



**U.S. Department of the Interior**

Bureau of Land Management

Wyoming State Office

Rawlins Field Office

October 2004

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**Environmental Assessment for the  
Hay Reservoir Unit Natural Gas Infill  
Development Project**

**MISSION STATEMENT**

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

**BLM/WY/PL-05/001+1310**

WY-030-05-EA-012



# United States Department of the Interior



BUREAU OF LAND MANAGEMENT  
Rawlins Field Office  
P.O. Box 2407 (1300 North Third Street)  
Rawlins, Wyoming 82301-2407

In Reply Refer To:  
1790

November 10, 2004

Re: Environmental Assessment for the Hay  
Reservoir Unit Natural Gas Infill  
Development Project

Dear Reader:

This is to inform you of the availability of the Hay Reservoir Unit Natural Gas Infill Development Project Environmental Assessment (EA) at the Wyoming Bureau of Land Management's (BLM) website:

[www.wy.blm.gov/rfo/nepa.htm](http://www.wy.blm.gov/rfo/nepa.htm)

The Hay Reservoir Unit Natural Gas Infill Development Project is an infill natural gas project located within the boundaries of the existing Hay Reservoir Federal Oil and Gas Unit in Sweetwater County, Wyoming. The unit lies approximately 30 miles northwest of Wamsutter, Wyoming, primarily within the boundaries of the Rawlins Field Office with a small portion lying within the Rock Springs Field Office boundaries. The Rawlins Field Office has jurisdiction over oil and gas development of the entire Hay Reservoir Unit. In order to satisfy the requirements of the National Environmental Policy Act, this EA was prepared to analyze impacts associated with the construction, drilling, production, maintenance, and reclamation of additional natural gas wells within the Unit.

It is expected that this EA can be viewed at our website beginning November 10, 2004. This will begin the 30-day public review/comment period for the document. We will review all comments and will address substantive comments in the Decision Record. A substantive comment is one that would alter conclusions drawn from the analysis based on: 1) new information, 2) why or how the analysis is flawed, 3) evidence of flawed assumptions, 4) evidence of error in data presented, and 5) requests for clarification that bear on conclusions presented in the analysis.

Your comments should be as specific as possible. Comments on the alternatives presented and on the adequacy of the impact analysis will be accepted by the BLM until December 10, 2004.

Comments may be submitted via regular mail to:

John Ahlbrandt, Project Manager  
Bureau of Land Management  
Rawlins Field Office  
P.O. Box 2407  
Rawlins, Wyoming 82301

or may be submitted electronically at the address shown below (please refer to the Hay Reservoir Unit Infill Project):

e-mail: rawlins\_wymail@blm.gov

Please note that comments, including names, e-mail addresses, and street addresses of respondents, will be available for public review and disclosure at the above address during regular business hours (7:45 a.m. to 4:30 p.m.), Monday through Friday, except holidays. Individual respondents may request confidentiality. If you wish to withhold your name, e-mail address, or street address from public review or from disclosure under the Freedom of Information Act, you must state this plainly at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

The EA may also be reviewed at the following locations:

Bureau of Land Management  
Wyoming State Office  
5353 Yellowstone Road  
Cheyenne, Wyoming 82009

Bureau of Land Management  
Rawlins Field Office  
1300 N. Third Street  
Rawlins, Wyoming 82301

If you require additional information regarding this project, please contact John Ahlbrandt, Project Manager, at the Rawlins address or phone (307) 328-4223.

Sincerely,



Field Manager

Enclosure

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## ACRONYMS AND ABBREVIATIONS

Ac-ft	Acre Feet
AOI	Area of Influence
AML	Appropriate Management Level
APD	Applications for Permit to Drill
AQRV	Air Quality Related Values
AUM	Animal Unit Month
bbls	barrels
BCFE	billion cubic feet equivalent
bcf	billion cubic feet
BLM	U.S. Bureau of Land Management
BOP	blowout preventer
BCPD	barrels condensate per day
BWPD	barrels water per day
CAA	Clean Air Act
CBNG	coalbed natural gas
CEQ	Council for Environmental Quality
CFR	Code of Federal Regulations
COA	Conditions of Approval
CRO	State Historic Preservation Office Cultural Records Office
CWA	Clean Water Act (Federal Water Pollution Control Act)
dba	A-weighted decibels
DOT	U.S. Department of Transportation
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act of 1976
FONSI	Finding of No Significant Impact
FOOGRA	Federal Onshore Oil and Gas Leasing Reform Act
ft	feet
gpm	gallons per minute
HAP	hazardous air pollutants
HMA	Horse Management Area
HRUNGIDP	Hay Reservoir Unit Natural Gas Infill Development Project
ID Team	Interdisciplinary Team
LOP	Life of Project
MCFD	thousand cubic feet per day
mg/l	milligrams per liter
mi	mile
MMCFD	million cubic feet per day
mmhos	millimhos
mpg	miles per hour
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act

NOI	Notice of Intent
NO <sub>x</sub>	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NWI	National Wetlands Inventory
O.D.	outside diameter
PFYC	Probable Fossil Yield Classification
PLS	Pure Live Seed
PM <sub>10</sub>	particulate matter of 10 microns in effective diameter or less
PM <sub>2.5</sub>	particulate matter of 2.5 microns in effective diameter or less
ppm	parts per million
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
psig	pounds per square inch gauge
RCRA	Resource Conservation and Recovery Act
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-Way
SAR	sodium adsorption ratio
SHPO	State Historic Preservation Office
SPCC	Spill Prevention Control and Countermeasure Plan
STATSGO	State Soil Geographic Database
SUP	Surface Use Plan
SWPP	Stormwater Pollution Prevention Plan
TDS	total dissolved solids
TES	Threatened or Endangered Species
TSP	total suspended particulates
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compounds
VRM	Visual Resource Management
WAAQS	Wyoming Ambient Air Quality Standards
WDAI	Wyoming Department of Administration and Information
WDEQ	Wyoming Department of Environmental Quality
WDOE	Wyoming Department of Employment
WDU	Wind Dancer Federal Exploratory Unit
WGF	Wyoming Game and Fish Department
WSEO	Wyoming State Engineer's Office

# CHAPTER 1: PURPOSE AND NEED

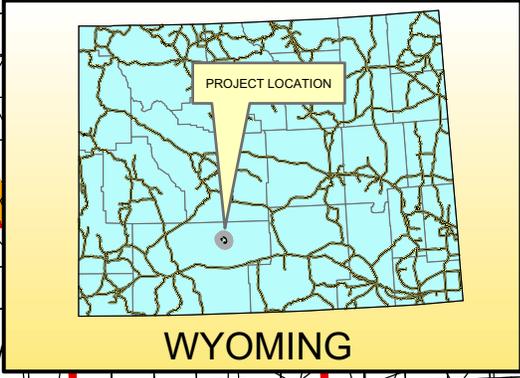
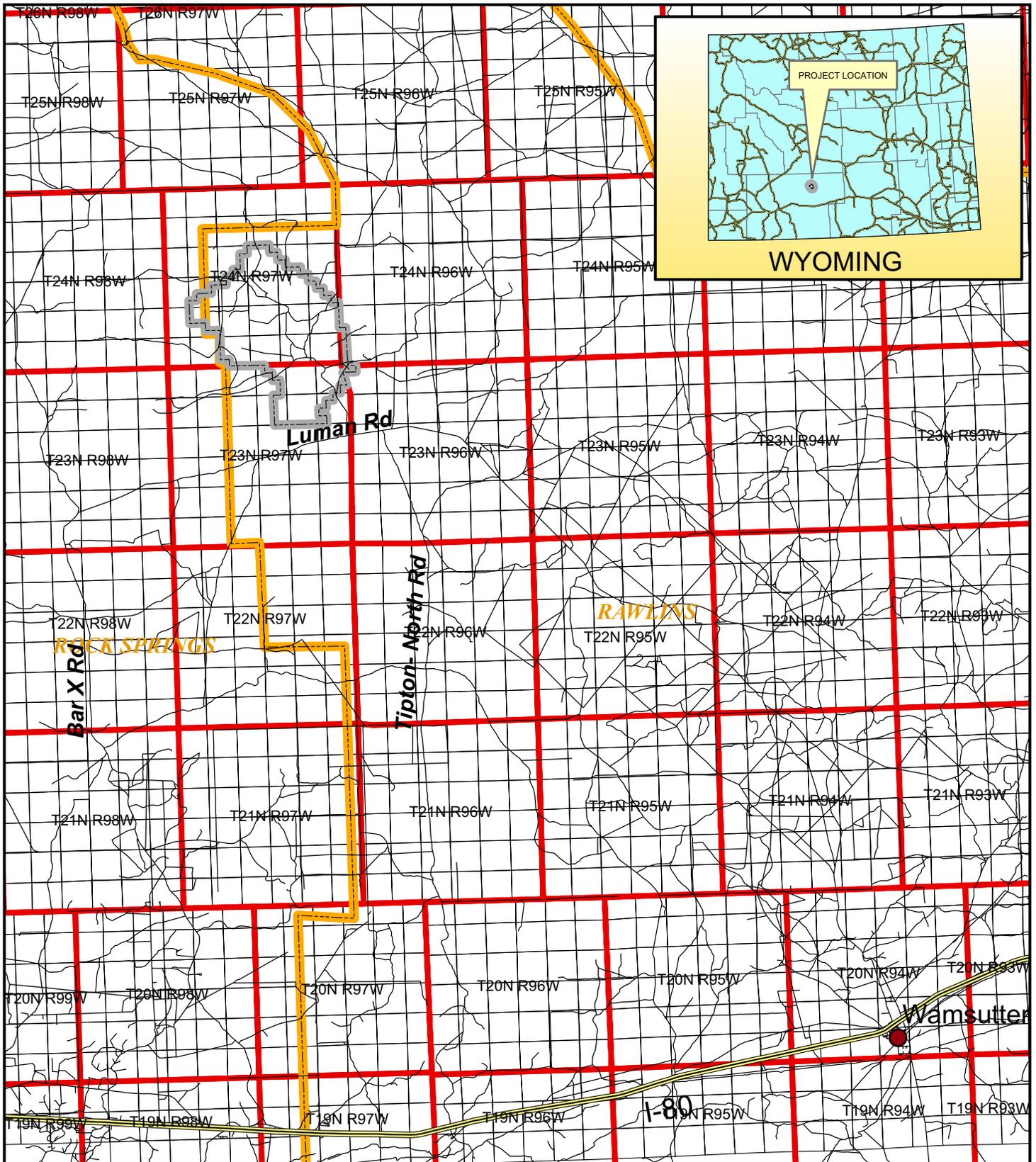
## 1.0 INTRODUCTION

Tom Brown, Inc. of Denver, Colorado, as unit operator (Operator), notified the Bureau of Land Management (BLM), Rawlins Field Office, that the company proposes to explore and develop natural gas resources within the Hay Reservoir Federal Unit (HRU) located in the Great Divide Basin of south central Wyoming (Figure 1-1). The Bureau of Land Management is preparing this Environmental Analysis (EA) for the proposed natural gas project which is known as the Hay Reservoir Unit Natural Gas Infill Development Project (HRIP).

