

1.0
INTRODUCTION

1.1 PROPOSED PROJECT

River Gas Corporation (RGC) has notified the Bureau of Land Management (BLM), the Price River/San Rafael Resource Area, of the company's intent to develop a coalbed methane (CBM) gas production field in an area adjacent to the City of Price, Utah. The proposed project, Price CBM Project, would involve the construction (wellpads), drilling, and completion/stimulation of 601 CBM gas wells and associated access roads, pipelines, and electrical distribution lines over approximately a 10-year plus period within an approximately 294-square mile Project Area (Figure 1.1-1). The proposed Project Area occupies portions of Carbon and Emery counties and contains the City of Price and the communities of Carbonville and Spring Glen and portions of Helper, Wellington, and Elmo.

1.2 PURPOSE AND NEED

RGC has given notice to the U.S. Department of the Interior (USDI), BLM of its intent to expand current CBM field development activities, located principally on state and private lands, onto federal lands in the Project Area. RGC holds valid federal, state, and private oil and gas leases within the Project Area. The leases have created contractual and property rights for RGC from the United States, the State of Utah and private mineral landowners to develop the CBM gas resources. The purpose of RGC's Proposed Action is to remove recoverable CBM gas at a profit within the portion of the Project Area that is or would be leased by RGC. Gas currently being produced by RGC flows from the Project Area to the Provo/Salt Lake corridor. The gas is transported by Questar Pipeline Company. RGC plans to continue using the Questar pipeline system to transport gas to market.

Private exploration and development of federal oil and gas leases is an integral part of the BLM's oil and gas leasing programs under authority of the Mineral Leasing Act of 1920, as amended by the Federal Land Policy and Management Act of 1976 and the Federal Onshore Oil and Gas Leasing Reform Act of 1987. The BLM oil and gas leasing program encourages development of domestic oil and gas reserves and the reduction of U.S. dependence on foreign energy sources. Natural gas, including CBM gas, is considered essential to supplying the nation's future energy needs. Domestic demand for natural gas is increasing and is expected to reach 24.8 trillion cubic feet (tcf) per year in 2010 (GRI 1993). To satisfy federal energy policy, increased development of domestic natural gas is necessary.

The proposed Price CBM project would provide the opportunity to develop a domestic energy source that may help lower dependence on foreign sources. The project would also provide a clean-burning energy resource that could supplement or replace some existing energy sources that are more harmful to the environment.

1.3 ENVIRONMENTAL ANALYSIS PROCESS

The BLM is required by the National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) directives to analyze proposed actions involving federal lands and leases in terms of their potential impact on the human environment (40 CFR Parts 1500-1508). The BLM is further required, by the regulations implementing the Mineral Leasing Act of 1920, to review and act on Applications for Permit to Drill (APDs) and attached Surface Use Plan of Operations (SUPO), and to decide on the requirements for surface occupancy provided by the SUPO.

Chapter 1. Land Status, Legal, and Policy Considerations

The BLM also issues right-of-ways (ROW, i.e., permission to construct and operate linear transportation facilities such as roads and pipelines) across federal lands under Title IV of the Federal Land Policy and Management Act (FLPMA). The analysis of impacts to the human environment discloses the potential environmental consequences of the Proposed Action and alternative actions. Another BLM responsibility is establishing provisions for ensuring the reclamation of facilities and disturbed lands should an oil and gas operator fail to complete adequate reclamation efforts. Bonds are required for oil and gas operations on federal leases to protect the environment. Refer to Section 1.6.2 for a discussion of bonding adequacy.

The BLM, Moab District, Moab, Utah is the responsible federal agency for preparing this Environmental Impact Statement (EIS). The development of this proposal and the alternatives was conducted through a cooperative effort among RGC, the BLM, and the project interdisciplinary team. Interdisciplinary participation included specialists provided by a third-party contractor, a private consulting firm working under the direction of, and in cooperation with, the BLM.

The EIS provides the responsible agencies with information upon which to base a final decision that is fully informed and that considers all factors relevant to the proposal. Scoping issues and concerns raised by the public drive the development of alternatives and the impact analysis process. The EIS serves to document (1) the analysis of impacts that result from implementation of the proposal and alternatives and (2) the development of environmental protection measures necessary to reduce or eliminate environmental consequences.

Factors considered during the environmental analysis process for this proposed CBM gas field

development and gas production project include the following:

- The location of wellsites, access roads, pipelines, electrical distribution lines, compressor facilities, and produced water disposal facilities reflect an initial attempt to minimize surface resource impacts and to meet needs of other resource activities while honoring the lease rights within the Project Area.
- The determination of impacts, which are anticipated to result from implementation of the Proposed Action and alternatives, is made in accordance with applicable regulations and lease stipulations, and with the application of mitigation measures necessary to avoid or minimize these impacts.

The EIS is not a decision document; it documents the process used to analyze the potential environmental consequences of implementing the proposed CBM gas field development project and alternatives to the Proposed Action. The decision regarding the proposed project will be documented in a Record of Decision (ROD) signed by the responsible BLM official. The BLM decision will relate primarily to federal lands administered by the BLM. Decisions by other jurisdictions to issue or not to issue approvals related to this proposal may be aided by the disclosure of impacts available in this analysis.

The EIS is not the final review upon which approval of all actions in the Project Area will be based. Site-specific environmental analyses and additional NEPA compliance documentation will be required for all site-specific actions. The scope of this additional approval process will be greatly reduced if significant changes in location of facilities or activities evaluated in the EIS are not required.

Chapter 1. Land Status, Legal and Policy Considerations

1.3.1 Preferred Alternative Identification

Identification of a preferred alternative is required in the Draft EIS (DEIS) to allow the public to review the agencies' preference. The preferred alternative identified in the DEIS has been changed in the Final EIS based upon comments received on DEIS. Rationale for the selection of the preferred alternative will be provided in the ROD.

Alternative D - Big Game Minimum Disturbance Corridors, 160-acre well spacing has been identified as the BLM's preferred alternative. A description of this alternative is provided in Chapter 2, Section 2.6.

1.4 LAND STATUS, LEGAL, AND POLICY CONSIDERATIONS

1.4.1 Land Status

Acreage of the Project Area totals approximately 188,242 acres. Surface and mineral estate ownership within the Project Area is divided among federal (BLM administered), School and Institutional Trust Lands Administration (State), Utah Division of Wildlife Resources (UDWR), and private entities (Plate 1). BLM-administered federal surface lands account for approximately 82,741 acres (44 percent of the Project Area); state surface lands total 44,866 acres (24 percent); and the remaining 60,635 acres (32 percent) are held in private ownership. Mineral ownership within the Project Area is split roughly equally between federal (95,462 acres) and state/private (92,780 acres) ownership. Lands with federal mineral ownership and non-federal surface ownership are called "split-estate", and occupy about five percent of the Project Area. These lands are included in BLM's permitting, environmental review, and environmental protection responsibilities.

RGC currently holds leases on approximately 123,000 acres on federal, state, and private lands within the Project Area (approximately 65 percent of the Project Area). Federal surface/mineral and non-federal surface/federal mineral lands not currently leased by RGC within the Project Area are either leased by other firms or individuals, or are not leased for oil and gas development. Nearly all federal lands within the Project Area are currently leased for oil and gas; or oil, gas and coal exploration and development.

On state and private lands within the Project Area, RGC has drilled in 1995, 98 wells (89 producing wells, eight coreholes and one injection well), with approximately 58 miles of access road, pipelines, and electrical distribution lines, and constructed a compressor station, injection well and evaporation pond. Additional details regarding existing RGC development are presented in the description of the Proposed Action, Chapter 2. The existing development is integral to the Proposed Action and alternatives as each is connected to and is an expansion of the existing development.

1.4.2 Lease Categories

In 1973, the U.S. Department of Interior published an EIS on the Federal Upland Oil and Gas Leasing Program. The proposed action was to lease federal lands for production of oil and gas resources. Alternatives included the "no action" alternative. To make specific environmental analysis in Utah and to supplement that impact statement and environmental analysis, the BLM, in Utah, produced a series of Environmental Assessments (EA) for each district in 1974-1975.

As a result of that analysis which involved months of public participation from all interested parties, a category system for leasing was developed. Under the system, all public and Forest Service lands were categorized into four leasing categories:

Category 1 - Open Lease Areas - with standard “open ended” lease stipulations.

Category 2 - Open Lease Areas Subject to Special Stipulations - with specific stipulations attached to the lease for special concerns (e.g., critical deer winter range).

Category 3 - Open Lease Areas Subject to No Surface Occupancy - where other resource values were intolerant of surface disturbance, thus requiring petroleum development through directional drilling.

