water requirements would equal 84 acre-feet/year. The Companies would purchase water from a variety of sources, resulting in very minor shifts in water consumption from existing uses to this project. The potential effects of the use of this amount of water are described in **Section 4.2**.

Because there is only a small population increase and subsequent housing demand expected with project implementation, a significant effect on domestic water service provision (in terms of supply and conveyance systems) is not expected. In addition, neither the proposed project itself or subsequent development resulting from project employment (if any) is expected to have any impact on local wastewater facilities.

Project activities would generate solid waste, as described in **Section 2.1.1.1.3.8**. Certain wastes would be disposed of onsite or recycled and other waste products would be disposed of at the local landfill. It is not anticipated that the addition of this waste stream would significantly affect the local landfills or their capacities.

4.15.1.1.7.2 Public Schools, Law Enforcement, Fire Protection, and Medical Facilities

Public schools in the region are not anticipated to experience significant increases in student enrollment as a result of the proposed project. Due to the limited population increases expected and the long-term time frame associated with the project, public schools are not anticipated to experience the potential effects of significant growth resulting from the project. If current plans change, resulting in a significant number of project workers being recruited from outside the local area who bring school-aged children with them, existing over-crowded conditions may be exacerbated.

Law enforcement and fire protection services are not expected to experience significant impacts as a result of project implementation. While there is the potential for some unquantifiable increase in calls for service related to vandalism and/or emergency fire calls, comments contained in the Price CBM EIS indicate that the agencies would not patrol Project Areas or provide routine security services. The Carbon County Sheriff's Office indicated it would respond to calls for service on an as-needed basis, if vandalism or other criminal activity is reported. No increase in staffing at the Sheriff's Office is foreseen as a result of the proposed project (BLM 1997c).

Medical facilities are not anticipated to experience significant effects due to project implementation.

4.15.1.1.8 Public Finance

The project would be considered to have a significant effect on public finance if local government fiscal conditions were impacted in such a way that revenues would not adequately provide public facilities and services at established levels.

Implementation of the Proposed Action would result in some level of both costs and benefits for the counties in the Project Area. Regarding financial costs, the primary project-related impact is related to the use of county roads. In Carbon County, the Carbon County Roads Special Service District has responsibility for building, improving, and maintaining roads. The County Special Service District #1 is charged with road maintenance for Emery County. Revenues used by these districts is generated through federal mineral lease royalties, state payments in lieu of taxes, and interest earned on unanticipated funds. Additional project-related costs to the Counties may arise from administrative services. Examples of these costs include mapping, naming, and signing of new roads developed in the Project Area for emergency access, as well as other staff and administrative costs.

4.15.1.1.8.1 Federal Mineral Royalties

Mineral lease royalties are collected by the Mineral Management Service, U.S. Department of the Interior, for gas produced by wells completed on federal lands. It is estimated that about 46 new wells would be completed on federal land in the project's North area and 84 new wells completed on federal lands in the South Area through the end of the estimated project life. Substantial revenues would be generated through these mineral royalty payments. Federal mineral royalties are collected at a rate of 12.5 percent and are split evenly between the federal government and the state of origin. The largest shares (91 percent) of Utah's

portion of the royalties is distributed in the following manner: 32.5 percent to the Permanent Community Impact Fund (PCIF), 33.5 percent to the Regents of the University of Utah, 25 percent back to the county of origin, and 9 percent to others.

Table 4–28 presents the estimated combined annual natural gas production and royalties associated with the project. Annual gas production rates for wells developed on federal lands have been estimated to range from 452 million cubic feet (MMCF) to as high as 27,487 MMCF at peak production. Forty-six percent of the project's annual gas production would originate from federal wells. Based on these rates, the annual federal mineral royalties have been projected at $78,541 to $4,775,790, equating to a total of $53,897,421 over the life of the project. Of this total amount, $26,948,710 would be paid to the State of Utah during the 25 years of production. Approximately $8,758,331 would be distributed to the PCIF, $9,027,818 to the Regents of the University of Utah, and $6,737,178 to Carbon and Emery counties. For both Carbon and Emery counties, the 25-percent share of the state's federal royalty funds are dedicated to the County Roads Special Service District. It is estimated that these revenues would amount to $1,684,294 for Carbon County and Emery County.

The values shown on **Table 4–28** are projections intended only to present a general sense of the federal, state, and local funds generated by the project. The production rate and natural gas price used to calculate the annual royalties are only estimates and in actuality could vary substantially over the life of the project. A natural gas price of $1.39 per thousand cubic feet (MCF) was used to calculate the federal mineral royalties. This price is an average of the 1992 to 1996 annual natural gas wellhead prices for the state of Utah, as provided by the EIA's 1996 Natural Gas Annual Report (EIA 1996b).

4.15.1.1.8.2 Permanent Community Impact Fund

The PCIF is another source of revenue funds related to mineral royalty payments. This fund, administered by the State of Utah, was established to provide rural communities with a means of funding major infrastructure projects. Cities within the Project Area can apply for grants and low-interest loans to fund projects such as roads, sewers, and educational and recreational facilities. Royalty payments generated from the proposed project are estimated to contribute about $8,758,331 to the PCIF over the life of the project, benefitting cities in Carbon and Emery counties, as well as other cities throughout Utah (**Table 4–28**).

4.15.1.1.8.3 Local Ad Valorem Tax Revenue

Additional project revenues would be generated throughout the collection of an ad valorem/property tax levied on improvements constructed by the Companies. Since this tax assessment is based on value added to property, revenues would increase based upon the number and location of wells. No estimate of the assessment of improvements associated with well development was available, however, assessed value would be determined as a percentage of the actual cost of the facilities (Ferderber 1998). Ad valorem tax revenues in Carbon County are distributed to the Carbon School District and the General Fund and in Emery County revenues would be used primarily for schools. Theoretically, revenues would gradually increase over the first five years in both counties, provide a steady revenue stream for a period of years, and then decline as facilities are dismantled and reclaimed. These projections are subject to the number, location, and life span of facilities and gas production.

Table 4–28
Projected Combined[1] Annual Production and Federal, State and Local Royalties for Alternative 1