## 1.1 PROJECT DESCRIPTION AND LOCATION

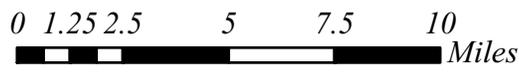
This project consists of the construction of up to 25 additional well locations located in the HRIP. The Hay Reservoir Unit has experienced gas and condensate production since 1976. One or more wellbores may be drilled from each well location (such as to different target depths). Seventy-nine wells have been drilled and completed within the HRIP, and 16 of these have been subsequently plugged and abandoned and the associated well pads and other facilities reclaimed. Initial drilling operations for the new well locations are proposed to begin in the summer or fall of 2004. Drilling is anticipated to take approximately 30 months, including approximately six wells in 2004, 10 wells in 2005, and 9 wells in 2006, with the total life of the Project (LOP) estimated at 10 to 30 years. The proposed HRIP Project Area has existing infrastructure (e.g. access roads and natural gas gathering lines) available for support of the proposed activity.

The HRIP is located principally in townships 23 and 24 North, Range 97 West, Sweetwater County, Wyoming, approximately 30 miles north of Wamsutter and approximately 45 miles northwest of Rawlins. Access to the HRIP is provided by several Sweetwater County Roads, including the Tipton Road County #4-67 north from Interstate 80 (I-80) west of Wamsutter Wyoming. Approximately 95 percent of the Project occurs within the administrative boundary of the BLM's Rawlins Field Office, with the remaining five percent located within the boundary of the Rock Springs Field Office, as illustrated in **Figure 1-1**.



**Legend**

- Township/Range
- Sections
- Hay Resv Unit Bdry
- BLM Field Offices
- Cities
- Roads 100k
- Highways



**FIGURE 1.1:  
PROJECT LOCATION**

Date: 9/9/04	File Location: C:\Projects\Hay Reservoir\GIS\FIGURE 1-1-Project Location_8-5x11.mxd
Created by: emj	Project No: 165-1

Data Sources:  
 -Wyoming Natural Resources Data Clearinghouse  
 -Wyoming Geographic Information Advisory Council  
 -BLM

The Hay Reservoir Unit encompasses approximately 11,619 acres. Surface ownership is divided among the federal government (BLM), 9,778 acres (84.2%), the State of Wyoming, 1,279 acres (11.0%), and private landowners, 559 acres (4.8%). Mineral ownership is the same as the surface ownership, there is no split estate land.

## **1.2 PURPOSE OF AND NEED FOR ACTION**

### ***1.2.1 Purpose and Need For the Proposed Development***

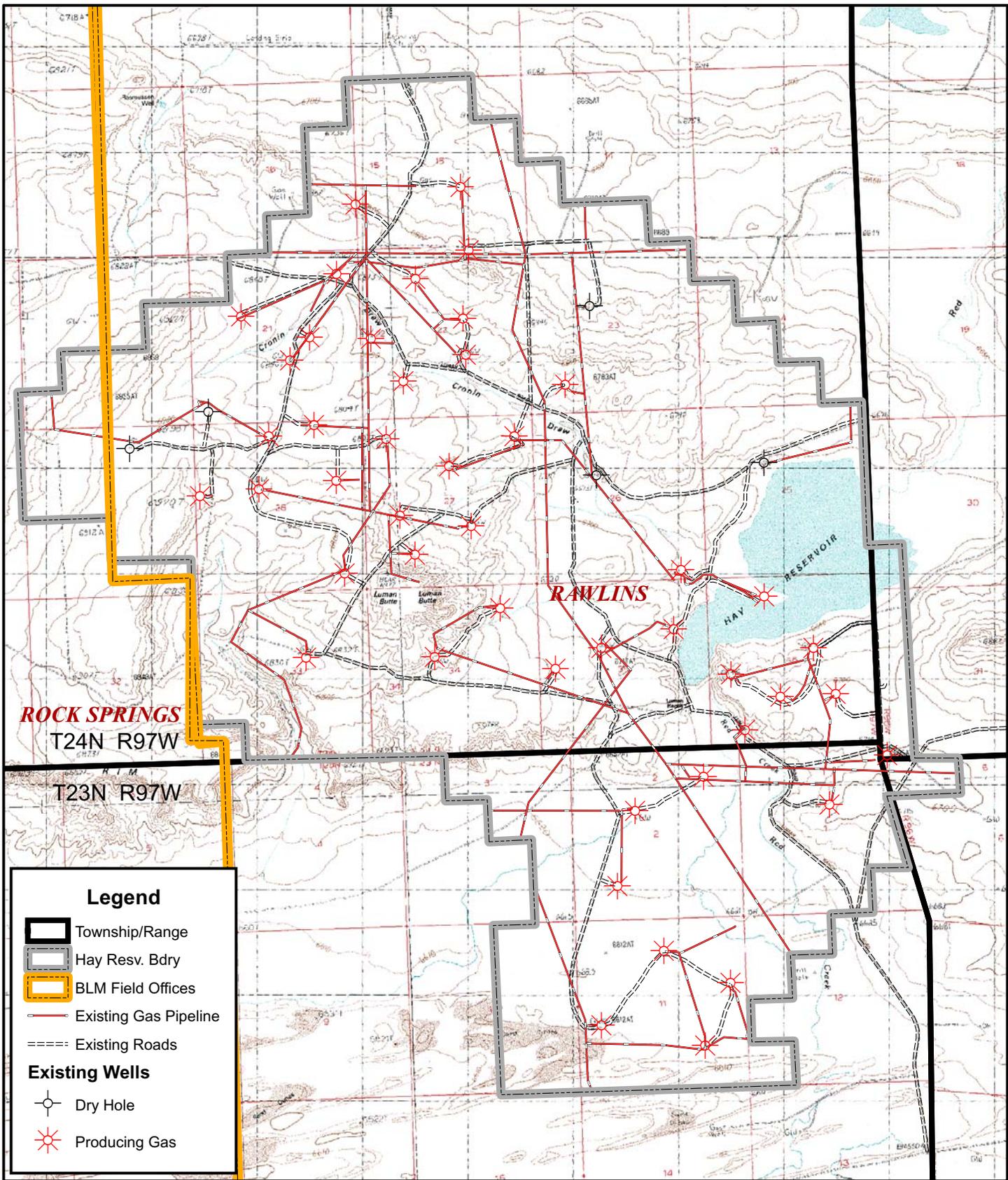
Exploration and development of federal oil and gas leases by private industry is an integral part of the BLM's oil and gas leasing program under authority of the Mineral Leasing Act of 1920, as amended, the Mining and Minerals Policy Act of 1970, the Federal Land Policy and Management Act of 1976, the National Materials and Minerals Policy, Research and Development Act of 1980, and the Federal Onshore Oil and Gas Leasing Reform Act of 1987.

The purpose of the proposed HRIP is to exercise the lease holders' rights within the Project Area to drill for, extract, remove, and market gas products. Federal mineral leasing policies and the regulations by which they are enforced recognize the statutory right of lease holders to develop federal mineral resources to meet continuing national needs and economic demands so long as undue and unnecessary environmental degradation is not incurred. Development of the Proposed Action is in conformance with the President's National Energy Policy.

Also included is the right of the lease holders within the Project Area to build and maintain necessary improvements, subject to renewal or extension of the lease or leases in accordance with the appropriate authority. The proposed project would allow the Operator to develop its mineral leases within the existing federal unit.

### ***1.2.2 Purpose of the Environmental Analysis Process***

The purpose of this EA is to provide the Decision-Maker with information needed to make a decision that is fully informed and based on factors relevant to the Proposed Action. It also documents analyses conducted on the Proposed Action and alternatives in order to identify environmental impacts and mitigation measures necessary to address issues. This EA is programmatic in nature, i.e., it describes environmental impacts to the Project Area as a whole. Subsequent to finalization of Project well and associated facilities locations, site-specific EAs would be completed prior to Project authorization. The EA also provides a vehicle for public review and comment on the Operator's proposal, the environmental analysis, and conclusions about the relevant issues. The proposed project would mostly occur on BLM lands managed by the Rawlins Field Office as shown on the Project Map, **Figure 1-2**.

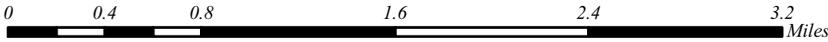


**Legend**

- Township/Range
- Hay Resv. Bdry
- BLM Field Offices
- Existing Gas Pipeline
- Existing Roads

**Existing Wells**

- Dry Hole
- Producing Gas



**FIGURE 1.2:  
PROJECT LOCATION**

Date: 9/9/04	File Location: C:\Projects\Hay Reservoir\FIGURE 1-2-Project Location_8-19-04.mxd
Created by: emj	Project No: 165-1

Data Sources:  
 - Wyoming Natural Resources Data Clearinghouse  
 - Wyoming Geographic Information Advisory Council  
 - BLM

Factors considered during the environmental analysis process regarding the HRIP include the following:

- A determination of whether the Proposed Action and alternatives are in conformance with the policies, regulations, and approved Resource Management Plan (RMP) for the BLM and with regulations and policies of other oversight agencies.
- The locations of environmentally-suitable well locations, access roads, pipelines, and ancillary production facilities that are compatible with other resource activities and that minimize resource impacts yet honor the lease rights within the Project Area.
- The determination of impacts resulting from the Proposed Action and alternatives on the human environment, if conducted in accordance with applicable regulations and lease stipulations, and the development of mitigation measures necessary to avoid or minimize these impacts.