Category 4 - Suspended or No Lease Areas - in which the highly critical nature of the other resource values outweigh the value of oil and gas resources that cannot be extracted through directional drilling other than in exceptional instances.

The BLM has been issuing leases under this system since 1975. The analysis completed in the EA assumed that any areas leased under Category 1 or 2 could go to full field development provided that a site-specific EIS be completed for the actual proposals.

Limitations on types, duration, and location of activities generally increase in order of ascending category number. Specific discussions of each category are presented in Appendix 1A.

Leases on federal mineral estate have been granted within the Project Area to RGC and others. Special stipulations attached to federal leases in the Project Area are listed by category in Appendix 1B.

1.4.3 Conformance with Management Framework Plan

The Proposed Action and all alternatives described in this EIS would take place within the Price River Resource Area and the San Rafael Resource Area of the BLM. The Price River Resource Area is managed under a Management Framework Plan (MFP) (USDI, BLM 1984a), a MFP Supplement (USDI, BLM 1984b), and the subsequent Environmental Assessment Supplement (USDI, BLM 1988a) approved in 1983. The San Rafael Resource Area is managed under a Resource Management Plan (RMP) approved in 1991.

The decision in the Price MFP pertaining to oil and gas development states: “Establish oil/gas production as the priority land use for Known Geologic Structures which have been or may be identified”. The San Rafael RMP decision states: “Management Objective is to lease public lands for oil and gas development, and to allow geophysical activity to occur, only so long as the RMP goals are met; and to administer operational aspects of federal oil and gas leases where BLM does not manage the surface”.

The Proposed Action and all alternatives analyzed in the EIS have been determined to be in conformance with both land use plans, and a plan amendment would not be required.

While development of CBM resources is in conformance with both the Price and San Rafael Land Use Plans, scale of development for the River Gas project far exceeds the scale of development analyzed by either plan. This EIS will update the 1983 EA supplement for the Price River MFP and the “Reasonable Foreseeable Development Scenario” for the San

Chapter 1. Public Involvement/Scoping of Issues and Alternatives

Rafael RMP, by analyzing the higher level of development in the Project Area.

1.5 AUTHORIZING ACTIONS

Federal, state, county, and local authorizing (permitting) actions required to implement any of the alternatives would generally be the same regardless of the alternative selected. These actions are listed in Table 1.5-1.

1.6 PUBLIC INVOLVEMENT/ SCOPING OF ISSUES AND ALTERNATIVES

Public issues and comments regarding the Price CBM Project were solicited for incorporation into this EIS through the scoping process, and public and agency review of the Draft EIS. Specifics regarding the scoping process and public involvement for this analysis are discussed in Chapter 6 of this EIS. The Public Scoping Summary Report that described the actions to be analyzed was prepared and submitted to the public on January 30, 1995. The Summary Report identified preliminary land and resource management issues, concerns, and opportunities, and outlined timing needs for public involvement. Environmental and social issues of local importance associated with CBM (natural gas) production were identified. The Draft EIS was issued for public and agency review in October 1996. The Final EIS has been refined to address and respond to comments on the Draft EIS.

In addition to issues and concerns brought out through the public involvement process, the BLM (USDI, BLM 1988b) requires that potential impacts be addressed for the following twelve critical elements:

- Water Quality
- Floodplains

- Air Quality
- Farmlands, Prime/Unique
- Threatened and Endangered Species
- Wetlands/Riparian Zones
- Areas of Critical Environmental Concern (ACECs)
- Wild and Scenic Rivers
- Wilderness Areas
- Native American Relations Concerns
- Cultural Resources
- Wastes, Hazardous/Solid

Issues analyzed in this EIS are listed by resource in Section 1.6.1. Issues considered, but not analyzed by alternative are listed in Section 1.6.2.

1.6.1 Issues Analyzed

Project Description Issues

- Assurances for effective reclamation and revegetation of disturbed areas
- Responsibility for road/bridge improvements and maintenance
- Effect of handling and disposal of wastes, including hazardous materials

Physical Resources Issues

Geology

- Effect of irretrievable commitment of coalbed methane
- Effect of varying thickness of coal seams on gas production

Water Resources

- Effect of construction activities, and subsequent increased runoff and sedimentation on surface water quality
- Effect of erosion of saline soils on the quality of the Price River and other surface waterbodies
- Effect of production and operation activities, including accidental spills, on surface water quality
- Effect of road and pipeline crossings on perennial and intermittent streams
- Effect of groundwater withdrawal from the Ferron Sandstone
- Effect of disposal of produced water on groundwater quality
- Effect of water consumption by the project activities on the needs of the communities
- Effect of using magnesium chloride for dust control on soil and water quality

Air Quality

- Effect of construction activities, including emissions from equipment and fugitive dust
- Effect of gaseous emissions from operating gas-fired compressors and glycol dehydration units at compressor facilities
- Effect on visibility/haze, both locally and regionally

- Cumulative effect from other energy development activities in the region that already reduce visibility and increase air pollution
- Effect of hazardous air pollutants on human health

Soils

- Effect of increased wind and water erosion of soils in disturbed areas exposed for extended periods of time during construction, especially on steep terrain
- Effect of increased volumes of runoff on areas prone to gully development; particularly formation of deeply incised gullies that can restrict access to valleys and ranges in the Mancos Shale region
- Effect of soil loss and increased sediment and salt loads on surface water due to increased erosion
- Effect of unsuccessful reclamation
- Effect of salt drift and deposition downwind from the evaporation ponds on soils, vegetation, and water quality
- Effect of erosion and sedimentation of soils containing selenium on surface water

Chapter 1. Issues Analyzed

Biological Resources Issues

Vegetation

- Loss of vegetation, particularly the clear cutting of trees, and the resulting effect on visual scenery, wildlife habitat, livestock management and soil erosion control
- Noxious weed control/management
- Success rates for reclamation and mitigation measures, based on problems with past projects
- Development and implementation of a strong compliance and monitoring plan

Wetlands/Riparian

- Losses of wetland and of riparian areas during construction and operation

Wildlife

- Loss of high value and critical winter range for big game (mule deer, elk, moose, antelope) from surface disturbance associated with CBM development
- Loss of habitat suitability and value from disturbance and displacement of big game
- Effect of CBM development and associated habitat impacts on big game populations in the project area
- Development of effective mitigation to retain as many of the wildlife resource value in the project as possible and to

replace or compensate for affected wildlife resource values

- Effect on black bear and mountain lion populations and habitat
- Effect on sage grouse habitat and breeding activity
- Effect on prairie dog habitat and population and on species associated with them
- Effect on nesting birds
- Effect of noise, dust, and traffic on reduction of wildlife
- Effects on waterfowl and shorebirds
- Effect on chukar, pheasants, and cottontail rabbits
- Effect on reptiles and amphibians
- Effect on big game and habitat in the Gordon Creek Wildlife Management Area

Special Status Species

- Effect on federally listed threatened and endangered plants and animals, including Colorado River fish, wintering bald eagle
- Effect on other sensitive species, including spotted bat, loggerhead shrike and burrowing owls

Human Resources Issues

Cultural Resources

- Effect of ground-disturbing activities and indirect impacts on cultural resources, including archaeological sites
- Effect of any project activities on Native American sites with religious or cultural significance

Land Use

- Potential for nonconformity with adopted plans and policies of federal, state, and local agencies
- Effect of CBM development on existing land uses, including irrigated agricultural land
- Potential land use incompatibility between project facilities and operations and residential, recreational, and other community uses
- Effect of project-related traffic on local roads used by the public

Livestock Management

- Effect of disturbance of vegetation on livestock carrying capacity
- Effect of vehicular traffic from the general public; and the construction and maintenance of roads, wellpads, and other facilities on livestock management
- Effect on livestock management facilities

Recreation

- Effect of CBM development on the quality of recreational experiences and the availability of recreational opportunities, particularly associated with the "de facto" trail system around the Price and Helper area (above Kenilworth and the Woodhill area), including picnicking, hiking, jogging, horseback riding, motorized off-road vehicle, mountain biking, cross-country skiing, wildlife viewing, and hunting

Visual Resources

- Effect on scenic quality from construction activities, and the long-term presence of project facilities, including the loss of natural vegetation and grading of landforms for roads and facilities
- Effect of project facilities on visibility from communities, public roadways and recreation areas
- Effect of night lighting of CBM facilities on dark skies
- Effect of project construction and operation resulting in increased air pollutants that may increase regional haze and diminish visibility to distant mountains and ridges. (Refer to Section 4.3 on air quality impacts.)