Year	Projected Annual Production (MMCF)[2]	Estimated Value of Natural Gas Produced by the Project[3]	Federal Mineral Royalties[4]	State Portion of Federal Royalties[5]	PCIF[6]	Regents of University of Utah	County of Origin Total	County Roads Special Service District Portion of County of Origin Total
1999	2,278	$3,167,005	$395,876	$197,938	$64,330	$66,309	$49,484	$12,371
2000	5,077	$7,057,445	$882,181	$441,090	$143,354	$147,765	$110,273	$27,568
2001	12,514	$17,394,753	$2,174,344	$1,087,172	$353,331	$364,203	$271,793	$67,948
2002	16,611	$23,089,656	$2,886,207	$1,443,103	$469,009	$483,440	$360,776	$90,194
2003	20,299	$28,215,829	$3,526,979	$1,763,489	$573,134	$590,769	$440,872	$110,218
2004	24,330	$33,818,164	$4,227,270	$2,113,635	$686,931	$708,068	$528,409	$132,102
2005	27,091	$37,656,612	$4,707,076	$2,353,538	$764,900	$788,435	$588,385	$147,096
2006	27,487	$38,206,320	$4,775,790	$2,387,895	$776,066	$799,945	$596,974	$149,243
2007	26,522	$36,865,970	$4,608,246	$2,304,123	$748,840	$771,881	$576,031	$144,008
2008	24,080	$33,471,346	$4,183,918	$2,091,959	$679,887	$700,806	$522,990	$130,747
2009	21,485	$29,863,687	$3,732,961	$1,866,480	$606,606	$625,271	$466,620	$116,655
2010	18,135	$25,207,333	$3,150,917	$1,575,458	$512,024	$527,779	$393,865	$98,466
2011	15,329	$21,306,749	$2,663,344	$1,331,672	$432,793	$446,110	$332,918	$83,229
2012	12,969	$18,027,520	$2,253,440	$1,126,720	$366,184	$377,451	$281,680	$70,420
2013	10,984	$15,267,565	$1,908,446	$954,223	$310,122	$319,665	$238,556	$59,639
2014	9,311	$12,941,924	$1,617,741	$808,870	$262,883	$270,972	$202,218	$50,554
2015	7,900	$10,980,854	$1,372,607	$686,303	$223,049	$229,912	$171,576	$42,894
2016	6,708	$9,324,754	$1,165,594	$582,797	$189,409	$195,237	$145,699	$36,425
2017	5,583	$7,759,955	$969,994	$484,997	$157,624	$162,474	$121,249	$30,312
2018	4,546	$6,318,794	$789,849	$394,925	$128,350	$132,300	$98,731	$24,683
2019	3,649	$5,072,281	$634,035	$317,018	$103,031	$106,201	$79,254	$19,814
2020	2,767	$3,846,691	$480,836	$240,418	$78,136	$80,540	$60,105	$15,026
2021	1,950	$2,709,866	$338,733	$169,367	$55,044	$56,738	$42,342	$10,585
2022	1,296	$1,801,294	$225,162	$112,581	$36,589	$37,715	$28,145	$7,036
2023	848	$1,178,671	$147,334	$73,667	$23,942	$24,678	$18,417	$4,604
2024	452	$628,329	$78,541	$39,271	$12,763	$13,156	$9,818	$2,454
Total	310,201	$431,179,366	$53,897,421	$26,948,710	$8,758,331	$9,027,818	$6,737,178	$1,684,294

Notes:
1 Anadarko, Chandler, and Texaco combined.
2 Source: Cox 1998. MMCF = million cubic feet; Annual production shown for federal lands only representing 46 percent of projected production.
3 Value of Gas equals estimated annual production multiplied by the assumed natural gas price of $1.39 per MCF (EIA, 1996b).
4. (50% Federal Funds, 50% State Funds) Does not include administrative fees.
5 State funds are divided between PCIF (32.5 percent), Regents of University of Utah (33.5 percent), and County of Origin (25 percent).
6. PCIF=Permanent Community Impact Fund. Carbon and Emery Counties are guaranteed PCIF Funds. Counties would apply for grants or loans from PCIF to collect these monies.

4.15.1.1.8.4 Sales and Use Tax Revenues

Sales and use tax revenues would be generated throughout Carbon and Emery counties as a direct result of spending on goods and services in various cities throughout the Project Area. Gross taxable sales generated in Carbon and Emery counties are $270,180,000 and $63,934,000, respectively (GOPB 1997b). Based on the current sales tax rates, total annual sales and use tax revenues generated in Carbon and Emery counties are $15,616,404 and $3,695,385, respectively. Although precise purchasing amounts for the project are not available, it is estimated that about $412,300 to $6,997,900 would be spent annually by the Companies over the life of the project (Cox 1998). The current sales tax rate is 5.78 percent, which includes a one percent local tax. It is assumed that sales and use tax revenues would be captured primarily by Carbon County. Based on these assumptions, it is estimated that sales and use tax revenues generated annually by the project would range from $23,830 to $404,478, which would represent between 0.2 and 10.9 percent of the total annual sales tax revenues generated in Carbon and Emery counties. This would not represent a significant impact.

4.15.1.1.9 Quality of Life

Project-related changes in existing ways of life that cause community discontent sufficient to raise conflict and organized response/opposition would be considered to represent a significant impact on quality of life. The perception of a "quality of life" is a very subjective and personal idea, which varies significantly by individual, location, and interests. Quality-of-life issues were raised as part of scoping for this project, however, little or no information regarding a definition of this issue was provided by respondents. It is clear that no one would be in favor of a "poor" quality of life, but it is difficult to assess what specific aspects of a long-term project may cause an individual's perception of quality of life to change in a negative manner. Additionally, many of the factors that would be considered by most to improve a quality of life (e.g., employment opportunities, municipal services, and vital economy) may or may not be achievable without some increase in factors seen to mar a quality-of-life perception (e.g., traffic increase, visual impairment, use of federal lands for resource extraction, or influx of transient workers). Each of these factors is discussed in the following paragraphs.

4.15.1.1.9.1 Local Economy

Over time, the proposed project would result in effects that would be considered to both aid and deter from a common perception of a desirable quality of life. All of the social and economic topics described in this section would factor into a "quality of life". It has been concluded that over the 25-year expected life span of the project, increased employment in certain sectors would be realized. These opportunities (primarily within the first five years of project development) would require skilled as well as unskilled labor. Many of these jobs could be filled by workers with similar skills who are currently residing in the Project Area. Employment opportunities and economic stability are a positive factor in the quality of life.

4.15.1.1.9.2 Open Space and Visual Effects

Project development would noticeably increase activities on federal lands throughout the Project Area. During the five-year development phase, it is expected that there would be numerous ongoing drilling operations that would increase noise and dust and pose local visual impairment. Once wells are completed, well pad and pumping units would dot the landscape in certain areas. New road and pipeline corridors also would be noticeable. These effects are a necessary part of resource extraction activities in the area. These features may affect one's perception of quality of life in terms of a visual impact experienced primarily

during outdoor recreational activities in the Project Area. Localized visual impacts, while unavoidable with project implementation, can be lessened by some extent through mitigation, such as screening and painting (see **Section 4.13**).

Regarding open space, one of the factors identified in previous surveys (BLM 1997c) as being perceived as a one component of quality of life was the availability and access to wilderness and open space areas. The project would create a road network that would allow vehicular and recreational access to areas previously unaccessible. At the same time, increased access could be perceived as a negative impact in that it would reduce the secluded and undisturbed quality of currently isolated areas.

4.15.1.1.9.3 Traffic Congestion

Implementation of the project would result in an increase in traffic on federal, state, and local roads (see **Section 4.10**). Truck and heavy equipment traffic on federal lands, state highways, and county roads would increase. Some additional traffic on local community roads also may occur over time as new employees and project activities create additional trips. The major traffic congestion would occur at locations along U.S. 6 and SR 10 where vehicles and construction equipment would enter and exit the Project Area.

4.15.1.1.9.4 Climate and Air Quality

Climate and air quality are generally perceived as a factor in a definition of quality of life. The Proposed Action would have no effect on the regional climate. Furthermore, implementation of the Proposed Action is not anticipated to have significant impacts to regional air quality (see **Section 4.3**). Since there are no changes to climate or significant impacts or degradation to air quality anticipated, neither of these factors would affect quality of life.