### **1.3 RELATIONSHIP TO POLICIES, PLANS, AND PROGRAMS**

This EA is prepared in accordance with the National Environmental Policy Act (NEPA) and is in compliance with all applicable regulations and laws passed subsequent to the Act. This EA assesses the environmental impacts of the Proposed Action and No Action alternatives and serves to guide the decision-making process.

#### **1.3.1 Conformance with Great Divide Resource Area RMP**

The BLM's Great Divide Resource Area Management Plan (RMP) and Record of Decision (ROD) (BLM, 1990) directs the management of BLM-administered lands within the Project Area. The objective for management of oil and gas resources as stated in the RMP (pg. 30) is to provide for leasing, exploration and development of oil and gas while protecting other resource values. The ROD found that all public lands in the resource area are open for oil and gas leasing and development, subject to certain stipulations.

#### **1.3.2 Relationship to Other Plans and Documents**

The proposed project is in conformance with the State of Wyoming Land Use Plan (Wyoming State Land Use Commission, 1979) and the Sweetwater County Land Use Plan and would comply with all relevant federal, state, and local laws and regulations as indicated in **Appendix A**.

The development of this project would not affect the achievement of the Wyoming Standards for Healthy Rangelands (August 1997, and as amended).

#### **1.3.3 Issues and Concerns**

The 30-day public scoping period for the HRIP ended April 26, 2004. Environmental and social issues of local importance associated with the HRIP, identified by the BLM Interdisciplinary Team (IDT) or through the public scoping process, include:

- Potential impacts to wildlife habitats within the analysis area, primarily nesting raptors and sage-grouse.
- Potential impacts to USFWS-listed threatened or endangered species, or to species proposed for listing, or to BLM-identified sensitive species.
- Potential impacts to cultural and paleontological resources within the analysis area.
- Reclamation of disturbed areas and control of non-native and invasive plants.
- Potential impacts to surface water quality.
- Potential impacts to soil and vegetation within the Project Area.
- Potential impacts to groundwater.
- Potential conflicts between mineral development activities and recreational activities.
- Potential impacts to air quality resulting from drilling and production activities.
- Potential increases in traffic and associated impacts on county, state, and BLM roads.
- Potential social and economic impacts to local communities.
- Cumulative effects of natural gas development activities when combined with other ongoing and proposed development activities.

Issues identified from public scoping were divided into significant and non-significant groups. Significant issues were defined as those directly or indirectly caused by implementing the Proposed Action. Non-significant issues were identified as those:

1. being beyond the scope of the Proposed Action,
2. previously decided by law, regulation, Resource Management Plan, or other higher level decision,
3. irrelevant to the decision to be made, not a proposed activity, or an effect already prohibited, or
4. conjectural or not supported by scientific or factual evidence.

The Council for Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)..." These issues have not been considered further in this EA. A list of non-significant issues and the rationale for their categorization as non-significant is indicated in **Table 1.1**.

**Table 1.1 Public Scoping Issues Considered Non-Significant**

Issue	Reason for Exclusion	Source (Table 1.2)
Maximum proposed well densities should be limited to not more than 4 to 8 wells per section.	2	1-1,7-5
Discharge of produced water to "waters of the state" requires NPDES permit	3	4-1
EA must analyze an alternative which removes all drilling and completion activities from lakebeds and wetlands	3	7-2
EA should "recognize the worldwide and long-range character of environmental problems and thus support international efforts to prevent declines in the world environment"	1	7-20
Alternative forms of energy, such as wind power, must be considered	1	7-20
EA should include a prohibition on oil and gas leasing and development in riparian areas, or a requirement for no surface occupancy	2	7-30
Injection of produced water must be in conformance with the Safe Drinking Water Act	3	4-3

Source: See Table 1.2

The BLM identified a number of significant issues raised during public scoping. These issues have been summarized in **Table 1.2**. Each of the issues has been organized by resource area, along with the source of the comment and the section of the EA in which the comment is addressed. The comment source indicates an identifying number for the origin of the comment letter and the number of the individual comment within the letter. These issues form the core of Chapters 3 and 4 of this EA, which address the existing environment and environmental consequences of the Proposed Project.

**Table 1.2 Significant Issues Identified from Public Scoping**

Direct Effect	Indirect Effect	EA Section(s)	Source and Comment
<b>NEPA, Other Laws, RMP, and Policy Conformity</b>			
Project is consistent with the National Energy Policy		1.2.1	3-2
Project would require Storm Water Pollution Prevention Plan		2.1.1.2	4-2
EA must adequately address cumulative impacts from the Project and additional drilling		4.17	7-1, 7-19
<b>Alternatives Including the Proposed Action, Mitigation</b>			
BLM should require directional drilling		2.3	1-2, 7-18
Project activities should avoid channels, wetlands, and riparian areas		2.1.1.2	1-9, 7-8, 7-12
BLM should require mitigation for invasive weeds		Appdx. B 47-48, 2.1.2.1	2-9, 7-26
BLM should require mitigation or prohibition of Project activities where impacts could affect federally-listed or sensitive species		4.9.1.1, 4.9.1.2, Appdx. B 49-54	7-3, 7-4,
NRHP eligible sites should be identified and protected		Appdx. B 42-45, 3.12.2, 3.12.4	7-7
All reserve pits should be lined		2.1.1.2, Appdx. B 21	7-8
Mitigation must mandate the use of native species		Appdx. B 28	7-10
Revegetation efforts must be evaluated to ensure successful reclamation within a reasonable time frame		Appdx. B 28-29	7-14
Reserve pits should be netted		Appdx. B 25	7-15
Citizens' proposal for the Red Lake Wilderness Study Area should be considered		2.3	7-16
<b>Geology, Minerals, Paleontology, and Geohazards</b>			
There should be no surface disturbance allowed within sand dune areas		2.1.1.1	7-17
<b>Air Quality, Visual Resources, and Noise</b>			
Impacts from Project-associated particulate emissions		4.2.1	2-8
Project cumulative air quality and visibility impacts		4.17.2, Table 4.8	6-1, 7-22, 7--23
EA should address noise created by oil and gas development, especially noise generated by compressors		4.16.1, 2.1.1.7	7-25
Discussion of visual resources and impacts		3.11, 4.11.1	7-27

Direct Effect	Indirect Effect	EA Section(s)	Source and Comment
<b>Water Resources</b>			
Effects on Colorado River system associated with water withdrawals resulting from the Project		3.4.1, 4.4.1	1-5,
Produced water suitable for livestock use should not be wasted		3.4.2.2, Table 3.5	5-2
EA must disclose the effects of hydraulic fracturing		2.1.1.5, 4.4.1	7-9
EA must discuss the types of drilling mud to be used		2.1.1.3	7-13
<b>Soils</b>			
EA must disclose impacts to biological soil crusts		4.3.1	7-11
<b>Vegetation, Wetlands, and Invasive Weeds</b>			
Effects of the Project on wetlands and riparian areas		3.5.2, 4.5.1	1-9, 2-10
Effects of existing and potential spread of invasive weeds		3.5.3	2-9
<b>Range Management and Land Use</b>			
Project impacts to range resources must be clearly defined		4.6.1	5-1
<b>Wildlife and Special Status Species</b>			
Effect of the Project on federally-listed, proposed, or candidate species		3.9.1, 4.9.1.1	1-3,1-4,1-8,
Effect of the Project on BLM-designated special status or sensitive species			
	Effects of the Project on Colorado River aquatic species	3.9.1	1-5
		4.9.1.2	1-6
Effects of the Project on migratory birds, including raptors		4.9.1.2, Fig. 1.2	1-7, 2-1, 2-3,
Effects of the Project on greater sage-grouse and mountain plover		4.17.7, 4.17.9	2-2, 2-3,
Cumulative impacts to wildlife generally and to federally-listed or special status species			
Noise impacts to greater sage-grouse		4.9.1.2	2-4
Effects of the Project on wild horses		4.8.1	2-5
Effects of the Project on big game		3.7.2, 4.7.1, 4.17.7	2-5
The Project Area should be surveyed and protective measures enforced for federally-listed or sensitive plant species		3.9.1, 4.9.1	7-6
EA must disclose the effects of granting exceptions to lease stipulations		4.9.1.2	7-24
EA must identify big game migration corridors		3.7.2	7-29
<b>Cultural Resources</b>			
Shoshone and Ute tribes should be consulted and eligible cultural sites should be protected		3.12.3	7-7

Direct Effect	Indirect Effect	EA Section(s)	Source and Comment
<b>Recreation and Transportation</b>			
Effects of the Project on recreational hunting		4.10.1	2-6
Project worker access		4.14.1	2-7
General impacts to recreational use		4.10.1	7-28
<b>Socioeconomics</b>			
Source of Project workers		4.13.1	2-7
Project would have beneficial economic impacts		4.13.1	3-1
<b>Health and Safety</b>			
No comments received			

Comment Sources:

1. United States Fish and Wildlife Service, letter of April 7, 2004
2. Wyoming Game and Fish Department, letter of April 22, 2004
3. Petroleum Association of Wyoming, letter of April 26, 2004
4. Wyoming Department of Environmental Quality, letter of April 21, 2004
5. Wyoming Department of Agriculture, letter of April 26, 2004
6. Bridger-Teton National Forest, letter of April 23, 2004
7. Biodiversity Conservation Alliance/Wyoming Outdoor Council, letter of April 23, 2004

Letters were also received from the Wyoming Office of State Lands and Investments and the Natural Resources Conservation Service which did not address specific concerns.

# CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

## 2.1 PROPOSED ACTION

The Proposed Action would involve the drilling, completion and operation of up to 25 additional natural gas well locations by the Hay Reservoir Unit (HRU) Operator, Tom Brown Inc, its successors and assigns. Occasionally, a unit partner or agent operator may act as operator for a specific well. A well location would consist of both the short-term and long-term contiguous surface disturbance from which one or more wells could be drilled. A well location may have a single well drilled from that location, or more than one (such as a twin well drilled to a different formation or target depth), but would be restricted to a single, contiguous location where total area of the disturbance is minimized. The actual number of well locations would be determined as development progresses and further analysis of the reservoir quality can be made, however the decision record for this EA would allow no more than 25 additional well locations.

The project is known as the Hay Reservoir Unit Natural Gas Infill Development Project (HRIP) and the Project Area consists of approximately 11,619 acres. The Project Area comprises the existing federal unit. Currently, there are 47 existing producing well locations within the Project Area, including 39 federal wells, five State of Wyoming wells, and three fee wells (WOGCC, 2004, online data). If all 25 new well locations were developed, there would be a total of 72 producing well locations within the federal unit. Average well location density would be one per 161 acres upon project completion, if all proposed well locations were to be developed. A list of existing wells within the HRU is indicated in **Table 2.1**.

The anticipated natural gas production will be from Cretaceous-age sandstone formations. Anticipated objective formations are the Lance and Lewis formations, and the Mesaverde Group, including the Almond, Ericson and Rock Springs formations. Individual well depths would range from 8,000' to 10,000' depending on the actual objective formation.

All activities would be conducted according to the regulatory requirements of the BLM and the Wyoming Oil and Gas Conservation Commission (WOGCC). The project would begin in the fall of 2004 and continue for approximately 30 months, with six wells being drilled in 2004, 10 in 2005, and nine additional wells in 2006. It is estimated that approximately 8.0 miles of additional roads and approximately 8.0 miles of additional pipelines would be needed to service the well locations. The program would require one drilling rig operating continuously. It is possible that a second rig would be added during the summer and fall peak drilling periods. The level of activity would be determined by a number of factors, some of which are weather, lease wildlife stipulations, drilling rig availability, and product price.

**Table 2.1 Existing Wells, Hay Reservoir Unit**

Well Number	Unit Or Lease Name	Footage NS	Footage EW	Qtr 1	Qtr 2	Sec.	Twp.	Rge.	Company	Status	Total Depth
No. 82	Hay Reservoir Unit	100 FSL	200 FWL	SW	SW	31	24N	96W	Tom Brown Inc	PG	10250
No. 16	Hay Reservoir W-7216	1786 FNL	1980 FEL	SE	NW	1	23N	97W	Tom Brown Inc	PG	10076
No. 74	Hay Reservoir	1000 FSL	1300 FWL	SW	SW	2	23N	97W	Tom Brown Inc	PG	9750
No. 79	Hay Reservoir	931 FNL	1127 FEL	NE	NE	2	23N	97W	Tom Brown Inc	PG	9940
No. 17	Unit Fee	3300 FSL	3300 FEL	SE	NW	2	23N	97W	Tom Brown Inc	PG	10022
No. 48	Hay Reservoir W15689	1000 FNL	2500 FEL	NW	NE	11	23N	97W	Tom Brown Inc	PG	9775
No. 78	Hay Reservoir	2100 FNL	500 FEL	SE	NE	11	23N	97W	Tom Brown Inc	PG	9750
No. 47	Hay Reservoir	1320 FSL	1321 FEL	C	SE	11	23N	97W	Tom Brown Inc	PG	9950
No. 2	Hay Reservoir 15689a	1980 FSL	659 FWL	NW	SW	11	23N	97W	Tom Brown Inc	SI	11958
No. 58	Hay Reservoir Unit	1500 FSL	10 FWL	NW	SW	15	24N	97W	Tom Brown Inc	PG	10625
No. 9	Unit W-30397	1980 FSL	1980 FEL	NE	SW	15	24N	97W	Tom Brown Inc	PG	10839
No. 56	Hay Reservoir Unit	1900 FNL	1594 FWL	SE	NW	21	24N	97W	Tom Brown Inc	PG	10347
No. 64	Hay Reservoir Unit	1872 FNL	1548 FEL	SW	NE	21	24N	97W	Tom Brown Inc	PG	10404
No. 52	Hay Reservoir Unit	698 FNL	697 FEL	NE	NE	21	24N	97W	Tom Brown Inc	PG	10500
No. 8	Hay Reservoir Unit	1980 FSL	2183 FEL	NW	SE	21	24N	97W	Tom Brown Inc	PG	10376
No. 59	Hay Reservoir Unit	84 FNL	1809 FEL	NW	NE	22	24N	97W	Tom Brown Inc	PG	10700
No. 57	Hay Reservoir Unit	2216 FNL	2037 FEL	SW	NE	22	24N	97W	Tom Brown Inc	PG	10590
No. 53	Hay Reservoir Unit	1238 FSL	1323 FWL	SW	SW	22	24N	97W	Tom Brown Inc	PG	10420
No. 54	Hay Reservoir Unit	901 FNL	1800 FWL	NE	NW	22	24N	97W	Tom Brown Inc	PG	10620
No. 42	Hay Reservoir Unit	2695 FNL	358 FWL	NW	SW	22	24N	97W	Tom Brown Inc	SI	10306
No. 3	Hay Reservoir Unit	1980 FSL	1980 FEL	NW	SE	22	24N	97W	Tom Brown Inc	PG	11193
No. 67	Hay Reservoir	981 FSL	1081 FWL	SW	NW	23	24N	97W	Tom Brown Inc	PG	10400
No. 44	Hay Reservoir	330 FSL	600 FEL	SE	SE	26	24N	97W	Tom Brown Inc	PG	10500
No. 70	Hay Reservoir Unit	1088 FSL	1544 FWL	SE	SW	27	24N	97W	Tom Brown Inc	PG	10280
No. 66	Hay Reservoir Unit	1474 FNL	2598 FEL	SW	NE	27	24N	97W	Tom Brown Inc	PG	10350
No. 55	Hay Reservoir W30398	NI	1089 FWL	NW	SW	27	24N	97W	Tom Brown Inc	PG	10300
No. 43	Hay Reservoir Unit	606 FNL	538 FEL	NE	NE	27	24N	97W	Tom Brown Inc	PG	10410
No. 41	Hay Reservoir Unit	569 FNL	741 FWL	NW	NW	27	24N	97W	Tom Brown Inc	PG	10425

Well Number	Unit Or Lease Name	Footage NS	Footage EW	Qtr 1	Qtr 2	Sec.	Twp.	Rge.	Company	Status	Total Depth
No. 5	Hay Reservoir W30398	1980 FSL	1982 FEL	NW	SE	27	24N	97W	Tom Brown Inc	PG	11914
No. 68	Hay Reservoir Unit	352 FNL	2350 FWL	NE	NW	28	24N	97W	Tom Brown Inc	PG	10280
No. 69	Hay Reservoir Unit	1800 FNL	850 FEL	SE	NE	28	24N	97W	Tom Brown Inc	PG	10310
No. 71	Hay Reservoir Unit	2155 FNL	157 FWL	SW	NW	28	24N	97W	Tom Brown Inc	PG	10200
No. 49	Hay Reservoir Unit	52 FNL	1500 FEL	NW	NE	28	24N	97W	Tom Brown Inc	PG	10531
No. 45	Hay Reservoir Unit	570 FSL	660 FEL	SE	SE	28	24N	97W	Tom Brown Inc	PG	10200
No. 11	Hay Reservoir Unit	1980 FNL	1985 FWL	SE	NW	28	24N	97W	Tom Brown Inc	PG	10141
No. 19	Hay Reservoir Unit	1980 FNL	1980 FEL	SW	NE	33	24N	97W	Tom Brown Inc	PG	9828
No. 46	Hay Reservoir Unit	692 FNL	1145 FEL	NE	NE	34	24N	97W	Tom Brown Inc	PG	10425
No. 6R	Hay Reservoir Unit	2231 FNL	2032 FWL	SE	NW	34	24N	97W	Tom Brown Inc	PG	10190
No. 81	Hay Reservoir Unit	1474 FNL	1042 FEL	SE	NE	35	24N	97W	Tom Brown Inc	PG	10150
No. 80	Hay Reservoir Unit	2000 FSL	500 FWL	NW	SW	35	24N	97W	Tom Brown Inc	PG	10082
No. 1	Hay Reservoir Unit	1980 FNL	1978 FWL	SW	NE	35	24N	97W	Tom Brown Inc	PG	10132
No. 85	Hay Reservoir Unit	658 FNL	1800 FWL	NE	NW	36	24N	97W	Tom Brown Inc	PG	10300
No. 86	Hay Reservoir	1500 FSL	2400 FWL	NE	SW	36	24N	97W	Tom Brown Inc	PO	10300
No. 50	Hay Reservoir	545 FSL	1099 FWL	SW	SW	36	24N	97W	Tom Brown Inc	PG	10175
No. 15	Hay Reservoir	2180 FNL	1924 FEL	SW	NE	36	24N	97W	Tom Brown Inc	PG	10309
No. 77	Hay Reservoir Unit	900 FSL	991 FEL	SE	SE	36	24N	97W	Tom Brown Inc	PG	10265
No. 76	Hay Reservoir Unit	2266 FSL	725 FWL	NW	SW	36	24N	97W	Tom Brown Inc	PG	10204

Source: WOGCC, 2004

Prior to commencement of drilling for each well, the Operator would file with the BLM and/or the WOGCC an Application for Permit to Drill (APD) containing technical drilling information and surface use information. The drilling plan and surface use plan would be in conformance with Federal Oil and Gas Onshore Orders Nos. 1 and 2 and applicable regulations of the WOGCC. This EA will disclose and analyze the effects of the Proposed Action and alternatives in detail. Any further necessary site-specific protection measures or operational requirements for a well could be addressed as attached Conditions of Approval (COA) in the APD permitting process. Separate Right-of-Way (ROW) permits would be obtained for access roads outside of the HRU. Pipeline easements would be filed for under the ROW process as well. The specific requirements and mitigation for individual well locations, roads, and/or pipelines are reviewed, discussed and approved within these filings. Site-specific environmental analyses would be conducted for well locations and associated facilities prior to approval of operations. Many of the issues addressed in the individual APD's and ROW filings are discussed below. Prior to commencement of construction operations, Operator will have secured all applicable federal, state, or local permits from the appropriate government agencies. See **Appendix A** for a listing of all government agencies with jurisdiction over this Project.