Noise

- Effect of project activities, including construction, drilling, operation of compressor stations and pumps, and vehicular traffic on ambient noise levels, particularly in residential areas

Chapter 1. Issues Analyzed

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- Socioeconomics/Quality of Life**
- Effect of CBM development on employment - number, types and longevity of jobs to be created, hiring of local workers
 - Costs and benefits of the proposed project
 - Effect of a possible economic boom-bust cycle
 - Applicant support of local communities through charities and community events
 - Effect of CBM development on quality of life
 - Effect of CBM development on tourism and economic diversity
 - Effect of CBM development on property values

Health and Safety

- Effect of increased human use of lands on wildfire ignitions
- Effect of potential natural (CBM) gas flowline leakage, rupture, and possible fire and/or explosion
- Risks associated with well field construction and operations
- Public and employee safety

1.6.2 Issues Considered, but Not Analyzed by Alternative

Several issues raised during scoping or issues that the BLM is required to address were considered but not analyzed in detail. The issues are listed below, along with explanations as to why they were not further analyzed.

Of the twelve critical elements required by the BLM to be addressed, the following elements are not present in the Project Area. An impact analysis is, therefore, not applicable for the Proposed Action or any of the alternatives.

- Areas of Critical Environmental Concern (ACECs)
- Prime or unique farmlands
- Wild and scenic rivers
- Wilderness areas

Issues required to be addressed that are not relevant to the Proposed Project or alternatives are as follows:

- Native American trust rights, per the Secretary of Interior directive (Babbitt 1994) and Executive Order 12898 - no direct or indirect effects are expected from this project because no such rights have been identified in the Project Area.
- Social (environmental) justice policy (Babbitt 1994) - no negative direct or indirect effects are expected to low income or minority populations because no such populations exist in close proximity to the Project Area.

Issues raised during public scoping and through the NEPA process that are not analyzed by alternative are listed below by resource.

Project Description Issues

- **Bonding Adequacy**

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, including historic, natural and cultural resources; to ensure downhole plugging and surface reclamation following drilling or other exploration or development; and to cover unpaid federal royalty obligations. RGC has filed a \$25,000 statewide bond with the BLM for operations on federal leases in Utah. The cost to properly plug and reclaim the surface associated with a single well is estimated, in 1996 dollars, at \$15,000. All 601 wells of the Proposed Action would then account for a total potential liability of \$9,015,000, in 1996 dollars. In the near term and for the vast majority of this project's life, all of those wells which are capable of production in paying quantities are not considered a liability. Additionally, RGC has responded in good faith on all performance requests and has maintained all royalty and rental accounts in good standing. On this basis, the apparent disparity between the bond amount and the potential liability of full implementation of the Proposed Action does not pose a significant risk to the federal government in the foreseeable future.

Bonding for oil and gas is a risk management tool used by the BLM. It is not designed to cover 100 percent of the reclamation costs and royalty income, as in some other federally administered activities such as coal operations. The historical rate of default is very low. As of November, 1994, only 156 wells had been orphaned, out of 104,209 nationwide on federal and Indian mineral estate (BLM Bonding/Unfunded Liability Review of the

Oil and Gas Program, March 27, 1995). This is a forfeiture rate of only 0.15 percent. Historically, the BLM has not seen oil and gas operators walk away from their responsibilities, and therefore has not had a need for large up-front bonds. The report did suggest a moderate increase in statewide bonds to \$75,000. To date, this change has not occurred.

Bonding requirements would increase as the risk increases, and the BLM would monitor the operations to determine when the liability is increasing. The risks are different in different stages of an oil and gas development project. Start-up costs are high in the very early stages of development. Once the break-even point is reached, there would be a positive cash flow and it is highly unlikely an operator would forsake a profitable venture. The risk increases at the end of production. The BLM would monitor for several telltale signs of concern: decrease in cash flow to a point prompting a sale to another oil and gas company with a smaller profit margin, unresponsiveness by the operator to non-compliance issues, unpaid royalties, unreclaimed activities, or other negative cash flow activities. At that time, the BLM would increase the bond amount to address the increasing liability. For the Price CBM project, that time would probably be ten to 15 years away. The bond could be increased to 100 percent of the remaining plugging and reclamation costs, or even higher, if needed.

If RGC or its successor did default, county or other local governments would not have any liability. The order of liability rests initially on the bonded entity and ultimately with the lessee of record title. In this case, because many leases are held by RGC, this is the same entity. Should both parties fail to respond, then the responsibility falls on the mineral right owner. For BLM administered leases, this would be the Federal Government. For a county, or any other governmental agency to be burdened with the financial liability for any plugging and

Chapter 1. Issues Considered, but Not Analyzed by Alternative

abandonment activities on federal lands, the Federal Government would first have to default.

Physical Resource Issues

Geology

- **Collection of Geologic Data**

A concern was raised regarding the collection of geologic data associated with coal seams encountered during drilling. Every well drilled as part of the Proposed Action would be logged to record the characteristics of each geologic formation. The drilling logs would be submitted to the BLM and the State of Utah and would be accessible to the public.

- **Future Exploration and Development of Other Mineral Resources**

There is a concern that CBM production and associated activities may preclude future exploration and development of other mineral resources. The production of CBM would not affect the recovery of oil within the Project Area. Associated with the production of CBM, the coal in the immediate vicinity of the well would be hydrofractured in order to stimulate and enhance well production. Studies involving the stimulation and production of methane from coal seams that were later mined indicate that hydrofracturing does not cause roof falls or adverse mining conditions (Diamond 1987, Dixon 1987). The presence of plugged and abandoned production wells, left after CBM production would have at least one negative impact. The cased hole has the potential of damaging mining equipment, i.e., continuous miners and longwalls. However, there are no known plans to mine the coal in the Project Area with these techniques.

Removal of methane from the coal strata would also not result in any negative impact to the future mining of that coal should it prove economical to do so at a later date. Methane encountered by coal mines is often a dangerous and expensive problem. Studies have shown that CBM production significantly reduces the amount of methane encountered during mining (Dixon 1987). In Alabama, mines have mined through zones that have had previous CBM production. That CBM operation had also hydrofractured the reservoir to stimulate removal of groundwater and to lower reservoir pressures, and produce CBM, just as is proposed for this project. The mine reported substantially less methane and reported no stability problems, even when visible evidence of the previous fracturing was observed in the mine (Diamond 1987). No significant detrimental impact to any future coal mining activities is expected.

- **Geologic Hazards**

Potential geologic hazards within the Project Area include methane gas seepage, subsidence, seismic activity, slope instability, abnormal high pressure, and hydrogen sulfide releases. These issues were analyzed and considered to be not significant relative to the Project Area and proposed activities as described below.

Methane Gas Seepage. In 1995, the United States Geological Survey (USGS), under the direction of UDOGM, is conducting a study of the pre- and early development of methane concentrations in groundwater and soil gas within the Project Area. The study area includes federal, state and fee lands. Water tests were conducted at 14 springs in the vicinity. Existing methane production has not increased methane concentrations or affected the springs, and no impacts are expected.

The 1996 sampling focused on soils and locations near residential areas, producing wells, proposed drilling locations, and plugged wells. The USGS and UDOGM plan to continue the sampling each year for several years during field development. Data collected will be evaluated to determine if any seepage is occurring as a result of the CBM projects so that corrective action may be taken, if necessary (UDOGM 1997).

Soil gas analysis was conducted at existing RGC wells drilled on state leases. Baseline methane concentration in groundwater averaged less than 0.005 mg/l. The median methane concentration in soil gas samples was less than 0.005 mg/l. Soil gas concentrations decreased significantly within 50 feet from the well bore (Naftz 1996).

Wells drilled in the area would be cased and cemented from the surface through the Ferron Sandstone and by design would prevent methane seeps to surface soils. Concentrations of methane measured near the wells by USGS are thought to be a result of installation (Hunt 1996).

A concern has been raised about methane seeps at surface outcrops of the Ferron Sandstone. Coalbed methane development in other areas has been suggested to have resulted in gas migration updip toward an outcrop after dewatering has reduced pressures and increased the amount of free gas held within and flowing through the coal fracture system. Although the Ferron Sandstone outcrop is located updip from the Project Area, there are no known methane seeps at the outcrop. Methane seeps at surface outcrops of the Ferron Sandstone are not anticipated in the future, due to the absence of coal at the outcrop east of the Project Area. The coal seams pinch out approximately five miles west of the outcrop, near Wellington. Here the

Ferron Sandstone is estimated to be 500 feet deep, with an overburden consisting mostly of impermeable shale. While the Farnham Unit, approximately 30 feet of porous sandstone, occurs at the Ferron outcrop, this unit is distinct from the methane producing horizon, in a small locale several miles wide.