4.15.1.1.9.5 Community Facilities and Services, Community Values

As described in previous sections, the proposed project would generate revenues currently not available to both Carbon and Emery counties. These revenues would likely be used for a variety of purposes, including funding for additional community facilities and services. While there may be a moderate increase in demand on existing services over time as project activities proceed, these affects have not been determined to be significant. Careful planning and budgeting of revenue would allow municipalities to consider such things as school additions, parks, recreational facilities, additional law enforcement officers, and other services and facilities.

It would be highly speculative and very difficult to predict the project's long-term impact on community values. Likewise, it would be difficult to assess whether or not implementation of the project would have any effect on religion in the area.

4.15.1.1.9.6 Crime

There is no information available that links natural gas development to increases in crime in a particular area. It would be impossible to predict increases or decreases in rates of crime resulting directly from project implementation.

4.15.1.10 Electric Power Option

Under the electric power option, the only effect on socioeconomicswould be the extra number of workers required to install the aboveground electric power lines and poles. For the five-year construction period, an additional 3,760 workdays, or an average of three workers per day, would be needed to install 187 miles of power lines. This increase would be approximately three percent of the projected total average of 98 workers needed to construct the rest of the Proposed Action. The projected annual payroll for the Proposed Action is $914,000 during the early stage of development. A three-percent increase in workers required to construct the power lines would increase the annual payroll by $27,000 to at total of $942,000. These extra workers would lead to an attendent three-percent increase in all the other factors analyzed for the socioeconomic resource.

4.15.1.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

Implementation of Alternative 2 would result in effects that only slightly vary from those described for Alternative 1. It is estimated that an average of 92 employees (98 employees under Alternative 1) would be required annually during the first five years of development. Approximately 37 would be local hires and 55 would be hired from outside the area. Employment for operations and reclamation would remain the same as for Alternative 1 (43 and 32 employees for operations and reclamation, respectively). Expenditures made by the Companies and local tax revenues would be reduced slightly (about 6 percent) because 18 fewer wells would be drilled under this alternative. The Environmental Protection Measures included in Alternative 2 that specifically relate to visual measures would aid in offsetting the project's effects on "quality of life".

Table 4–29 presents the estimated combined annual natural gas production and royalties associated with Alternative 2. Annual gas production rates for wells developed on federal lands have been estimated to range from 416 million cubic feet (MMCF) to as high as 25,277 MMCF at peak production. Forty-two percent of the project's annual gas production would originate from federal wells. Based on these rates, the annual federal mineral royalties have been projected at $72,228 to $4,391,911, equating to a total of $49,565,130 over the life of the project. Of this total amount, $24,782,565 would be paid to the State of Utah during the 25 years of production. Approximately $8,054,334 would be distributed to the PCIF, $8,302,159 to the Regents of the University of Utah, and $6,195,641 to Carbon and Emery counties. For both Carbon and Emery counties, the 25-percent share of the state's federal royalty funds are dedicated to the County Roads Special Service District. It is estimated that these revenues would amount to $1,548,910 for Carbon County and Emery County.

4.15.1.2.1 Electric Power Option

Under the electric power option, the only effect on socioeconomicswould be the extra number of workers required to install the aboveground electric power lines and poles. For the five-year construction period, an additional 3,400 workdays, or an average of three workers per day, would be needed to install 170 miles of power lines. This increase would be similar to the Proposed Action resulting in a similar three percent of the projected total average of 92 workers needed to construct the rest of the project under Alternative 2. Therefore, the socioeconomic impacts would be similar to the Proposed Action.

Table 4–29
Projected Combined[1] Annual Production and Federal, State and Local Royalties for Alternative 2

Year	Projected Annual Production (MMCF)[2]	Estimated Value of Natural Gas Produced by the Project[3]	Federal Mineral Royalties[4]	State Portion of Federal Royalties[5]	PCIF[6]	Regents of University of Utah	County of Origin Total	County Roads Special Service District Portion of County of Origin Total
1999	2,095	$2,912,440	$364,055	$182,028	$59,159	$60,979	$45,507	$11,377
2000	4,669	$6,490,165	$811,271	$405,635	$131,831	$135,888	$101,409	$25,352
2001	11,508	$15,996,557	$1,999,570	$999,785	$324,930	$334,928	$249,946	$62,487
2002	15,276	$21,233,702	$2,654,213	$1,327,106	$431,310	$444,581	$331,777	$82,944
2003	18,668	$25,947,833	$3,243,479	$1,621,740	$527,065	$543,283	$405,435	$101,359
2004	22,374	$31,099,850	$3,887,481	$1,943,741	$631,716	$651,153	$485,935	$121,484
2005	24,913	$34,629,762	$4,328,720	$2,164,360	$703,417	$725,061	$541,090	$135,273
2006	25,277	$35,135,285	$4,391,911	$2,195,955	$713,685	$735,645	$548,989	$137,247
2007	24,390	$33,902,673	$4,237,834	$2,118,917	$688,648	$709,837	$529,729	$132,432
2008	22,145	$30,780,910	$3,847,614	$1,923,807	$625,237	$644,475	$480,952	$120,238
2009	19,758	$27,463,235	$3,432,904	$1,716,452	$557,847	$575,011	$429,113	$107,278
2010	16,677	$23,181,160	$2,897,645	$1,448,823	$470,867	$485,356	$362,206	$90,551
2011	14,096	$19,594,106	$2,449,263	$1,224,632	$398,005	$410,252	$306,158	$76,539
2012	11,927	$16,578,462	$2,072,308	$1,036,154	$336,750	$347,112	$259,038	$64,760
2013	10,101	$14,040,354	$1,755,044	$877,522	$285,195	$293,970	$219,381	$54,845
2014	8,562	$11,901,649	$1,487,706	$743,853	$241,752	$249,191	$185,963	$46,491
2015	7,265	$10,098,209	$1,262,276	$631,138	$205,120	$211,431	$157,785	$39,446
2016	6,169	$8,575,228	$1,071,903	$535,952	$174,184	$179,544	$133,988	$33,497
2017	5,134	$7,136,208	$892,026	$446,013	$144,954	$149,414	$111,503	$27,876
2018	4,180	$5,810,887	$726,361	$363,180	$118,034	$121,665	$90,795	$22,699
2019	3,356	$4,664,569	$583,071	$291,536	$94,749	$97,664	$72,884	$18,221
2020	2,545	$3,537,493	$442,187	$221,093	$71,855	$74,066	$55,273	$13,818
2021	1,793	$2,492,046	$311,506	$155,753	$50,620	$52,177	$38,938	$9,735
2022	1,192	$1,656,505	$207,063	$103,532	$33,648	$34,683	$25,883	$6,471
2023	780	$1,083,929	$135,491	$67,746	$22,017	$22,695	$16,936	$4,234
2024	416	$577,824	$72,228	$36,114	$11,737	$12,098	$9,028	$2,257
Total	285,267	$396,521,041	$49,565,130	$24,782,565	$8,054,334	$8,302,159	$6,195,641	$1,548,910

Notes:
1 Anadarko, Chandler, and Texaco combined.
2 Source: Cox 1998. MMCF = million cubic feet; Annual production shown for federal lands only representing 42 percent of projected production.
3 Value of Gas equals estimated annual production multiplied by the assumed natural gas price of $1.39 per MCF (EIA 1996b).
4. (50% Federal Funds, 50% State Funds) Does not include administrative fees.
5 State funds are divided between PCIF (32.5 percent), Regents of University of Utah (33.5 percent), and County of Origin (25 percent).
6. PCIF=Permanent Community Impact Fund. Carbon and Emery Counties are guaranteed PCIF Funds. Counties would apply for grants or loans from PCIF to collect these monies.