If travel outside of the Project Area were necessary for access to proposed well locations, surface agreements with private surface owner(s) would be completed prior to conducting well location, pipeline and road construction. Within the Project Area, the Operator has secured a Surface Use Agreement (SUA) and grazing lease agreement with the surface owner and lessee of the grazing rights on state land.

### **2.1.1 Construction, Drilling, and Completion**

The HRIP Proposed Project was developed in consultation with the BLM and in consideration of comments received during public scoping. The 30 day public scoping period ended April 26, 2004. Comments were received from 9 individuals, groups, or government agencies. The Proponent and its contractors consulted with the BLM Project Interdisciplinary Team (ID Team) staff May 12, 2004 to review the comments and incorporate suggestions from the comments, where warranted, into the EA. In some cases, comments led to the incorporation of mitigative measures into the design of the Proposed Action. Additional applicant-committed mitigation measures have been listed in **Appendix B**. Subsequent to onsite inspections and site-specific EAs completed by the BLM, additional mitigations may be required as Conditions of Approval which would be attached to federal drilling permits.

#### **2.1.1.1 Access Road Construction, Road Use, and Transportation Plan**

Currently, there are approximately 37.0 miles of roads which service well locations within the Project Area, as indicated on **Figure 1.2**, the Project Map. Roads in the HRU are generally of two classifications: 1) Local Road (double lane) and, mainly, 2) Resource Road (single lane). It is estimated that approximately 8.0 miles of additional proposed resource roads would be needed to access proposed well locations. Although the final locations of proposed wells are undetermined at this time, the general development area of most of the wells will be in the

southern portion of the HRU. An extensive network of roads already exists to serve the HRU, reducing the requirements for proposed road construction. A study of likely well locations indicated that 5.0 miles of additional resource roads would be required to develop that scenario. To be conservative, a figure of 8.0 miles has been assumed for this EA.

Roads would be constructed in accordance with the specifications outlined in the BLM Road Standards Manual, Section 9113 and the BLM/USFS Gold Book as shown in cross section on **Figure 2.1**. Surface disturbance would generally be less than 40 feet in width, but occasionally surface disturbance widths of up to 60 feet could result where unique conditions (such as requirement of flat-bottomed ditches) dictate. The typical travel surface would be between 14 and 16 feet wide for resource roads, with turnouts as per BLM-9113 as noted above.

Local contractors would be used for the construction of each road. Two or three people would be needed for construction. The length of time to complete each road would vary. A well location access road of approximately 1/2 mile would take one or two days depending on weather conditions. All roads would be constructed with native materials and maintained to provide safe operating conditions at all times as determined by the BLM. Surfacing with gravel, scoria, or other approved materials would be used where required by BLM. Brush would be removed and windrowed along the road. The topsoil would be windrowed as specified in the APD or ROW grant. Some topsoil would be removed from roads and used to reclaim cut slopes on permanent roads.

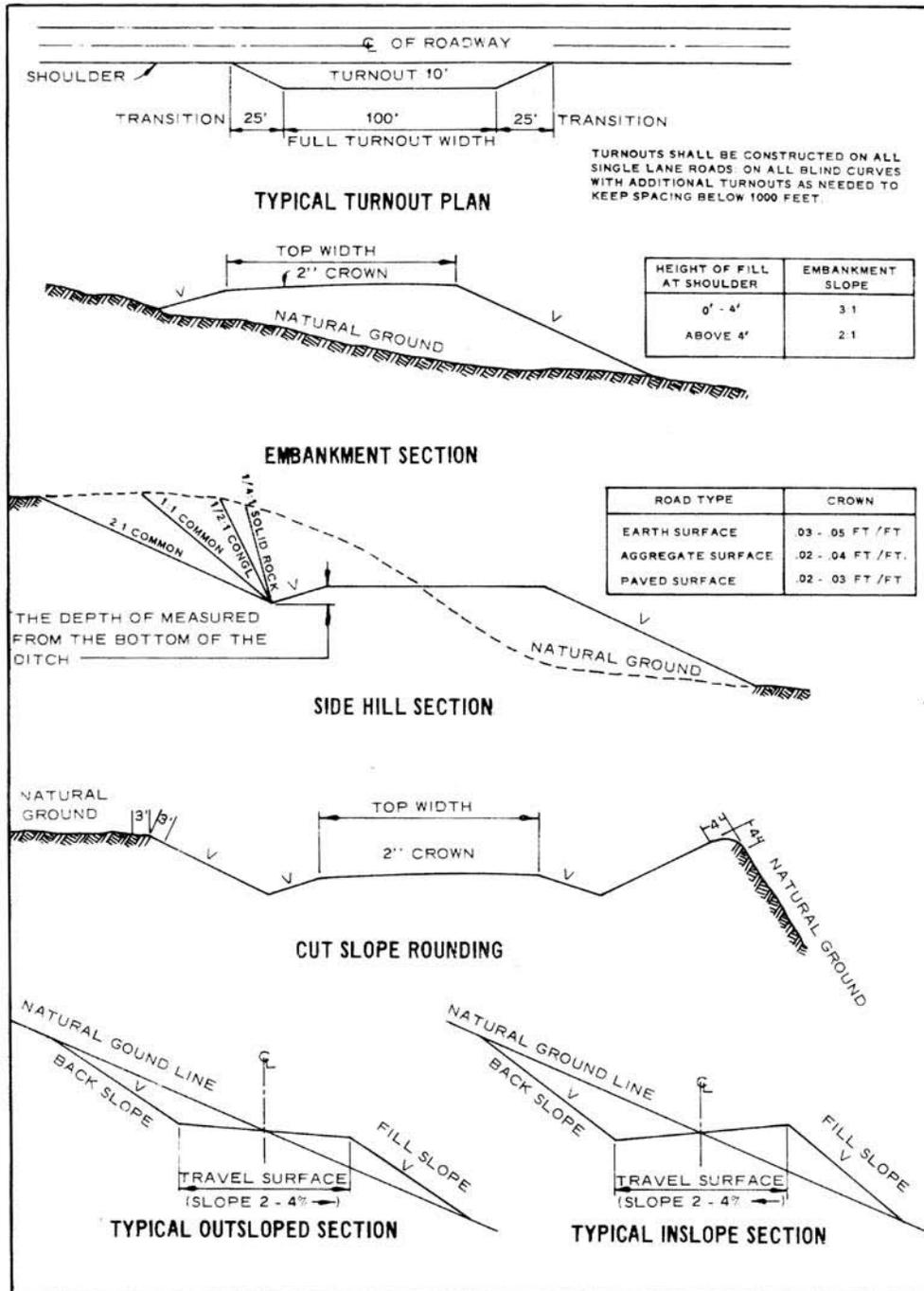
An area of active sand dunes is located immediately to the south of the Hay Reservoir Unit and some existing wells are located proximal to sand dunes. The Proposed Action does not include drilling locations or associated roads constructed in active dunes and therefore no provisions are made in this EA regarding special road construction techniques required for dune fields.

During the construction, drilling, and completion phases of the Project there would be approximately 10 vehicle trips per day to and from the proposed well location, including 50% light truck traffic and 50% transport or heavy truck traffic. During the operation, reclamation, and maintenance phase of the Project, there would be approximately 1-3 trips per day. Vehicles utilized would include pickup trucks for personnel transportation, flatbed semi-trailer trucks for transporting construction implements, rig components, tanks, and casing, and other intermediate size trucks for activities such as water hauling, well logging and perforating.

Authorization from the BLM would be obtained prior to any road construction activity through the APD and/or ROW process, including a site-specific EA. Other proper authorities would be consulted as necessary. Operator would obtain all necessary federal, state, and local permits necessary for conducting operations prior to implementation and construction.

## Figure 2.1 Typical Roadway Construction Plans

(Source: Surface Operating Standards for Oil and Gas Exploration and Development ("Gold Book"), 1989)



### 2.1.1.2 Well Location Construction

The surface disturbance area for each well location, including reserve pit, cut/fill side slopes and soil stockpiles, would be up to 3 acres in size. It is anticipated that this size would be required for safety during drilling and completion operations (assuming two wellbores drilled from a single well location). If only one wellbore were to be drilled from a well location, the disturbance area would be approximately 3.0 acres in size. Well location preparation would require that vegetation and topsoil be removed. Depending on the site-specific conditions and available topsoil in place, 2-12 inches of topsoil would be removed and stockpiled. The amount would be determined by the Operator and the BLM at the time of the onsite meeting during the APD process. The topsoil would be separated from excess “cut” material and stockpiled for future use in reclamation. The well location would be leveled using standard cut-and-fill construction techniques and construction machinery. **Figure 2.2** shows a typical drilling well location layout.

Well pads would be located at least 500 feet from any riparian vegetation. There is no perennial water within the vicinity of the Project Area. All locations and any ancillary production facilities would be situated at elevations above the level of the Hay Reservoir spillway. Each location would be provided with a Storm Water Pollution Prevention Plan (SWPPP) approved by WDEQ.

A reserve pit would be excavated at each well location to temporarily store drilling fluids (mud), rock cuttings, and any water which may be produced during drilling. It is estimated that a total of 5,000-20,000 cubic yards of material would be excavated with the construction of each well location and associated reserve pit. Approximately 15% of excavated material would be topsoil, 50% would be reserve pit contents, and 35% would be the cut material from the well pad. Reserve pits would be lined. The liner would be made of synthetic material of sufficient size and qualities to sustain a hydraulic conductivity no greater than  $1 \times 10^{-7}$  cm/sec after installation, and which is sufficiently reinforced to withstand normal wear and tear associated with the installation and use thereof. The liner would be chemically compatible with all substances which would be placed in the pit. All reserve pits would be fenced with woven-wire stock fence as typically required by specific permit to ensure that wandering wildlife or livestock do not intrude. Netting would be installed over the pit to protect wildlife species, in particular waterfowl, if potentially harmful or toxic substances were discharged to the reserve pit.