Subsidence. Although subsidence has occurred as a result of water production in some areas of the country, subsidence from groundwater withdrawal associated with this project is unlikely because the production zone is quite deep and the geologic units are not very compressible (Tabet 1995b). The Utah Geological Survey does not consider subsidence a significant concern within the Project Area (Tabet 1995b).

Seismic Activity. Seismic activity, i.e., earthquakes, in the area may adversely affect the CBM operation and may cause damage to surface facilities, pipelines and wells. However, the potential for the proposed project to affect seismic activity in the area is minimal, as is the potential for seismic activity to affect the project.

The normal fault systems of the Wasatch Plateau and the thrust faults southeast of the Project Area provide some evidence of seismic activity in the vicinity of the Project Area. The North Gordon fault system is considered "geologically active"; however, it is not considered significant compared to the seismic activity initiated by local coal mines (University of Utah Seismic Station 1995). The thrust faults southeast of the Project Area are considered inactive because: (1) the lack of information about them, both in the literature and in the seismic record at the University of Utah, implied there has been no recent activity; (2) these faults originated in either the Sevier or Laramide Orogenies. The younger of these two

Chapter 1. Issues Considered, but Not Analyzed by Alternative

mountain building events and the most likely to have created the thrust faults in question is the Laramide Orogeny which began 50 to 60 million years ago and continued for 25 to 30 million years. Since Laramide times, stress regimes that drive faulting, have changed. Extensional stresses, which result in the high angle normal faulting common to the basin and range just west of the Project Area, make moving along compressional, thrust faults very unlikely.

Most of the seismic activity in the vicinity of the Project Area is generated by coal mining activity (University of Utah Seismic Station 1995; UGS 1995). Longwall mining, a mining technique used in some of the Price area coal mines, involves the complete removal of large blocks of coal (much larger than in other mining techniques) leaving nothing to support the overlying rocks. As mining progresses, the overlying rocks are allowed to collapse behind the active mine face thus generating earthquakes. Earthquakes of magnitudes between 2 and 4 on the Richter Scale have been attributed to longwall mining (University of Utah Seismic Station 1995).

Maps of seismic risk for the United States indicate this portion of Utah is at relatively low seismic risk (Keller 1982). Relatively minor earthquakes of up to magnitude 4 on the Richter Scale have been recorded in the vicinity of the proposed project. The earthquake intensity that is usually associated with a magnitude 4 earthquake is II to III on the modified Mercalli scale. According to this scale, intensity III earthquakes are "felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like the passing of a truck" (Keller 1982). Earthquakes of this minor intensity are not likely to affect the integrity of

wells, pipelines, or other surface facilities, or affect slope stability.

Slope Instability. No specific areas of slope instability or failure have been identified in the Project Area; however, the potential for instability typically exists for most areas where slopes are greater than 30 percent. Such steep slopes do occur in the Project Area. The project activities should have minimal effect on slope stability. Surface disturbance on slopes in excess of 30 percent would be avoided where possible. Where such disturbance cannot be avoided, BLM-required environmental protection measures would be implemented to reduce erosion and protect watershed values. Construction activities on slopes in excess of 30 percent may be specifically authorized by the BLM at the APD stage. Section 3.4 provides additional discussions of slope instability and soil erosion.

Abnormal High Pressure (Blowouts). Encountering high pressures while drilling is always a possibility. However, offset well information can be utilized to anticipate subsurface pressures. Nearly 100 CBM wells have been drilled in the Project Area without experiencing abnormally high pressure. One well outside the Project Area encountered abnormally high formation pressure, but that situation was safely and effectively controlled by the approved blowout preventer.

Because it is impossible to know exactly what pressures will be encountered, all wells drilled are required to have Blowout Prevention Equipment (BOPE) that will safely control any abnormal pressures encountered. Onshore Oil and Gas Order No. 2 (Drilling Operations) establishes the minimum equipment necessary to safely drill and handle specific pressure situations. All wells drilled on Federal mineral estate would adhere to this Order. Wells drilled

on fee and state-owned minerals have similar requirements administered by UDOGM. Pressure equipment is prescribed on a site-specific basis during APD approval and RGC would be required to maintain the equipment in good condition. In addition, all RGC drilling crews are certified with blowout prevention training. UDOGM would make inspections during drilling activity to verify compliance with these requirements.

Hydrogen Sulfide Releases. Hydrogen sulfide (H₂S) has not been encountered while drilling any of the approximately 140 CBM wells drilled to date into the coal zones of the Ferron Sandstone and Blackhawk Formation within and surrounding the Project Area. Encountering H₂S is a distinct possibility while drilling the deeper injection wells through the Navajo Sandstone. There also exists the possibility that H₂S will be generated at the injection facilities. Operations involving H₂S on federal leases are regulated by Onshore Oil and Gas Order No. 6 (Hydrogen Sulfide Operations). This Order requires, on a site-specific drilling well or production facility basis, monitoring of H₂S beginning at levels of 10 parts per million (ppm). UDOGM has similar requirements for wells and production facilities on fee and state-owned lands. In addition, a written contingency plan would be required to be in effect whenever workover operations are in progress. The plan would include details of actions to be taken to alert and protect operating personnel and members of the public in the event of an accidental release of H₂S gas. Additional protective equipment and safety measures would be required at each drill site where H₂S may be encountered.

- **Paleontological Resources**

Paleontological resources occur within the Price River Resource Area in the Carmel Formation, the Summerville Formation and members of the Mancos Shale (USDI, BLM 1992). Marine fossils likely to be found in the Project Area include, in order of decreasing abundance: mollusks, protozoans, arthropods, worms, brachiopods, bryozoans, echinoderms, coelenterates, and sponges. The most common fossils found in the region are pelecypods which can be found in great banks containing millions of shells at certain stratigraphic levels. Gastropods are the next most plentiful fossil in the region. Shark's teeth are easily found in certain members of the Mancos Shale (Stokes 1988). The Cretaceous rocks yield a notable record of both continental and marine vertebrates. Although the Cleveland-Lloyd Dinosaur Quarry is located approximately eight miles southeast of the Project Area near Cleveland, Utah, no major dinosaur finds have been recorded in the Project Area. The Cleveland-Lloyd Dinosaur Quarry is located in the Morrison Formation which is not exposed within the Project Area. There is a low probability for a significant paleontological find in the Project Area. It is not considered a collecting site and no paleontological inventory is required at this time by the BLM. (Rasmussen 1996).

Water Resources

- **Potential for Community Use of Produced Water**

The proposed CBM Project would produce a maximum of approximately 100,140 BWPD (12.9 ac-ft/day) that with treatment could be used for community use including municipal, industrial and irrigation use. Because Carbon and Emery Counties are dependent on limited supplies of water, any source of water would be important to local water users. Projected annual water production from the Proposed Action would be equivalent to approximately six percent of the annual community water use in Carbon County as reported in the 1995 Price River water commissioners' reports. However, Carbon or Emery County or RGC would have to apply to the State of Utah for rights to the produced water for community water uses. Because neither County has not applied for water rights or approached RGC or BLM with a proposal for use of the potential water source, the potential for community use of the produced water is not analyzed further in this EIS. An application for use of the public lands for water treatment facilities for treatment of CBM produced water for community use would be a separate project and would require additional NEPA documentation.

- **Water Rights Owned By RGC**

RGC has entered into an agreement with the Price River Water Improvement District (PRWID) and other local users to purchase or lease fresh water. The water to be used for the project would come from the Price River and Scofield Reservoir. Based on discussions with the Utah Division of Water Rights and the Price River Water Users Association, all of the water is appropriated by existing water rights. Water purchased or leased by the project would not result in a significant depletion or adverse impact on the Price River or Scofield Reservoir (Page 1996). However, the water would shift from municipal, industrial or agricultural use to the CBM project. The Utah Division of Water Rights Division regulates the diversion and use of water in the state of Utah. The Division would evaluate on a case-by-case basis whether or not RGC must file a Change in Nature Use application based on the prior consumptive use (Page 1996).

RGC has filed for water rights on water produced from 84 existing wells. RGC must file with the Division of Water Rights for all proposed wells because of the consumptive use of produced water by evaporation.

- **Floodplains**

The Price CBM Project Area includes several streams and washes that can experience flooding during storm events and/or periods of unusually high runoff. The Federal Emergency Management Agency (FEMA) has identified the portions of these streams and washes that are prone to flooding on its Flood Insurance Rate Maps. Of particular interest are areas designated by FEMA as 100-year floodplains. Streams and washes in the project area that have designated 100-year floodplains include the Price River, Gordon Creek, Spring Glen Wash, Pinnacle Creek, Mead Wash, Cardinal Wash, Drunkards Wash, Deadman Creek, Hayes Wash, Coal Creek, Miller Creek, and Marshing Wash (Plate 11).