4.15.1.3 Alternative 3 — No Action

Under the No Action Alternative, no natural gas drilling would take place on federal lands. However, drilling could still occur on state and private land. Compared with the Proposed Action and Alternative 2, the No Action Alternative would create fewer jobs in the Project Area over the life of the project. An average of 49 employees (98 employees under Alternative 1) would be required annually during the first five years of development. Approximately 20 would be local hires and 29 would be hired from outside the area. Employment for operations would remain the same as for Alternatives 1 and 2 (43 employees). However, the number of employees needed for reclamation would decrease to about 20. Expenditures made by the Companies and local tax revenues would be reduced substantially because 131 fewer wells would be drilled under this alternative. In addition, the costs and benefits of the project directed to Carbon and Emery counties would be reduced relative to the Proposed Action and Alternative 2. With no additional federal wells, there would be no additional federal royalties available and no associated distribution of those royalties to the counties.

4.15.2 Summary of Impacts

During the construction phase, approximately 98 new jobs would be created under Alternative 1. It is assumed that 39 of the new construction jobs would be local hires. These jobs would be seasonable through the expected 8-month (May through November) construction period. The operational phase of the project is expected to generate 43 jobs, about 37 of which would be local hires. People hired for the construction phase would be hired by third-party contractors to perform the required labor. Expenses incurred during the construction period (labor, equipment rental, and materials) would range from $28.7 million during the first two years, decrease to $18.7 million during the third through fifth years, and drop to $10.3 million during the last two years. The annual payroll of the Companies' permanent employees would range from $640,000 to $966,000 during the initial construction and then level off at about $1.1 million during the operational phase. Approximately 35 of the permanent employees would be local hires, whose annual salaries would total about $990,000.

The influx of non-local hires during the construction phase would not significantly impact the local housing, schools, medical facilities, or other community services because the increase would only be about 40 people.

In addition to salaries generated by the project, extra revenue would filter to county levels through federal royalties, local ad valorem taxes, and sales and use taxes. Based on projected natural gas market prices, it is estimated that federal royalties would total $53 million over the life of the project. Approximately half would be paid to the State of Utah and $6.7 million would be distributed to Carbon and Emery counties. Both counties would dedicate 25 percent ($1.7 million) to maintenance and construction of county roads. Another $8.8 million would be dedicated to Utah's PCIF, a means to provide rural communities for infrastructure projects. Communities in Carbon and Emery counties would have the right to apply for grants and low-interest loans in competition with other rural communities in Utah.

Approximately 92 new construction jobs would be created under Alternative 2. It is assumed that 37 of the new construction jobs would be local hires. These jobs would be seasonable through the expected 8-month (May through November) construction period. The operational phase of the project is expected to generate 43 jobs, about 37 of which would be local hires.

Based on projected natural gas market prices, it is estimated that federal royalties would total almost $50 million over the life of the project. Approximately half would be paid to the State of Utah and $6.2 million

would be distributed to Carbon and Emery counties. Both counties would dedicate 25 percent ($1.5 million) to maintenance and construction of county roads. Another $8.1 million would be dedicated to Utah's PCIF, a means to provide rural communities for infrastructure projects.

Under the No Action alternative, no additional wells would be drilled on federal lands. Approximately 49 new construction jobs would be created under Alternative 3. It is assumed that 20 of the new construction jobs would be local hires. The operational phase of the project is expected to generate 43 jobs, about 37 of which would be local hires. Implementation of Alternative 3 would result in a complete loss of all the federally-related benefits and costs described in the Proposed Action because no federal royalties would be collected and the associated distribution of these royalties would not occur.

4.15.3 Mitigation

There is no mitigation applicable.

4.15.4 Unavoidable Adverse Impacts

Impacts to quality of life may occur depending on an individual's point of view. For those that prefer the solitude and natural setting, their quality of life would be affected for the life of the project.

4.16 HEALTH AND SAFETY

4.16.1 Direct and Indirect Impacts

4.16.1.1 Alternative 1 — Proposed Action

4.16.1.1.1 Hazardous Materials

BLM policy (Instruction Memorandum 93–244, 9/9/93) on hazardous materials requires the identification of the following:

(A) any chemical or chemicals from the EPA's Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986, 10,000 pounds of which will be used, produced, stored, transported, or disposed of annually in association with the Proposed Action (regardless of exemption status) and

(B) are extremely hazardous substances, as defined in 40 CFR 355, which will be used, produced stored, transported, or disposed of in association with the proposed (action regardless or exemption status).

The Hazardous Substances Management Plan (**Appendix A**), lists the chemicals that would be used, stored, and produced during construction and operations and the methods that the Companies would use to ensure safety and efficiency with the chemicals. No materials incorporating a component listed as extremely hazardous would be used during operations.

The Companies have Emergency Plans in place that cover potential emergencies, including fires, employee injuries, chemical releases, hydrogen sulfide releases, and many others. The Emergency Plans include phone numbers for all medical and emergency services along with a list of responsible personnel to contact in the

event of an emergency. The Plans would be posted at all emergency facilities. All employees would be trained in emergency response upon being hired.

Several measures would be utilized to prevent pollution. All chemicals in the Project Area would be properly stored in accordance with state and federal guidelines. Areas containing chemicals would be periodically inspected by personnel who have emergency response training. The Companies' internal procedures include measures that would be taken in the event of a chemical release in excess of reportable quantities as outlined in the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. BLM standard approval for oil and gas operations would require the Companies' activities involving the generation, storage, or transport of hazardous materials be subject to required coordination and/or permitting from applicable local and state agencies and otherwise conform to applicable state and federal laws and regulations. Additionally, Federal and State operating and reporting requirements include provisions to cleanup and mitigate chemical, product, or waste releases.

According to local authorities, there have been no known incidents of hazardous materials released in the area as a result of natural gas development. The Carbon/Emery area has infrastructure in place to handle releases of hazardous materials.

The discussion of the Proposed Action in Chapter 2 identifies wastes generated during the various phases of gas development. Wastes would be disposed at approved facilities including regional landfills in accordance with State and Federal requirements. The Companies have identified in the Hazardous Substance Management Plan (**Appendix A**) that they would comply with regulations promulgated for the Resource Conservation and Recovery Act (RCRA), which covers transportation and disposal of hazardous wastes. Proper handling and disposal of wastes associated with the project would pose minimal risk to public health and safety and should not pose any adverse impacts.

Information concerning produced water disposal and hydrology and water quality is discussed in the **Section 4.2**. Specific information on spill impacts to surface and groundwater is contained in **Sections 4.2.1.1.4** and **4.2.1.2.4**.

4.16.1.1.2 Health and Safety

Potential risks associated with the Proposed Action and alternatives would be geologic hazards (methane gas seepage, H_2S releases, abnormal high pressure, seismic activity), fires and explosions (gas flowline leakage or rupture, well fires, human-caused fires), and public and employee safety. The following sections describe these risks and the measures that would to taken to minimize the risk factor to health and safety.