Construction operations would be described in detail in the individual Surface Use Plans which will accompany each federal APD, in addition to site-specific EAs required to comply with the provisions of NEPA as implemented by the BLM

### 2.1.1.3 Drilling Operations

It is anticipated that the project would be completed using one drilling rig with the possibility that a second rig could be added. The rigs would be of sufficient size to be capable of drilling wells to a total depth of approximately 10,000 feet. Rigging-up, the preparation of the rig for drilling at the site, typically requires 1-3 days and employs approximately 20 people for construction. The drilling phase is estimated to take approximately 21 days. During that time

there would be from 5 to 12 people at the well location, with possibly twice that number during shift changes. As many as 4 supervisory people could be residing at the location during various times of the drilling phase. This would include the Operator's representative, wellsite geologist and/or mud logger, and drilling contractor's tool pusher (supervisor), all of whom would reside in trailers onsite and located on the well pad. On occasion, some contractors provide a bunkhouse on location which would house 8 drilling personnel for several days at a time. This would reduce the number of vehicle trips per day by two.

Sewage disposal facilities require Wyoming Department of Environmental Quality (WDEQ) approval. Facilities would be self-contained chemical toilets and waste would be disposed of in accordance with state and local regulations. Garbage would be contained in a portable trash cage totally enclosed with small mesh wire and which would be transported to an approved sanitary landfill at the completion of operations.

The drilling rigs are powered by diesel engines. Diesel fuel is supplied to the well location during drilling and completion operations by tanker truck, and is stored onsite in tanks during operations. Excess diesel fuel is hauled from the site at the end of drilling and completion activities.

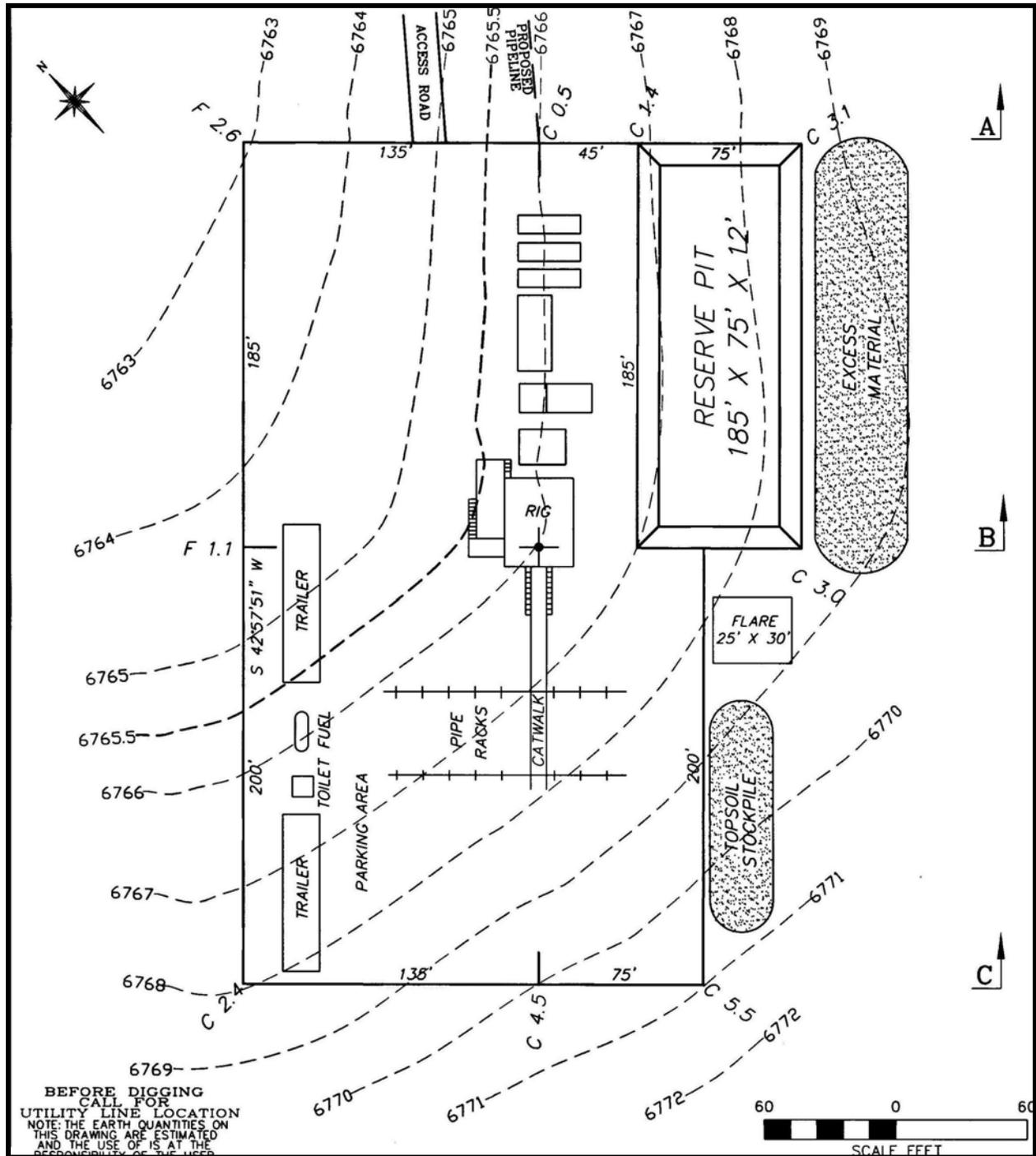
Drilling fluids, known as muds, are used to lubricate and cool the drill bit, raise drilled rock cuttings to the surface, help protect fresh water zones, and help control underground pressure while drilling the well. The muds would consist primarily of fresh water and powdered bentonite, a natural clay. Water for the muds would be obtained from a water well operated by Tom Brown, Inc., the TBI Hay Reservoir WSW in the center of Section 26, T94N, R97W. The well has a permit in good standing from the Wyoming State Engineer's Office (WSEO). Water would be hauled to the drilling locations by tanker truck. Surface drilling would be done with bentonite gel/fresh water. Near total depth, a gel-polymer/fresh water system would be used. Muds would be mixed on location from dry and liquid components hauled to the rig from nearby towns. All drilling mud additives, are classified as exempt (non-toxic) under the Resource Conservation and Recovery Act (RCRA) guidelines. The specific mud program for each well would be included in the APD.

All drilling programs would include a string (lengths of connected drill pipes or casing sections) of conductor casing (+16 inch diameter) set at a depth of 40-80 feet. Surface casing (8-5/8 or 9-5/8 inch diameter) would be set at a minimum depth of 1,500 feet and cemented from total depth to surface. Casing setting depths and cement programs would be stated in the APD, reviewed and approved on a well-by-well basis, and would comply with BLM Onshore Order #2. An 11-inch blowout preventer (BOP), rated at 5,000 pounds per square inch (psi), would be installed on the surface casing prior to drilling to total depth. The BOP would be pressure-tested at installation and at other required intervals per Onshore Order #2.

Technical specifications of the drilling operations would be included with individual Drilling Prognoses filed with each federal APD.

**Figure 2.2 Typical Drilling Well Location Layout**

Source: Wind Dancer Natural Gas Development Project Environmental Assessment



#### **2.1.1.4 Completion Operations**

Production casing (4½ or 5½ inch diameter) would be installed from total depth to surface for all wells anticipated to produce gas (See well bore diagram, **Fig. 2.3**). Production casing would not be installed in any wells that are determined to be uneconomical. Any well determined to be uneconomical would be plugged and abandoned per BLM and/or Wyoming Oil and Gas Conservation Commission requirements (See Section 2.1.3 Reclamation and Abandonment, below). Casing would be cemented in place by a well cementing service company crew using specialized equipment which mixes dry cement and water into a slurry, and which is then pumped down the well. During the running-in and cementing of the production casing, an additional 8 people would be on location.