The Executive Order 11988 on Floodplain Management states that, as a matter of policy, the federal government should avoid or minimize the adverse impacts associated with floodplain occupancy and modification. The Executive Order directs the federal government to avoid support of floodplain development in order to reduce the risk of flood loss and protect and restore the beneficial values served by floodplains. The Executive Order also directs the CEQ to integrate its floodplain management objectives into implementation of the NEPA. As a result, an EIS must include an assessment of whether the project under review would adversely impact floodplains.

With respect to the proposed project, the BLM has established environmental protection measures that prohibit occupancy or surface disturbance within 100-year floodplains of perennial streams, except where authorized in writing. (Refer to BLM 4 in Chapter 2.0, Section 2.2.5.2.) An example of a project activity that may be allowed in a floodplain area under BLM 4 would be the construction of road

and pipeline crossings. This environmental protection measure would assure that no construction of CBM wells or other structural facilities would occur within 100-year floodplains of perennial streams, thereby minimizing the risk of flood-related damage and losses to property. In addition, no project facilities or activities for any of the alternatives, other than transportation corridor crossings, would be located within 100-year floodplains of intermittent streams. As a result, the Proposed Action, as well as the project alternatives being considered, would be in compliance with Executive Order 11988.

- **Surface Springs**

A concern was raised regarding the potential effect of the CBM development on springs located within the Project Area. A potential impact related to water withdrawals and associated drawdowns in the Ferron Sandstone would be the reduction of flow from any springs that are in hydraulic communication with the Ferron Sandstone. Within the Project Area, there are approximately 90 identified springs (Plate 11). In the northwest corner of the Project Area there are as many as 22 springs that are in the vicinity of a series of high angle normal faults. Little is known about how deep-seated these faults are, but the presence of clay and shale layers within the Mancos Shale makes it unlikely that the faults provide any type of conduit between the Ferron Sandstone and the surface.

Most springs are found in the Star Point Sandstone or younger formations (Waddell 1981), located at the base of the cliffs west of the Project Area. The source of these springs is the Wasatch Plateau further west. The Star Point Sandstone overlies the Mancos Shale, with a minimum of 4,000 feet of mostly impermeable

Chapter 1. Issues Considered, but Not Analyzed by Alternative

shale between the springs and the CBM producing interval.

Under the Proposed Action there are about 29 proposed wells within one mile of these springs. Under the BLM preferred alternative (Alternative D), the majority of wells in this portion of the Project Area would be eliminated. Only eight wells would be located within one mile of three of the 22 springs. There are no known permeable structures connecting the Ferron Sandstone and the springs, or the Ferron Sandstone and the sandstone overlying the Mancos Shale. Any impact to the springs associated with withdrawal of water from the Ferron Sandstone would only occur if hydraulic communication resulted around the annulus of production or injection wells that penetrates both the formations. RGC production and injection wells will be cemented from the surface to the bottom and perforated only in the production or injection zone in accordance with 43 CFR 3160 and Onshore Oil and Gas Order No. 2. Thus, there is little potential that any communication between the Ferron Sandstone and the springs would occur. By state law (Title 73-5-4), it is the responsibility to the water right owner to monitor the quality and quantity of the water. Neither the BLM nor Division of Water Rights would require monitoring of the springs.

A water rights search of springs was conducted east of the Project Area in the vicinity of the Ferron Sandstone outcrop belt to evaluate potential impacts to these springs from groundwater withdrawal from the Ferron Sandstone to the west. A total of 56 springs was identified and plotted on Plate 11A.

Conclusions from the evaluation of locations of these springs were:

- Approximately half of the springs were located in the Book and Roan Cliffs area (T13S, R11 and 12E) northeast of the Project Area at elevations considerably above the Ferron Sandstone outcrop elevation, suggesting no impacts from proposed dewatering in the Project Area.
- Only one spring was identified between the eastern Project Area boundary and the Ferron Sandstone outcrop belt. The spring is situated adjacent to the Price River and is most likely related to groundwater in river bottom alluvium.
- Ten of the 56 springs (those located in T14S and 15S, R11 and 12E) were situated more than six miles east of the Project Area. Only two of the ten springs were situated near the Ferron Sandstone outcrop belt.
- The remaining springs located southeast of the Project Area were situated from two to eight miles east of the Ferron Sandstone outcrop belt and were separated from the outcrop by intervening surface water drainages (topographic lows) suggesting unlikely impacts from water withdrawal from the Ferron Sandstone in the Project Area.

Air Quality

- **Venting Methane**

There would be minimal venting of gas at wellsites during completion and/or well connection to flowlines. Slight amounts of gas may be produced when the well is flowed to the surface following hydraulic fracturing. The venting would occur only during the recovery of the water and last for a matter of days. Any gas venting would be in accordance with Notice of Lessee 4A. This minimal and infrequent venting of methane is not expected to adversely affect air quality in the Project Area.

Recreation

- **Effect of Water Consumption by the Proposed Project on Recreational Opportunities Along the Price River**

Concern was raised during public scoping on the issue of water use by the Proposed Action and its potential effects on recreational opportunities along the Price River, and effects on any existing wild and scenic qualities of the river. RGC plans to buy available water rights as needed for project development. Water is being purchased from PRWID and withdrawn from the Carbon Canal, one of the main diversion on the Price River, located just north of the City of Price, Utah. All of the available water in the Price River and the Carbon Canal is allocated and currently being used for some purpose, typically agricultural or industrial use. Approximately 80,000 ac-ft of water is used or diverted annually from the Price River. The Proposed Action is estimated to consume 49 ac-ft per year. The Price CBM Project may result in a change in ownership and use of existing water in the canal, but should not result in a net change in the amount of water being taken out of the Price River or in the amount of water returned to the Price River through Carbon Canal. Therefore, it is not anticipated that the project would result in changes to water levels in the Price River, and would not affect the existing recreational opportunities along the river, or the existing scenic, recreational, fish, and wildlife, or other wild and scenic river characteristics that the river may possess.

Chapter 1. Issues Considered, but Not Analyzed by Alternative

- **Effect on Carbon County Fairgrounds, Rifle Ranges, Nationally Sanctioned Mountain Bike Race, and Bald Eagle Day**

Direct impacts to several developed recreational areas may occur, including the Carbon County Fairgrounds, the Four-Mile Rifle Range and the Pinnacle Peak Black Powder Range. The Carbon County Fairgrounds would continue to incur direct impacts resulting from trucks using the Fairgrounds Road as access to the Project Area. Impacts to the quality of recreational experiences at the fairgrounds would result from the presence of truck traffic and adjacent wells and related noise, traffic, and visual change. Recommended mitigation includes working with the county consultant who is currently revising the fairgrounds master plan to identify any measures, such as landscape screening, that would be effective in reducing the direct impacts of truck traffic on the fairgrounds.

The Four-Mile Rifle Range and Pinnacle Peak Black Powder Range would also be adjacent to CBM roads and/or wells. Individuals using these rifle ranges are not considered to be sensitive to the noise, visual, and dust impacts; however, the Four-Mile Rifle Range may be incompatible with CBM activities due to the potential for stray bullets and related safety considerations.

Recommended mitigation includes coordinating with the county to identify measures that would be effective in reducing safety risks near the Four-Mile Rifle Range. Alternative sites for the range should be considered if safety at the existing site cannot be assured.

The Butch Cassidy Blowout Bike Race is located northeast of Price, partially within the Project Area. No direct or indirect impacts are expected from the Proposed Action or alternatives. However, this race course would be

impacted by the reasonable foreseeable future actions which are discussed in the cumulative impacts chapter in Section 5.3.5.

Due to mitigations to protect bald eagle habitat, Bald Eagle Day, a watchable wildlife event sponsored by UDWR, should not be impacted by any alternative.

- **Access in the Project Area on Public Lands**

Access would not be restricted to public lands affected by CBM development, except in select areas where seasonal closure gates would restrict access during the winter months (December 1 to April 1), to protect wintering big game. Some of these areas affected by seasonal closure, such as Pinnacle Bench, Horse Bench, and some areas accessed from the Consumers Wash Road, are important to recreationists, and impacts may be significant during the four-month closure period. Use of these areas is generally not as great during the winter as in other times of the year. The location and geographic area covered by the seasonal closure gates would not change by alternative; however, the miles of road affected by the closure would vary by alternative. Recommended mitigation includes coordinating with the counties and special interest groups to identify any previously closed roads that could be reopened to provide increased access to public lands with recreational values.