4.16.1.1.2.1 Methane Seepage

There are two potential avenues for methane gas reaching the surface. One is gas migration up the well bore annuli. This will be prevented by the cementing and casing program, which will isolate or protect all zones containing a fluid (gas or liquid) with the potential to migrate. The second is through the natural fractures and conduits of the formations leading to venting at the surface. The geologic setting (a thick layer of shale above the productive gas bearing zone) does not lend itself to vertical migration and recent studies have confirmed that horizontal gas migration is not currently occurring.

The USGS and UDOGM have been monitoring methane concentrations in soil and shallow groundwater since 1995. This study encompasses the area of current and proposed coalbed methane production from the

Ferron Sandstone. Approximately 80 percent of 121 soil samples had a methane concentration below the detectable limit. Samples containing detectable concentrations were taken immediately adjacent to producing coalbed methane or conventional gas wells.

Fourteen samples were taken from springs, wells, and drains. One sample, taken from a pond, contained a detectable level of methane. This is most likely the result of decomposition of organic material at the bottom of the pond. The USGS and UDOGM will continue to monitor shallow ground water and soil gas in this area.

Additionally, the BLM recently conducted a soil gas survey (**Appendix D**) sampling along the Ferron Sandstone outcrop. The outcrop is located 6 to 10 miles east of the FNG Project Area. Samples were taken approximately 1,312 feet (400 meters) apart. Sample sites were permanently marked to allow for future analysis, if necessary. Of the 70 samples taken, none had detectable levels of either methane, hydrogen sulfide, or carbon monoxide.

4.16.1.1.2.2 Hydrogen Sulfide Releases

H_2S has not been encountered to date in any of the more than 100 CBM wells drilled in the Price area. Therefore, H_2S would not be expected during the extraction of natural gas in the Project Area. However, H_2S has been detected in produced water from some of the CBM wells in small amounts (80 to 90 ppm below the minimum level of 100 ppm at which it is regulated under Onshore Order No. 6). Solution H_2S also was recently encountered in the drilling of a disposal well to a depth of approximately 6,000 feet into the Navajo Formation. As a result, the Companies would prepare an H_2S contingency plan in accordance with UDOGM's requirements.

4.16.1.1.2.3 Abnormal High Pressure

Encountering high pressures while drilling is always a possibility. However, offset well information can be used to anticipate subsurface pressure. More than 100 wells have been drilled in the Price CBM Project Area without experiencing abnormally-high pressure. One well outside of the Price Project Area experienced high formation pressure, but that situation was safely and effectively controlled by the approved blowout preventer.

All wells drilled would be required to have Blowout Prevention Equipment (BOPE) that would safely control any abnormally-high pressures encountered. Onshore Oil and Gas Order No. 2 (Drilling Operations) established the minimum equipment necessary to safely drill and handle specific pressure situations. All wells drilled on federal mineral leases would adhere to this Order. Wells drilled on private and State leases have similar requirements administered by UDOGM. Pressure equipment is prescribed on a site-specific basis during APD approval and the Companies would be required to maintain the equipment in good condition. In addition, all drilling companies employed by the Companies would be required to be certified with blowout prevention training. BLM and UDOGM would make inspections during drilling activities to verify compliance with these requirements. Therefore, blowouts are considered unlikely in the Project Area because of the shallow well depths, low gas pressures, experience in the area, and the BLM and UDOGM's requirements to install BOPE during drilling activities.

4.16.1.1.2.4 Seismic Activity

Risks to facilities during seismic events are described in **Section 4.1.**

4.16.1.1.2.5 Gas Flowline Leakage or Ruptures

A potential for gas flowlines or ruptures exists for the proposed project. According to the U.S. Department of Transportation (Office of Pipeline Safety 1997), an average of one rupture annually could be expected for every 5,000 miles of pipeline. More than 50 percent of pipeline ruptures occur as a result of heavy equipment striking the pipeline. Such ruptures could lead to a fire or explosion if a spark or open flame would ignite methane being released from the pipeline.

Pipeline design, materials, maintenance, and abandonment practices would be conducted in accordance with safe and proven engineering procedures and would meet or exceed the standards set forth in U.S. Department of Transportation (DOT) regulations (49 CFR Part 192, Transportation of Natural Gas by Pipelines) and standards construction specifications recommended by the American Society of Mechanical Engineers (ASME–31.8) and the American Petroleum Institute (API Standard 1004). Frequent signing of buried pipelines would minimize the risk of heavy equipment damaging the pipelines. The Companies' monitoring of the pipeline flow by either remote sensors or daily inspections of the flow meters would minimize the risks of pipeline ruptures by early detection of potential leaks.

Approximately 100 miles of pipelines would be constructed for the Proposed Action and these pipelines would be in service for more than 20 years. Applying the DOT statistic of one rupture annually for every 5,000 miles of pipeline, there is a potential for only one rupture in a pipeline over the lifetime of the project.

4.16.1.1.2.6 Well Fires and Explosions

Well fires are very rare but could occur under certain conditions. A well fire could result from a blowout during drilling activities or a gas leak during operations. Gas would have to accumulate, such as in a confined space, and there would have to be a spark to start the fire. Because a blowout is unlikely for the reasons listed above, and signage and monitoring would reduce the likelihood of pipeline damage and undetected leaks, it is unlikely that the conditions for a well fire would occur. However, in the unlikely event of a well fire, the Companies would immediately contact one of the service companies specializing in controlling well fires for extinguishing the fire.

4.16.1.1.2.7 Human-Caused Fires

Increased use of the Project Area by the Companies and increased public access could result in a higher potential for fires. Human-caused wildfire resulting from unsafe well control practices can be averted by implementing UDOGM's measures for fire hazards on the surface. The well site would be kept free of vegetation and trash in order to minimize the potential for wild fires to cause well fires. The UDOGM R649–3 Drilling and Operating Practices (from the Oil and Gas Conservation General Rules) requires the following measure for fire hazards on the surface:

- All rubbish or debris shall be contained in a trash cage during drilling and removed from the site subsequently.

- All rubbish or debris shall be placed in trash cages.

There is always a possibility that fires could be caused by vandalism. During daily inspections, pumpers would inspect facilities to determine whether unauthorized trespass has occurred overnight. Any damage to facilities would be immediately addressed, especially if safety or efficient operations would be a factor.

4.16.1.1.3 Public and Employee Safety

Risks associated with the construction of natural gas facilities would approximate the impacts associated with the oil and gas industry. During 1996, OSHA (1996) reported that the injury rate per 100 workers was about nine injuries per year. Based on the average level of employment for the Ferron construction and operational phases (see **Table 2–3**), approximately 10 injuries could occur annually in the construction phase and five injuries could occur annually during the operational phase. This potential injury rate would be limited to employees and subcontractors and would not affect the general public. Issues concerning the potential for safety concerns associated with increased traffic are addressed in **Section 4.10.**

Potential related hazards to public and employee safety are described in **Section 4.16**. The Companies and their subcontractors would comply with all applicable federal laws and regulations to minimize the potential risks to the safety of the public and the company employees.