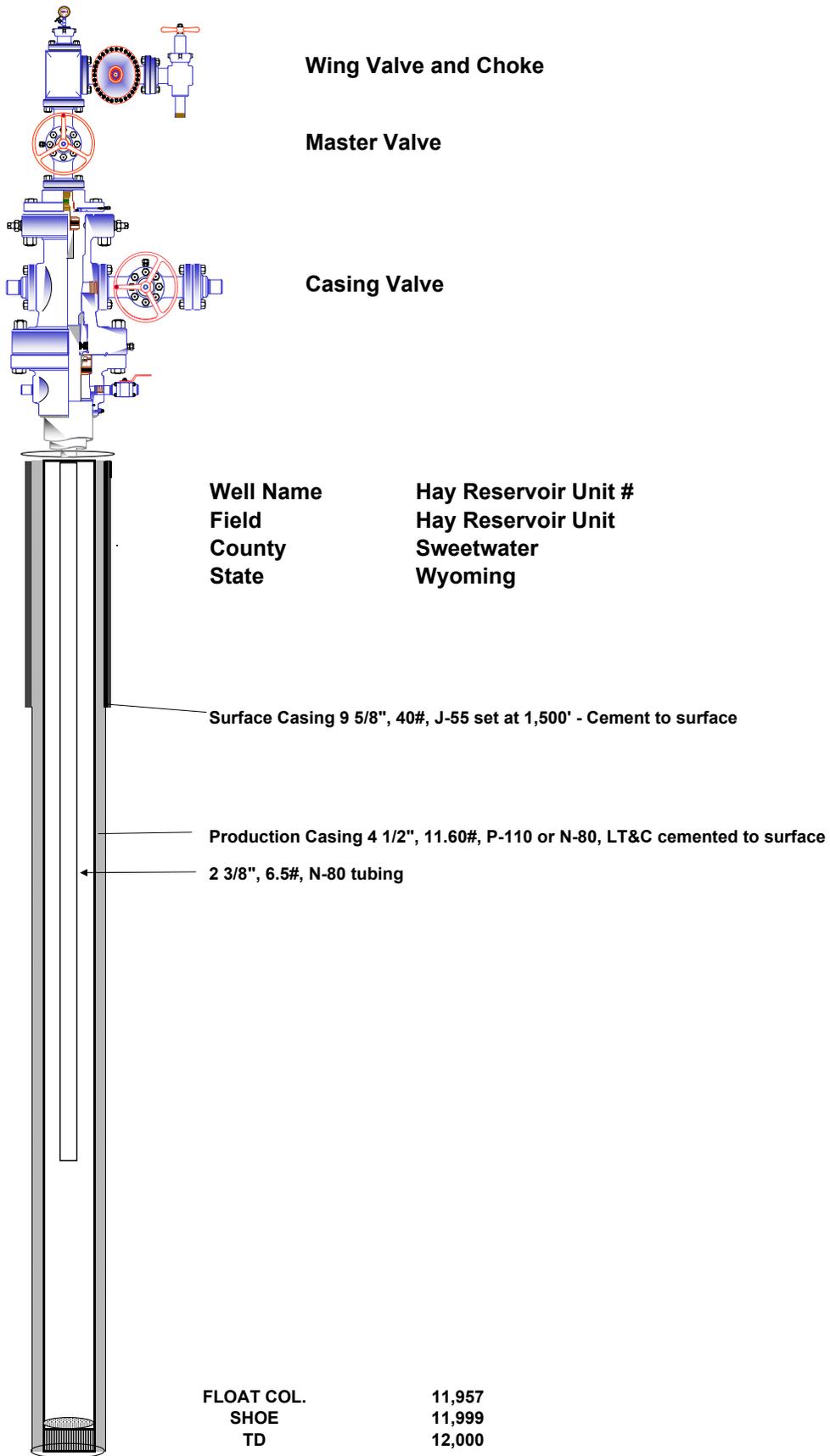
Once the production casing is cemented in place, the drilling rig would be moved off the location. Completion procedures would then be carried out with a smaller service rig. After ensuring that the casing is cleaned out, a cement bond log would be run to evaluate the adequacy of the cement job. Upon determining that the cement sheath is adequate, the producing formation would be perforated. If the sheath were determined to be inadequate, additional cementing would be completed. The perforating of the casing and cement sheath would be accomplished by a perforating tool assembly, which fires shaped explosive charges. These charges penetrate the casing, cement, and producing formation. The holes allow formation fluids (primarily natural gas and condensate at Hay Reservoir) to enter the wellbore. Completion operations are expected to last approximately 7 to 14 days. During completion operations, 3-30 people would be on location, including service rig crew, perforating and/or other service company personnel, and supervisory personnel.

#### **2.1.1.5 Well Stimulation and Production Testing**

After perforating, the well would be allowed to flow if it were capable of doing so, and the produced fluids would be measured or estimated. Typically, because the sandstone producing zones at the Hay Reservoir Unit have low permeabilities, the wells often require fracture stimulation. This treatment would be done by pumping fluids (typically polymer-gelled fresh water) down the wellbore and into the productive zone under pressures sufficiently high to fracture the rock formation. Sand grains, glass beads, or other similar materials, called proppants, are carried in suspension by the fluids into the fractures. These proppants remain when the pumping ceases. The polymer is designed to break down within a few hours and the thinned fluid is allowed to flow back to the surface at controlled rates. The remaining proppant prevents closure of the induced fractures and allows the reservoir fluids to flow more efficiently into the wellbore. Hydrocarbon liquids would be separated and stored in steel tanks on location until removed for sale. Fresh water would be flowed to a pit during production testing and allowed to evaporate.

**Figure 2.3 Well Bore Diagram**

**Hay Reservoir Unit**  
 Typical Lewis/Almond Completion



Six or seven people would likely be on location during production testing, but nearly all would be commuting to the location except for the testing personnel who are on location 24 hours per day. Production testing for HRIP wells is anticipated to take 3-15 days.

### **2.1.1.6 Production Facilities**

Once the well has been tested and determined to be economically commercial, it would be equipped for production. Tubing would be placed in the well to conduct the flow of gas and liquids to the surface. The tubing string also provides a safety measure by causing any deterioration to take place on the tubing, which is removable and repairable, instead of the permanent production casing. **Figure 2.3** shows the tubing string inside the casing.

A series of valves (the “tree”), designed to regulate the flow of gas and liquids from the well, would be installed on top of the wellhead, which is in turn attached to the casing (**Figure 2.3**). Pressure gauges would be installed on the wellhead and tree to monitor casing and tubing pressures and maximize well production.

Once the gas passes through the tree, it is routed to a gas production unit, which is a high pressure, separator that isolates the three phases of the well production ( natural gas; condensate, and water). The natural gas enters a sales pipeline, the liquids flow to tanks. **Figure 2.4** is a schematic of a productive well location. Condensate would be diverted to separate storage tanks for eventual sale. Condensate would be removed by tanker truck. Produced water, if any, would be flowed to a tank for eventual transportation to an approved water disposal facility (See Part 2.1.2 below regarding disposition of produced water).

In order to maintain aesthetic values, all permanent and semi-permanent facilities would be painted Munsell Soil Color Chart “Shale Green” (5Y 4/2) standard environmental color unless a different color is approved by the Authorized Officer.

Firewalls/containment dikes would be constructed and maintained around all storage facilities/batteries. The containment structure will have sufficient volume to contain, at a minimum, 110% of the entire contents of the largest tank within the facility/battery, per Spill Prevention Control and Countermeasure Plan regulations as required under 40 CFR, Part 112.

### **2.1.1.7 Ancillary Facilities**

Gas compression for the entire HRU is provided by the Hay Reservoir Compressor Station, located in NENE Section 18, T23N R96W, outside the Project Area. Gas from the HRU is transported via pipeline to the Red Desert Gas Plant, located in Section 7, T19N, R96W, approximately 20 miles south of the federal unit. Previously, many wells in the unit were equipped with individual well compressors. Over time, these have been replaced with the single centralized facility. The station is powered by two Waukesha 7042 engines rated at 1,380 horsepower (hp) each. Production from existing wells in the HRU has declined over the years and the Operator is confident that the existing compression facility will be sufficient to accept all gas developed under the Proposed Action. Additional compression is not proposed.

### 2.1.1.8 Pipelines

Currently, there are approximately 42.3 miles of pipeline serving the existing wells within the HRIP as identified on **Figure 1.2**. It is estimated that an additional 8.0 miles of pipeline would be needed to service the additional wells that would be drilled. Pipelines to connect the proposed wells would commonly be required to follow proposed or existing road disturbance, where feasible. This EA has estimated that an additional 8.0 miles of resource roads would be required to construct the Proposed Action (Section 2.1.1.1). The same figure is used for estimated proposed pipeline construction. The main pipeline system interconnect to the Red Desert Plant is adequate to handle the anticipated additional production. Authorization for any additional or new pipelines would be applied for separately through the BLM ROW application or APD process, following completion of site-specific EAs to ensure NEPA compliance.

New natural gas pipelines would become part of the existing gas transportation system owned and operated by Mountain Gas Resources, Inc. which is a subsidiary of Western Gas Resources. All necessary authorizing actions for natural gas pipelines would be addressed on a case-by-case basis. New gas pipelines would be 4 to 6 inches in diameter and the distance from a new well to the existing gathering system would average one half mile. The maximum width of the pipeline construction ROW and short-term disturbance area would be 50 feet. The ROW would be placed adjacent to existing roads and pipelines where possible. **Figure 2.5** illustrates typical pipeline installation procedures within a 50-foot ROW adjacent to an existing pipeline. Following completion of construction, the permanent pipeline ROW would be reduced to a width of 30 feet. Wherever feasible, pipelines would be located within corridors adjacent to existing or proposed roads.

Construction methods are specified in the individual Application for Right-of Way, Plan of Development. These would be reviewed and approved or modified as agreed to by BLM and Western Gas. Construction details, including topsoil stripping, trenching, pipe type and installation, backfilling, ripping compacted surface, topsoil replacement and reseeding would be considered at this time. Additionally, technical points of pipeline design such as location and number of clean-out ports or “pig launchers” and “pig receivers” would be stated, as well as pressure test methods and maximum test pressures. Pressure testing would be completed before the trenches would be backfilled. Hydrostatic pressure testing would not be used. Location of pipelines and the clean-out “pig launchers” and “pig catchers” would conform to the existing transportation system and would be designed to minimize travel off existing roads and/or production locations. It is estimated that well hook-up would occur 30-60 days after the well would be completed.

As soon as feasible following the installation of additional pipelines, typically during the spring or fall, the ground would be returned to natural contour, and seeded with a seed mix as agreed upon by Western Gas Resources and the BLM (see Section 2.1.3 for typical seed mixes).

## **2.1.2 Production Operations and Maintenance**

In the vicinity of the HRIP, wells produce in a range of 200 thousand cubic feet of gas per day (MCFD) to over 5 million cubic feet of gas per day (MMCFD), between 1 and 30 barrels of condensate per day (BCPD), and a range of 1 to 30 barrels of water per day (BWPD),. The gas would be transported from the well by pipeline, and the condensate would be hauled out by tanker truck at such time as approximately 240 barrels were accumulated in the storage tanks. Produced water would be managed per Onshore Order #7. All produced water will be temporarily stored on-site in tanks, and then trucked in 80-120 barrel quantities to a WOGCC-approved disposal facility located near Wamsutter. No injection disposal wells are planned for the Proposed Action.