Since the vast majority of project-related roads on state and federal lands would have no restrictions to public access, there is the potential that impacts associated with increased access and human disturbance (vandalism, littering, discharging of firearms) would occur in the CBM development area.

1.6.3 Alternatives

1.6.3.1 Alternatives Analyzed

The following eight alternatives were analyzed in detail:

- Proposed Action - field development at 160-acre well spacing
- Alternative A - field development at 80-acre well spacing
- Alternative B1 - Critical areas avoidance - field development at 160-acre well spacing; precluding well drilling on federal mineral estate within boundaries of critical deer and elk winter range
- Alternative B2 - Critical areas avoidance - field development at 80-acre well spacing; precluding well drilling on federal mineral estate within boundaries of critical deer and elk winter range
- Alternative C1 - Security areas protection - field development at 160-acre well spacing; precluding well drilling and operations on federal mineral estate in security habitat areas (concentration areas) within critical winter range for mule deer and elk
- Alternative C2 - Security areas protection - field development at 80-acre well spacing; precluding well drilling and operations on federal mineral estate in security habitat areas (concentration areas) within critical winter range for mule deer and elk

- Alternative D - Big Game Minimum Disturbance Corridors - field development at 160-acre well spacing; precluding well drilling and operations within the Gordon Creek Wildlife Management Area, and minimizing activities within designated big game corridors.
- No Action - field development at 160-acre well spacing on state and private lands; federal lands would be unavailable for well drilling

Chapter 1. Alternatives Analyzed

1.6.3.2 Legal Constraints on Alternatives

The BLM's authority to implement alternatives that would deny RGC's "right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits" in the leased lands, as granted in BLM Form 3100-11 is somewhat limited because their mineral leases are in the nature of a contract between the Secretary of Interior and RGC. However, leases are subject not only to the explicitly attached terms and stipulations, but to the laws and regulations applicable to the management of the public lands, including the Federal Land Policy and Management Act (FLPMA). The regulations that apply to the RGC leases include the BLM Regulations Governing Onshore Oil and Gas Operations (43 CFR Part 3160). RGC operations are also subject to Notices to Lessees and Onshore Oil and Gas Orders; BLM lease stipulations conforming with leasing categories; and standard operating procedures for oil and gas operations included in the BLM Environmental Assessment Supplement on Cumulative Impact on Oil and Gas Categories (USDI, BLM 1988a). Section 302(b) of FLPMA requires the Secretary to take any actions necessary to prevent unnecessary or undue degradation of the public lands. Section 202 of FLPMA requires the Secretary to develop land use plans, and manage the public lands according to them. The land use plans that were in effect at the time of lease issuance are the Price River Management Framework Plan (USDI, BLM 1984a) and the San Rafael Resource Management Plan (USDI, BLM 1991). The terms and conditions of the laws, regulations and plans that apply to the RGC leases with any of the action alternatives analyzed in this EIS are presented in Section 2.2.5.2 BLM Required Environmental Protection Measures and Section 2.2.5.3 State of Utah Measures Applicable to All Lands.

Because the RGC leases were issued without a no surface occupancy stipulation, BLM could

require movement of RGC's proposed well locations by over 660 feet, place timing restrictions of over 60 days, or deny applications for permit to drill (APDs) only if failure to require the modifications or deny the APDs would result in unnecessary or undue environmental degradation (see *Sierra Club v. Peterson*, 717 F.2d.1409, 1983), or would result in a violation of applicable laws and regulations. Therefore, BLM could reject RGC's Proposed Action (well field development), and implement either Alternative B or C (restricting development of wells, transportation systems and surface facilities on federal mineral estate to lands outside of areas mapped as critical deer and elk winter range or security habitat areas) only if the Proposed Action would result in unnecessary and undue environmental degradation or violation of law. Other mitigation requirements for design of facilities, construction and operation of the project or off-site compensation for impacts may be required to minimize adverse environmental impacts to other resources and resource users as noted in Sec. 6 of BLM's standard lease form, 3100-11 as long as they do not unnecessarily or unreasonably interfere with RGC's rights to utilize their leases. Such measures may be applied as required by the appropriate BLM land use plans or to minimize the impacts identified through NEPA analysis.

Alternative D was developed through a collaborative effort between RGC and BLM in consultation with UDWR and UDOGM. The alternative complies with the BLM land use plans, and conforms to the legal contractual constraints, between BLM and valid federal oil and gas lease holders in the Project Area. The mitigation requirements have been negotiated between RGC and BLM with a commitment from RGC to work with BLM to meet the objectives of the mitigation. As such, the requirements in Alternative D do not interfere

with RGC's rights to utilize their leases. Alternative D is not subject to the same legal constraints as Alternatives B, C, and No Action.

Although certain APDs could be denied to avoid unnecessary or undue environmental degradation or to minimize environmental impact, denial of RGC's right to drill for, mine, extract, remove and dispose of all oil and gas deposits in the leased lands may be a breach of the lease contracts. If BLM were to deny APDs on the federal mineral estate under lease in the Project Area, RGC could proceed with administrative and judicial review to overturn BLM's decision or to seek compensation for losses under the lease contracts. BLM also could ask Congress to order the leases forfeited subject to compensation (see *Union Oil Company of California v. Morton*, 512 F.2d 743, 560-51, 9th Cir. 1975). Therefore, RGC could take such actions in response to BLM's selection of alternatives and mitigation requirements.

1.6.3.3 Alternatives Considered but Eliminated from Detailed Analysis

The following is a description of alternatives that were considered but eliminated from detailed analysis, along with a brief rationale for their exclusion from consideration.

Multiple Well Completion/Directional Drilling (160- or 80-acre spacing field development). Several wells would be directionally drilled from a common wellpad, thereby maintaining the desired well spacing. Technical problems associated with directional drilling to these coals and the high costs associated with overcoming the limitations posed by the coals to directional well drilling reduce the viability of directional and horizontal drilling as a basis for an alternative to the Proposed Action.

Directional Drilling. Directional drilling can only be considered a viable alternative if the method meets the proponent's needs. To date, RGC has not proposed any directional wells. Several technical and economic aspects challenge the feasibility of directional drilling.

First, CBM wells are produced by pumping water from the coal seams to the surface; a process known as "dewatering." The water is brought to the surface using pumping units and rod actuated subsurface pumps. Wells must be nearly vertical to accommodate this production equipment. Therefore, the deviation from vertical in the wellbore must be very gentle. In the Project Area, not enough vertical distance exists, from the surface to the target formation, to drill a directional well that would access an adjacent spacing unit while still being able to accommodate a pump.

Secondly, coal exists locally in multiple seams; therefore, in order to access all of the coal, at least one lateral leg would have to be drilled into each coal seam. The technology of conventional horizontal drilling does not permit this many laterals in such a limited vertical section. Multiple laterals can be drilled using ultra-short radius horizontal drilling, but technology does not exist to drill the laterals far enough away from the wellbore to influence an adjacent spacing unit.

In addition to the above technical impediments, directional and horizontal wells are much more expensive to drill. They require larger rigs, larger drill pads, larger reserve pits, they take much longer to drill, must be drilled with mud rather than air, and they required specialized tools, surveys and expertise.

Subsurface Placement of Facilities. Subsurface placement of producing well facilities and other facilities was not considered

Chapter 1. Alternatives Considered but Eliminated from Detailed Analysis

a feasible alternative due to safety concerns and the costs associated with meeting safety and reclamation requirements. Specific costs/ risks would include:

- The potential accumulation of methane in a subsurface facility (wellhead, water separation unit) due to a leak would pose a significant risk to the health and safety of workers.
- The large additional costs associated with subsurface placement of facilities would negatively affect the economics of the project; and the health and safety issue, noted above, which would be the source of much of the additional costs, would not be totally eliminated.
- The removal and disposal of bulky waste concrete and rebar and the backfilling of underground facilities as part of reclamation would add to costs for the project, further hindering development.

Phased Project Development. A phased development approach (basis for an alternative) would consist of dividing the field into three portions. The field would be developed one portion, or phase, at a time. Development of the second phase area would not begin until the initial phase area had been drilled, produced, depleted, plugged and reclaimed (approximately 30 years). The same scenario would apply to the third phase, thus the field life would be approximately 90 years. For this discussion, the term "phase" refers to an area.

Phased development was not considered a viable alternative due to limitations posed to field development that likely reduce rate and amount of gas recovery. Such limitations could prevent RGC from meeting lease requirements,

thereby exposing them to litigation by some mineral estate owners.