UDOGM's Drilling and Operating Practices require the operator to carry on all operations and maintain the property at all times in a safe and workmanlike manner having due regard for the preservation and conservation of the property and for the health and safety of employees and people residing in close proximity to those operations (R649–3–15). At a minimum, the operator shall:

- Take reasonable steps to prevent and remove accumulations of materials deemed to be fire hazards from the vicinity of well locations, lease tanks and pits.
- Remove from the property, or store in an orderly manner, all scrap or other materials not in use.
- Provide secure workmanlike storage for chemical containers, barrels, solvents, hydraulic fluid, and other non-exempt materials.
- Maintain tanks in a workmanlike manner that will preclude leakage and provide for all applicable safety measures, and construct berms of sufficient height and width to contain the quantity of the largest tank at the storage facility. The use of crude or produced water storage tanks without tops is strictly prohibited except during well testing operations.
- Catch leaks and drips, contain spills, and cleanup promptly. Waste reduction and recycling should be practiced in order to help reduce disposal volumes. Produced water, tank bottoms and other miscellaneous waste should be disposed of in a manner which is in compliance with these rules and other state, federal, or local regulations or ordinances. In general, good housekeeping practices should be used.

Safety requirements for well operations are regulated under 43 CFR Ch. II, Subpart 3162.5 — Environmental Obligations. Safety precaution require that the operator shall perform operations and maintain equipment in a safe and workmanlike manner. The operator shall take all precautions necessary to provide adequate protection for the health and safety of life and the protection of property. Compliance with health and safety requirements prescribed by the authorized officer shall not relieve the operator of the responsibility for compliance with other pertinent health and safety requirements under applicable laws or regulations. Environmental obligations require that all spills or leakages of oil, gas, produced water, toxic liquid , or waste materials, blowouts, fires, personal injuries, and fatalities shall be reported by the operator in accordance with these regulations and as prescribed in applicable order or notices. The operator shall

exercise due diligence in taking necessary measures, subject to approval by the authorized officer, to control and remove pollutants and to extinguish fires.

All of the above listed items would be covered in the Emergency Plans that are being developed by the Companies. In addition, the Companies' Operational Plans list safety measures that are incorporated in the construction, drilling, operational, and vehicle operation phase of the project. The Emergency Plans cover all potential emergencies including fires, employee injuries, chemical releases, and others. The Plans include phone contacts for medical and emergency services and a list of personnel to contact in any emergency situation. The Plans would be posted in all Company facilities and in all Company vehicles. All employees would be trained on the contents of the Plan and refresher training would be conducted periodically.

4.16.1.1.4 Electric Power Option

The only potential effect to health and safety associated with installing electric power would be a slight, but imperceptible, increase in the potential for injuries to workers. As previously described in this analysis, OSHA predicts an injury rate of about nine injuries per 100 workers for installation of facilities in the oil and gas industry. Since the average increase of workers for installation of electrical facilities would be three workers per year, the predicted injury rate could increase by three percent.

4.16.1.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

Under this alternative, the measures to handle hazardous materials, ensure safe operations, and respond to emergency situations would apply in the same manner as to the Proposed Action. With 18 fewer wells to be drilled, the probability of accidents and vandalism should decrease slightly.

4.16.1.2.1 Electric Power Option

Under Alternative 2, approximately the same number of extra workers would be required to install electrical power. Therefore, the potential effects would be similar to the Proposed Action.

4.16.1.3 Alterative 3 — No Action

Under the No Action alternative, a maximum of 155 wells could be drilled on State and private leases. The level of activity would be about 54 percent of the Proposed Action. Therefore, potential risks to the pubic through increased traffic would decrease. However, the measures to handle hazardous materials, ensure safe operations, and respond to emergency situations would apply in the same manner as to the Proposed Action even though fewer wells, roads, and facilities would be constructed and operated.

4.16.2 Summary of Impacts

No hazardous chemicals above the reportable quantity limits would be stored, produced, or used by the Companies. The Companies' adherence to the provisions of the Hazardous Substances Management Plan would ensure the safe and efficient handling and storage of all chemicals.

No significant geological hazards would occur. No hydrogen sulfide has been encountered in any CBM wells drilled in and near the Project Area. Although abnormally-high pressures have not been encountered,

the Companies would be required to use BOPE during all drilling activities. USGS and BLM studies concerning methane seepage have determined that seepage would not occur even at the Ferron Outcrop to the east of the Project Area. Therefore, it can be concluded that seepage would not occur around drilling activities where the Ferron coal seem is at depths from 1,400 to 3,500 feet. H_2S has been detected in produced water from some of the CBM wells in small amounts (80 to 90 ppm below the minimum level of 100 ppm at which it is regulated under Onshore Order No. 6). Solution H_2S was also recently encountered in the drilling of a disposal well to a depth of approximately 6,000 feet into the Navajo Formation. As a result, the Companies would prepare an H_2S contingency plan in accordance with UDOGM's requirements.

According to past statistics compiled by the DOT, a gas line rupture occurs annually for every 5,000 miles of pipelines. Applying this statistical record to the FNG Project, one pipeline rupture would occur over the life of the project. Well fires are very rare and unlikely to occur with the FNG Project because pumpers would check the well sites and equipment daily. Any potential safety problems would be corrected immediately. The likelihood of human-caused fires would be reduced by good housekeeping practices around the well sites and facilities. Daily inspections by pumpers would note and correct the presence of any debris. However, fires caused by vandalism, especially on the remote wells, cannot be ruled out. The daily inspections would alleviate these potential problems by noting any vandalism that might have occurred overnight.

Public and employee health and safety would be protected by the Companies' compliance with all applicable federal laws concerning the safe operation of natural gas facilities. All employees and subcontractors would be trained concerning the safe operation of equipment and vehicles.

4.16.3 Mitigation

No extra mitigation is required concerning health and safety measures.

4.16.4 Unavoidable Adverse Impacts

There are no unavoidable adverse impacts associated with health and safety matters.

4.17 RECLAMATION

The potential for successful reclamation of lands that would be disturbed by the three alternatives has been evaluated using data from the Carbon County Soils Survey, The Emery County Soils Survey and the 1997/98 NRCS survey commissioned by BLM. Soils mapping units were categorized into one of five basic classes for reclamation potential. There are four classes of reclamation potential identified for the North Area; variable, fair, poor, and unsuitable. The four classes of reclamation potential identified for the South Area are good, fair, poor, and unsuitable.

The reclamation potential shown on **Plate 4–4** represent the potential of the soils to support vegetation. The information is presented for analysis purposes only, as the characteristics of the soils were primarily developed for agricultural purposes. Soils classified as having a good or fair potential for reclamation commonly lie at the lowest elevations in the Project Area and occur in areas with the lowest slopes. Good and fair potential soils also tend to occur along streams.

4.17.1 Alternative 1 — Proposed Action

Under this alternative, about 1,633 acres of soils would be disturbed during construction of the wells, roads, and pipelines. As shown on **Table 4–29**, most (>80 percent) of this disturbance would involve soils classified as unsuitable for reclamation. About 69 percent of the transmission line right-of-way would have a reclamation potential of poor or unsuitable. Reclamation of these soils is expected to require many growing seasons and multiple efforts to reseed and successfully generate a vegetative cover similar to that which presently exists. The portions of the Project Area with a good or fair potential for reclamation are expected to return to pre-project conditions following a much shorter period of time after completion of initial reclamation activities.

Table 4–29
Reclamation Potential for Project Facilities Under Alternative 1

Facility	Areal Extent of Reclamation Potential (acres)										
	Variable		Good		Fair		Poor		Unsuitable		Total
	PUB	PVT STATE	PUB	PVT STATE	PUB	PVT STATE	PUB	PVT STATE	PUB	PVT STATE	
NORTH AREA											
Wells	0.0	0.0	0.0	0.0	2.8	1.4	6.9	5.5	53.7	19.3	89.6
Roads	0.0	2.5	0.0	0.0	4.2	4.4	3.7	7.4	82.5	35.1	139.8
CPFs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.6	0.0	15.6
Subtotal	0.0	2.5	0.0	0.0	7.0	5.8	10.6	12.9	151.8	54.4	245.0
SOUTH AREA											
Wells	0.0	0.0	0.0	1.4	1.4	13.7	13.8	28.9	100.6	143.3	303.1
Roads	0.0	0.0	0.0	1.2	3.0	32.0	29.8	37.6	334.4	348.0	786.0
CPFs	0.0	0.0	0.0	0.0	0.0	6.3	6.3	12.6	12.6	0.0	37.8
Subtotal	0.0	0.0	0.0	2.6	4.4	52.0	49.9	79.1	447.6	491.3	1,126.9
PIPELINE											
Pipeline	0.3	5.9	5.2	6.7	12.4	50.6	34.9	32.7	9.5	103.2	261.4
TOTAL	0.3	8.4	5.2	9.3	23.8	108.4	95.4	124.7	608.9	648.9	1,633.3
Portion of total disturb. (percent)	0.0	0.5	0.3	0.6	1.5	6.6	5.8	7.6	37.3	39.7	100.0

Bonds are required for oil and gas operations on Federal leases by Title 43 Code of Federal Regulations Parts 3104.1 and 3162.3 to protect the environment; ensure downhole plugging and surface reclamation following drilling or other exploration or development; and to cover unpaid Federal royalty obligations. The State of Utah (UDOGM) also requires bonds for State leases. Bonding for oil and gas operations is a risk management tool used by the BLM. It is not intended to cover 100 percent of the reclamation costs and royalty income. The historical default rate is 0.15 percent nationwide (BLM Bonding Liability of the Oil and Gas Program, March, 1995). Historically, the BLM has not seen oil and gas operators walk away from their responsibilities. Currently Texaco and Anadarko have $150,000 nationwide bonds. Chandler has a $25,000 statewide bond for activities on Federal lands in Utah. The State of Utah has similar bonding requirements. State bonds for private and State wells are established by UDOGM or SITLA.

The cost to plug and reclaim the surface associated with a single well and its associated access road has been estimated, in 1996 dollars, at $15,000. **Table 4–30** shows the amount of Federal reclamation liability each company would have for each year of the project. The analysis assumes that 20 percent of the proposed Federal wells would be drilled in each year of the five year construction period, and the production lifetime of each well would be 20 years. The 131 wells that would be drilled on Federal leases would accrue and estimated reclamation liability of $1,965,000, in 1996 dollars. The amount of liability at the end of production assumes that reclamation activities would take two years for reclamation.

Table 4–30
Ferron Natural Gas Project Reclamation Liability

	Anadarko		Texaco		Chandler			
Year	Number Federal Wells	Company Liability	Number Federal Wells	Company Liability	Number Federal Wells	Company Liability	Total Federal Wells	Total Liability
1999	9	$135,000	8	$120,000	9	$135,000	26	$390,000
2000	18	$270,000	16	$240,000	18	$270,000	52	$780,000
2001	27	$405,000	24	$360,000	27	$405,000	78	$1,170,000
2002	36	$540,000	32	$480,000	36	$540,000	104	$1,560,000
2003	46	$690,000	41	$615,000	44	$660,000	131	$1,965,000
2004–2023	46	$690,000	41	$615,000	44	$660,000	131	$1,965,000
2024	36	$540,000	32	$480,000	36	$540,000	104	$1,560,000
2025	27	$405,000	24	$360,000	27	$405,000	78	$1,170,000
2026	18	$270,000	16	$240,000	18	$270,000	52	$780,000
2027	9	$135,000	8	$120,000	9	$135,000	26	$390,000
2028	0	$0	0	$0	0	$0	0	$195,000
2029								$97,500
2030								$0

4.17.2 Alternative 2 — Proposed Action with Additional Environmental Protection Measures

Under this alternative, about 1,473 acres of soils would be disturbed during construction of the wells, roads, and pipelines. As with Alternative 1, most (>80 percent) of this disturbance would involve soils classified as unsuitable for reclamation (**Table 4–31**). Reclamation of these soils is expected to require many growing seasons and multiple efforts to reseed and successfully generate a vegetative cover similar to that which presently exists. The portions of the Project Area with a good or fair potential for reclamation are expected to return to pre-project conditions following a much shorter period of time after completion of initial reclamation activities.

Eighteen fewer Federal wells would be drilled under this alternative. Therefore, the reclamation liability would be 86 percent of the Proposed Action or $1,689,900 in 1996 dollars.

Table 4–31
Reclamation Potential for Project Facilities Under Alternative 2

Facility	Areal Extent of Reclamation Potential (acres)										
	Variable		Good		Fair		Poor		Unsuitable		Total
	PUB	PVT STATE	PUB	PVT STATE	PUB	PVT STATE	PUB	PVT STATE	PUB	PVT STATE	
NORTH AREA											
Wells	0.0	0.0	0.0	0.0	2.8	1.4	4.1	5.5	51.0	19.3	84.1
Roads	0.0	2.5	0.0	0.0	2.5	4.4	2.5	8.1	65.7	31.1	116.8
CPFs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.6	0.0	15.6
Subtotal	0.0	2.5	0.0	0.0	5.3	5.8	6.6	13.6	132.3	50.4	216.5
SOUTH AREA											
Wells	0.0	0.0	0.0	1.4	0.0	13.7	15.2	28.9	81.3	143.3	283.8
Roads	0.0	0.0	0.7	1.2	3.0	34.9	28.2	39.4	238.4	327.7	673.5
CPFs	0.0	0.0	0.0	0.0	0.0	6.3	6.3	12.6	12.6	0.0	37.8
Subtotal	0.0	0.0	0.7	2.6	3.0	54.9	49.7	80.9	332.3	471.0	995.1
PIPELINE											
Pipeline	0.3	5.9	5.2	6.7	12.4	50.6	34.9	32.7	9.5	103.2	261.4
TOTAL	0.3	8.4	5.9	9.3	20.7	111.3	91.2	127.2	474.1	624.6	1,473.0
Portion of total disturb. (percent)	0.0	0.6	0.4	0.6	1.4	7.6	6.2	8.6	32.2	42.4	100.0

4.17.3 Alternative 3 — No Action

Under this alternative, about 917 acres of soils would be disturbed during construction of the wells, roads, and pipelines. Like the other two alternatives, most (>80 percent) of this disturbance would involve soils classified as unsuitable for reclamation (**Table 4–32**). Reclamation of these soils is expected to require many growing seasons and multiple efforts to reseed and successfully generate a vegetative cover similar to that which presently exists. Reclamation requirements would be specified by the State of Utah or private landowner.

4.17.4 Summary of Impacts

Although the three alternatives vary in the areal extent of disturbances (917 to 1,633 acres), most of the disturbances under each alternative would involve soils with a reclamation potential classified as poor or unsuitable. While the cost estimates for reclamation is high for Alternatives 1 and 2, Federal bonding policies and requirements would be adequate to assure reclamation is complete.