Correlative Rights - Leases located along a phase boundary would be negatively impacted by drainage. A non-unit lease located just inside the second phase would be subject to drainage from phase one development for perhaps 30 years before a protective well could be drilled. During the period of phase one development, formation fluids would flow from the high pressure, virgin reservoir in the phase two area to the reduced pressure in phase one. Despite having limited transmissivity data on fluid flow through coal reservoirs, significant drainage can be anticipated given 30 years of reservoir equilibration.

Loss of Reserves - Based on the same principles of drainage addressed above, reserves would be lost. Fluids would continue to flow from phase two into phase one, responding especially to the high pressure difference that would be experienced in the waning years of phase one development. The reserves recharging phase one would not likely be significant enough to extend the economic life of the entire phase.

Additionally, operators would be induced by higher profit potential to move on to the next phase before completely depleting the prior phase. Since all wells in a phase must be plugged and abandoned before to the next phase, the condition could exist where several economic wells remain in one phase, yet those wells would be plugged in order to realize the higher profits of moving onto the next phase.

Infrastructure - Infrastructure requirements would be greater for phased development. The initial start-up costs of infrastructure would be similar whether development is in one phase or three. However, in phased development, certain roads, pipelines and compressor stations would be

Chapter 1. Alternatives Considered but Eliminated from Detailed Analysis

integral to all three phases of development. These improvements would have to be maintained/replaced for three times as long.

Lease Suspensions - If lessees are precluded from developing leases for up to 60 years, lease suspensions under Section 39 of MLA would be in order. Under such a scenario, no mineral revenue, in the form of lease rentals and bonus bids, would be realized from these lands for the duration of the suspension. Such long-term suspensions are extraordinary and without legal precedent. Lessees could contest the legality of being denied enjoyment of lease rights, without stipulation, beyond the life expectancy of the lessee.

Produced Water Treatment and Use. Seven different methods of produced water disposal have been investigated and evaluated for the proposed project:

1. Injection into on-site deep wells
2. Evaporation ponds
3. Direct discharge to surface water
4. Hauling of water to an off-site injection wells
5. Treatment for beneficial use through reverse osmosis (RO)
6. Treatment for beneficial use through electro dialysis
7. Treatment for beneficial use through ion exchange

The alternative methods of production water disposal were initially considered for the following reasons:

- a. To provide potential benefits of additional water to the local community.
- b. To avoid potential impacts occurring as a result of injection.

- c. To provide alternate means of disposal that would enable continued development of the CBM resources in the event adequate injection facilities are unavailable.

The methods were evaluated on the basis of cost of disposal, regulatory constraints, and applicability and reliability of available technology.

Methods 1 and 2, disposal into on-site injection wells and evaporation ponds have been incorporated into the Proposed Action and alternatives, and are analyzed in detail in this EIS.

Method 1. Injection into On-Site Deep Wells - It has been the long-standing policy of the BLM and its predecessor, the USGS, that the preferred disposal methodology of produced water is disposal by deep well injection. Onshore Oil and Gas Order No. 7, Disposal of Produced Water, effective October 8, 1993, reinforces this position and states in the Section III Requirements, "Injection is generally the preferred method of disposal".

Disposal into on-site injection wells is currently the most economical means of disposal. According to the Gas Research Institute (GRI) Topical Report GRI-95/0301 (GRI 1995), the cost envelope for on-site injection is \$0.20 to \$0.75 per 42-gallon barrel. RGC reports a current cost of \$0.094 per barrel; however, that cost may vary with future injection wells. This RGC cost includes all direct and intangible costs such as land acquisition, permitting, site clearing, drilling, casing, chemicals, electricity, personnel and on-going operations costs. Due to the large quantities of water produced in CBM, locating and developing sufficient disposal reservoirs onsite has thus far proven difficult. Should onsite injection wells be incapable of

Chapter 1. Alternatives Considered but Eliminated from Detailed Analysis

accepting all of the produced water from the project, Onshore Oil and Gas Order No. 7 would require that production on federal leases be temporarily curtailed to the level of approved injection capacity, or discontinued until alternative means of proper disposal be developed. The Proposed Action would utilize evaporation ponds along with on-site injection wells.

Method 2. Evaporation Ponds - Solar evaporation ponds may be either passive or active, i.e., equipped with aerators to enhance evaporation. The use of surface evaporation ponds is dependent upon evaporation rates of the specific area, and thus, usually provide inconsistent year-round disposal rates. The surface impoundments generally require liners and leak-detection systems. Concentrated salts would remain in the pond which if buried in place would create near-surface salt beds several acres in size. The general practice for abandonment is to remove the liner and salt residue, and dispose of it in an approved landfill. The pond is filled in with clean soil and reclaimed per the landowner's requirements. Costs given by GRI for evaporation ponds range from \$0.05 to \$0.15 per barrel (GRI 1995). Evaporation rates vary from season to season, making such ponds unreliable as a primary means of disposal. The large quantities of produced water prevent evaporation from being the sole method of disposal. Used in combination with other methods, evaporation ponds serve to reduce the volume of water to be disposed of by other methods, reduce costs, and provide temporary storage for the produced water.

Methods 3 through 7 have been eliminated from detailed analysis by alternative for the following reasons:

Method 3. Direct Discharge Disposal to Surface Waters - RGC had an agreement with PRWID to discharge a portion of the produced water to the treatment plant and ultimately to the Price River. This disposal option was limited by the volume and total dissolved solids (TDS) concentration of the water. As of July 31, 1996, RGC no longer discharges produced water to PRWID.

Direct disposal to surface waters would not be an option as long as the TDS levels of produced water exceed beneficial use standards. In the event that waters encountered in the Ferron Sandstone meet beneficial use quality standards, it would be possible to directly discharge to surface waters provided NEPA analysis were completed and relevant permits were obtained.

Method 4. Hauling of Water to an Off-Site Injection Well - This would be the most expensive method of disposal with an envelope of \$1.00 to \$3.50 per barrel (GRI 1995). The closest commercially available well to the Project Area is near Duchesne. Disposal costs to haul water from the Project Area are estimated to be \$3.90 per barrel. Given the large volumes of water to be disposed (100,140 BWPD for the Proposed Action), this single well does not have adequate disposal capacity for the proposed project.

Method 5. Reverse Osmosis (RO) - RO involves forcing water under pressure through semipermeable membrane to produce a partially demineralized water stream and a concentrated brine solution. RO would reduce TDS concentrations in the moderate- to high-saline produced water to around 130 to 400 mg/L which would meet all beneficial use quality standards, including drinking water standards. Based on RO studies in the literature, treatment costs range from \$0.30 to \$1.43 per barrel of water (Stevens 1993 and Cox and Stevens

Chapter 1. Alternatives Considered but Eliminated from Detailed Analysis

1993). Anadarko is using RO to treat produced water from the Castlegate CBM project. The estimated treatment cost is \$0.40 - 0.75 per barrel based on the pilot tests (Walters 1997). Anadarko is using the RO plants, as an interim disposal method. It is not considered cost-effective as a long-term disposal option due to the high operating costs (Walters 1997). RGC has investigated RO as a disposal option. Based on information provided by vendors, RO would cost 300 - 500 percent more than their current injection cost including pipelines and water transport. RO is a more expensive and less reliable disposal option for disposal of CBM produced water, and is therefore not analyzed further in this EIS. Because the process would produce high quality water suitable for community

use, Carbon County, Emery County or RGC could apply to the State of Utah for water rights to the produced water and develop water treatment facilities as a separate project.

Method 6. Electrodialysis - This method involves an electrochemical separation process in which ions are electrically transferred through permeable membranes to a concentrated solution. Electrodialysis is more effective than RO in dealing with fluctuations in TDS levels of the input water (Stevens 1993). Electrodialysis has not been applied to oil and gas production operations, but may be adaptable to such applications. Estimated treatment costs for partial demineralization of produced water ranges from \$0.11 (not including disposal of the reject stream) to \$0.30 per barrel (GRI 1995 and Cox and Stevens 1993). Because the process has not been applied to CBM production and would cost more than the proposed onsite injection, it is a more expensive and less reliable water disposal alternative, and has been dismissed from further analysis.

Method 7. Ion Exchange - Ion exchange removes dissolved solids by exchanging waterborne ions for more soluble ions as the water passes through chemical "resins". It is not specifically designed to remove salt from water, rather it changes the kind of salt. This would not provide the required treatment of the produced water from this project and it has been dismissed from further analysis.

The above alternatives are not analyzed in detail in this EIS. Implementation of any of these alternatives would require further impact analysis and NEPA documentation.