Table 4–32
Reclamation Potential for Project Facilities Under Alternative 3

Facility	Areal Extent of Reclamation Potential (acres)										
	Variable		Good		Fair		Poor		Unsuitable		Total
	PUB	PVT STATE	PUB	PVT STATE	PUB	PVT STATE	PUB	PVT STATE	PUB	PVT STATE	
NORTH AREA											
Wells	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.9	1.4	6.9	26.2
Roads	0.0	2.5	0.0	0.0	0.0	4.4	0.6	6.6	0.5	25.9	40.5
CPFs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	0.0	2.5	0.0	0.0	0.0	4.4	0.6	24.5	1.9	32.8	66.7
SOUTH AREA											
Wells	0.0	0.0	0.0	1.4	0.0	12.4	0.0	28.9	0.0	143.3	186.0
Roads	0.0	0.0	0.0	1.2	0.4	29.5	0.0	31.3	2.2	313.0	377.6
CPFs	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	0.0	18.9	25.2
Subtotal	0.0	0.0	0.0	2.6	0.4	41.9	6.3	60.2	2.2	475.2	588.8
PIPELINE											
Pipeline	0.3	5.9	5.2	6.7	12.4	50.6	34.9	32.7	9.5	103.2	261.4
TOTAL	0.3	8.4	5.2	9.3	12.8	96.9	41.8	117.4	13.6	611.2	916.9
Portion of total disturb. (percent)	0.0	0.9	0.6	1.0	1.4	10.6	4.6	12.8	1.5	66.7	100.0

4.17.5 Mitigation

Reclamation operations should use the following measures as prescribed by the Authorizing Officer.

Site Preparation

1. The entire roadbed and drill site should be obliterated and brought back to the approximate original contour. Drainage control should be reestablished as necessary. All areas affected by road construction should be recontoured to blend in with the existing topography. All berms should be removed unless determined to be beneficial by the Authorizing Officer. In recontouring the disturbed areas, care should be taken to not disturb additional vegetation.

2. Water bars should be installed at all alignment changes (curves), significant grade changes, and as determined necessary by an approved engineer. Water bars should be sloped with the grade and cut to a minimum 12-inch depth below the surface. The grade of the water bar should be 2 percent greater than the grade of the road.

Seedbed Preparation

3. An adequate seedbed should be prepared for all sites to be seeded. Areas to be revegetated should be chiseled or disked to a depth of at least 12 inches unless restrained by bedrock.

4. Ripping of fill materials should be completed by a bulldozer equipped with single or a twin set of ripper shanks. Ripping should be done on 4-foot centers to a depth of 12 inches. Ripping should be followed by final grading and precede seedbed material application. Ripping should be completed at a speed that maximizes ripper shank action and promotes soil material disruption to the specified depth. Ripping should be repeated until the compacted area is loose and friable.

5. Seedbed preparation would be considered complete when the soil surface is completely roughened, the number of rocks (if present) on the site would be sufficient to cause the site to match the surrounding terrain, and topsoil is redistributed.

Fertilization

6. Commercial fertilizer with a formula of 16–16–8 should be applied at a rate of 200 pounds per acre. The rate may be adjusted depending on soil test results.

7. Fertilizer should be applied not more than 48 hours before seeding and cultivated into the upper 3 inches of soil.

8. Fertilizer should be broadcast over the soil using hand-operated "cyclone-type" seeders or rotary broadcast equipment attached to construction or revegetation machinery as appropriate to slope. All equipment should be equipped with a metering device. Fertilizer application should to take place before the final seeding preparation treatment. Fertilizer broadcasting operations should not be conducted when wind velocities would interfere with even distribution of the material.

Mulching

9. Mulching should be conducted. The type of mulch should meet the following requirements: Wood cellulose fiber should be natural or cooked, should disperse readily in water, and should be nontoxic. Mulch should be thermally produced and air dried. The homogeneous slurry or mixture should be capable of application with power spray equipment. A colored dye that is noninjurious to plant growth may be required. Wood cellulose fiber should be packaged in new, labeled containers. A minimum application of 1,500 pounds per acre should be applied. A suitable tackifier should also be applied with the mulch at a rate of 60 to 80 pounds per acre.

   An alternative method of mulching on small sites would be the application of straw or hay mulch at a rate of 2,000 pounds per acre. Hay or straw should be certified weed free. Following the application of straw or hay, crimping should occur to ensure retention.

Reseeding

10. All disturbed areas should be seeded with the seed mixture required by the authorizing agency. The seed mixture(s) should be planted in the fall of the year (September through November), in the amounts specified in pounds of pure live seed (PLS)/acre. There should be no noxious weed seed in the seed mixture. Seeds would be tested. The viability testing of seeds should be done in accordance with State

law(s) and within 12 months prior to planting. Commercial seed would be either certified or registered seed. The seed mixture container should be tagged in accordance with State law(s) and available for inspection by the authorized officer. Seed is to be planted using a drill equipped with a depth regulator to ensure proper depth of planting where drilling is possible. The seed mixture should be evenly and uniformly planted over the disturbed area. (Smaller/heavier seeds tend to drop to the bottom of the drill and are planted first. Appropriate measures should be taken to ensure this does not occur.) Where drilling is not possible, seed should be broadcast and the area raked or chained to cover the seed. Woody species with seeds that are too large for the drill would be broadcast. When broadcasting the seed, the pounds per acre are to be increased by 50 percent. Reseeding may be required if a satisfactory stand is not established to specifications. Evaluation of the seeding's success will not be made before completion of the second growing season after the vegetation becomes established. The Authorized Officer should be notified a minimum of seven (7) days before seeding of a project.

11. Seed mixes would be specified by the authorizing agency and distributed immediately after the topsoil is replaced.

4.17.6 Unavoidable Adverse Impacts

With the alternatives considered in detail, at least 917 acres of land within the Project Area would be disturbed. Additionally, most (>80 percent) of this disturbance would involve soil mapping units with a potential for reclamation that is poor or unsuitable. Due to these characteristics, reclamation of disturbances would take several years (probably at least 5 to 10 years) before vegetative cover returns to pre-project conditions.

4.18 IRREVERSIBLE AND IRRETRIEVABLE EFFECTS

An irreversible or irretrievable commitment of resources would occur when resources would be consumed, committed, or lost as a result of the project. The commitment of resources would be irreversible if the project stated a process (chemical, biological, or physical) that could not be stopped. As a result, the resource or its productivity or its utility would be consumed, committed, or lost forever. Commitment of a resource would be considered irretrievable when the project would directly eliminate the resource, its productivity, or its utility for the life of the project and possibly beyond.

No irreversible or irretrievable effects would occur to air quality, visual or noise resources. The following is a listing of the effects that would occur to the other resources analyzed in this EIS.

4.18.1 Irreversible Effects

- Removal of natural gas
- Transfer of groundwater from the Ferron Sandstone aquifer to the Navajo aquifer
- Road kill of big game
- Accidental death of a sensitive species
- Destruction of a significant cultural resource
- Loss of a natural recreational setting
- Road kill of livestock

4.18.2 Irretrievable Effects

- Loss of vegetative cover for several years until reclamation is successful
- Loss of riparian vegetation over life of Project
- Loss of portions of big game winter range over life of Project
- Loss of sensitive species habitat
- Loss of livestock forage for several years until reclamation is successful
- Loss of natural recreation setting