Chapter 1. Summary of Changes from the Draft to the Final EIS

1.6.4 Summary of Changes from the Draft to the Final EIS

The most significant change from the Draft to the Final EIS was the addition of Alternative D - Big Game Minimum Disturbance Corridors. This alternative was developed through a collaborative effort between BLM and RGC in consultation with UDWR and UDOGM to address a wide array of comments on the DEIS.

Following is a summary of the most significant changes made to the Final EIS to address issues and concerns raised during public and agency review of the Draft EIS. Additional information has been added and in some cases, entire sections revised to address issues not previously identified in the scoping process. Significant changes to the text have been underlined so the reader can quickly identify new information. New tables presented for Alternative D, the Response to Comments in Section 6, and Appendix 4A-2 - Salt Drift Calculations were not underlined for better readability. However, new information is easily identified in table titles or column headings. Minor editorial corrections or clarification of issues previously addressed were also made throughout the document. These changes were not underlined for better readability.

The summary of changes is presented by chapter for Chapters 1, 2, 5, and 6, and by resource for Chapters 3 and 4.

Chapter 1.0 - Introduction

- Alternative D was added to the list of alternatives analyzed.
- BLM's preferred alternative has been changed to Alternative D - Big Game Minimum Disturbance Corridors.

- Additional issues have been analyzed as a result of public and agency review of the DEIS.
- The description and explanation of bonding requirements has been expanded.
- Potential effects of CBM development on surface springs has been expanded to include those east of the Project Area.

Chapter 2.0 - Description of Alternatives Including the Proposed Action

- BLM-required environmental protection measures BLM 40, BLM 41, and the new BLM 41A define active raptor nests, identify raptor surveys to be done prior to proposed drilling activity, and describe protective buffer zones around bald eagle winter roost sites.
- A description of Emery and Carbon County zoning, regulations, and permits that would apply to CBM activities on private and other lands was added.
- UDOGM's well spacing requirements have been added to clarify the need to address 80-acre well spacing alternatives in the EIS.
- A description of Alternative D, site location standards, restrictions on construction activity and non-emergency workover operations, and the project components have been added to Chapter 2. Relevant tables and figures for this new alternative have also been added. The Impact Summary Table (2.8-2) was revised to include Alternative D.

Chapter 1. Summary of Changes from the Draft to the Final EIS

Chapter 3.0 - Affected Environment

There were no significant changes to the following sections: 3.4 Soils, 3.5 Vegetation, 3.6 Wetlands, 3.11 Livestock Management, 3.13 Visual Resources, 3.14 Noise, 3.15 Socioeconomics, and 3.16 Health and Safety.

3.1 - Geology

- Plate 10A - Ferron Sandstone Coal Isopachs - was added to show the extent and thickness of Ferron coal in the proposed Project Area.

3.2 - Water Resources

- Plate 11A shows the results of a water rights search which identified 56 springs east of the Project Area.

3.3 - Air Quality

- The description of air quality in the Project Area was expanded to include additional meteorological data. Figures 3.3-1 and 3.3-2 in the DEIS depicting average wind direction and speed were replaced with wind roses, Figures 4.3-1 through 4.3-6 in the FEIS.
- Two reports from the Interagency Monitoring of Protected Visual Environments were reviewed and cited to identify any trends in the patterns and chemical composition of haze for the Colorado Plateau region over a period of four years.

3.7 - Wildlife

- Additional information includes the occurrence and habitat of desert cottontail, chukar, ring-necked pheasant, waterfowl, shorebirds, reptiles, and amphibians in the Project Area. Plate 19A was added to show the location of prairie dog towns and sage grouse habitat in Project Area.

3.8 - Special Status Species

- Further information was provided on the occurrence of bald eagles, Colorado squawfish, shrike, and milk snake in the Project Area. Plate 20A was added to show the location of bald eagle habitat and shrike breeding habitat in the Project Area.

3.9 - Cultural Resources

- All available information regarding cultural resource inventories conducted by Baseline Data, Inc. and Powers Elevation was incorporated into the discussion of known cultural resources.

3.10 - Land Use

- This section was revised to include information from Carbon County's new Comprehensive Plan, and Emery County's recently drafted General Plan. The permitting process RGC would have to follow to drill and operate CBM wells in each county has also been included.

3.12 - Recreation

- A description of UDWR's annual Bald Eagle Day was added to the discussion of recreational opportunities.

Chapter 4.0 - Environmental Consequences

Chapter 1. Summary of Changes from the Draft to the Final EIS

There were no significant changes to the following sections: 4.5 Vegetation, 4.6 Wetlands, and 4.13 Visual Resources.

In addition to the following changes, an impact assessment of Alternative D was added to each resource section.

4.1 - Geology

- New information includes the quality of CBM gas, and the extent and thickness of Ferron coal relative to the rate of gas production.
- Estimated gas production was recalculated for a 30-year project life.

4.2 - Water Resources

- Potential impacts from the use of magnesium chloride on roads for dust control have been incorporated into this section.
- RGC has prepared and implemented a Spill Prevention, Control and Countermeasure (SPCC) Plan for the handling and storage of oil and chemicals at the compressor facilities and disposal well sites. Information regarding this plan has been added to Section 4.2.
- Additional information has been provided regarding potential impacts from injection on pressure head changes in the Navajo-Nugget Aquifer.
- Water production estimates were recalculated for a 30-year project life.
- Table 4.2-2, Quality of Produced Water and Groundwater from the Navajo Sandstone, was added.

4.3 - Air Quality

- In response to comments on the DEIS, an Air Quality Technical Support Document was prepared to provide additional detail regarding the analysis of air quality impacts. Section 4.3 has been substantially revised to incorporate information from the technical report and clarify potential impacts.
- Table 4.3-1 was completely revised, and seven new tables were added.

4.4 - Soils

- A model was developed to estimate the amount of salt drift and salt deposition downwind from the evaporation ponds (Appendix 4A-2), and potential impacts were assessed in this section. Table 4.4-2, Soil Types in the Vicinity of the Evaporation Ponds was added.
- Additional information was provided to address the potential for erosion and sedimentation of shallow soils overlaying Mancos Shale to contribute selenium to the surface water system.

4.7 - Wildlife

- Potential indirect impacts to big game and raptors have been clarified.
- Impact assessments have been added for the following species: chukar, ring-necked pheasant, desert cottontail, waterfowl and shorebirds, reptiles and amphibians. Impact assessments were expanded for white-tailed prairie dogs and song birds.

Chapter 1. Summary of Changes from the Draft to the Final EIS

- Tables 4.7-14 and 4.7-15 were added summarizing direct impacts to sage grouse and prairie dogs by alternative.

4.8 - Special Status Species

- Environmental protection measure BLM 41A has been added to the FEIS (see Section 2.0) to restrict surface occupancy within 0.5 mile of bald eagle winter roosts, unless specifically authorized by BLM, USFWS, and UDWR.
- Per the US Fish and Wildlife Service, the impact conclusions for peregrine falcon were changed to “not likely to adversely affect”.
- Table 4.8-2, Distance of Bald Eagle Roosts to CBM Wells, was revised.
- Table 4.8-3 was added on impacts to loggerhead shrike breeding habitat.
- Potential impacts to milk snakes were added.

4.9 - Cultural Resources

- The Unavoidable Adverse Impacts section was revised to clarify the impact assessment.

4.10 - Land Use

- Tables 4.10-2 and 4.10-3 were added to show the number of residences that may be affected by CBM development.
- Updated information on Carbon and Emery Counties’ Land Use Plans has been incorporated into this section.

- More detailed information is provided on traffic volumes and potential impacts.

4.11 - Livestock Management

- Additional information includes potential impacts of oil and gas development on ranch operations.

4.12 - Recreation

- Mitigation measures were added to reduce potential recreation-related impacts.

4.14 - Noise

- The impact assessment was revised to include updated information on the number of residences potentially affected by project development.

4.15 - Socioeconomics

- A more detailed cost-benefit analysis has been added to this section, including new Table 4.15-3, County and Private Sector Costs and Revenues.
- New sections were added to assess potential impacts on tourism, economic diversity, and property values.

4.16 - Health and Safety

- This entire section was revised to include more information on potential risks associated with project development, including geologic hazards, fires and explosions, public safety and employee safety.

Chapter 5.0 - Cumulative Impacts

Chapter 1. Summary of Changes from the Draft to the Final EIS

- The projects used to evaluate cumulative impacts to air quality were revised based on consultation with the U.S. Environmental Protection Agency and Utah Division of Air Quality.
- The Cumulative Impact Assessment for the Manti elk herd was revised to provide a more detailed analysis of potential impacts.

Chapter 6.0 - Consultation and Coordination

- This chapter now includes all of the public and agency comments received on the DEIS and BLM's response to each comment.