### **2.1.2.1 Maintenance**

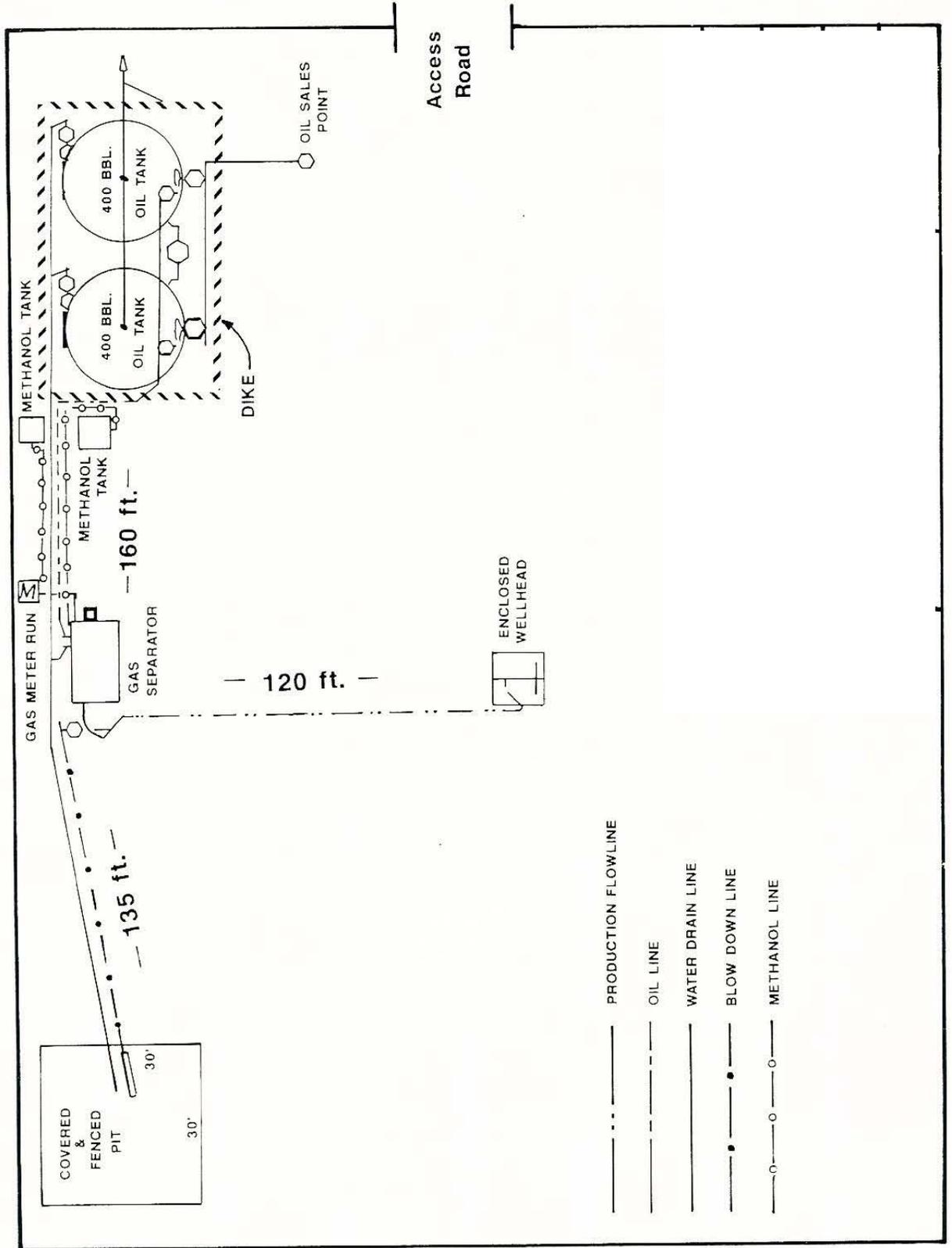
Routine maintenance of the producing wells would be necessary to maximize performance and detect operational difficulties. Company personnel, known as pumpers, would visit each well location daily to ensure that operations are proceeding efficiently and safely. This visit would include, but would not be limited to, checking gauges, valves, fittings, and on-site water and condensate storage. Routine on-site equipment maintenance would also be performed.

Pipelines would be periodically patrolled and inspected by pipeline personnel on foot or by vehicle to check for problems such as erosion, right-of-way condition, unauthorized encroachment and any other situations which could cause a safety hazard or require preventive maintenance.

The Operator would be responsible for preventive and corrective road maintenance on all areas covered by the ROW grant and approved APD, from the beginning to completion of operations and as affected by their operations. On roads under BLM jurisdiction with multiple rights-of-way issued, the Operator will enter into a joint maintenance agreement with all other ROW holders. This would include, but not be limited to, snow removal, blading the roadways, cleaning ditches and drainage facilities, or other requirements as directed by the Authorized Officer. Weed control will conform to the requirements and decisions found in the BLM EIS entitled "Vegetation Treatment on BLM Lands" (BLM, 1991).. Prior to herbicide application, the BLM would be contacted and a Pesticide Use Permit obtained. Where necessary and required by BLM, gravel would be placed on roadways.

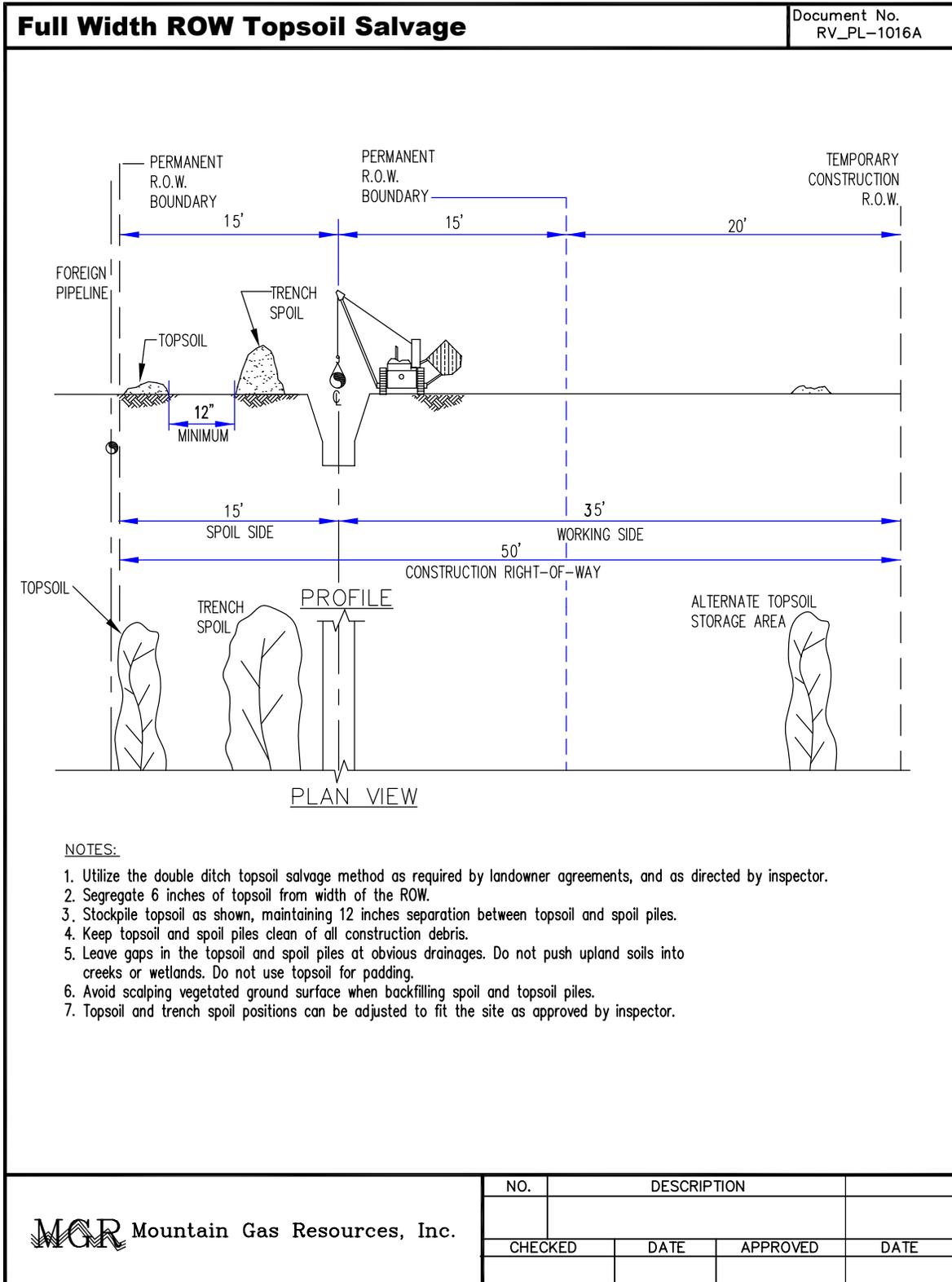
**Figure 2.4 Typical Producing Well Location Layout**

Source: Wind Dancer Natural Gas Development Project Environmental Assessment



## Figure 2.5 Typical Pipeline Installation

Source: Western Gas Resources



### **2.1.2.2 Workovers**

If a well's performance is considered by company personnel to be below its potential, the well would be subjected to remedial action, known as a "workover", to improve its production. This action could entail removing the production tubing from the well, stimulating the formation, cleaning obstructing material from the well, or other activity. Workovers for the types of wells with an average production rate of less than 5 barrels of water per day (BWPD), would be performed with a truck-mounted completion rig. Workovers occur an average of once every 5 years. The traffic associated with a workover would be similar to that of a completion. However, it takes approximately 10 days for a workover as opposed to 15 days for a completion. Fluids generated during workover operations would be handled as indicated above in Section 2.1.1.4, Completion Operations and Section 2.1.1.5, Production Testing.

### **2.1.2.3 Characteristics of Produced Gas**

The Lance, Lewis, Almond and Ericson gas streams consist predominately of methane gas with some heavier hydrocarbon gases. Trace amounts of nitrogen and carbon dioxide are produced. Hydrogen sulfide (H<sub>2</sub>S) is not present in the gas streams.

## **2.1.3 Reclamation and Abandonment**

The BLM Wyoming State Office has issued the following goal statement with respect to reclamation (Instruction Memorandum No. WY-90-231):

The Wyoming BLM's primary long-term goal for reclamation is eventual ecosystem reconstruction. This means to return the land to a condition approximate or equal to that which existed prior to disturbance or to a stable and productive condition compatible with that described in the land use plan. Our short-term reclamation goal is to immediately stabilize disturbed areas and protect both disturbed and adjacent undisturbed areas from unnecessary degradation.

The Operator intends on complying with BLM's reclamation policy. After installation of production equipment, the producing well location would be reduced from an area of approximately 3 acres to an area of approximately 1.5 acres. All unneeded, previously disturbed areas would be recontoured, then "ripped" 12"-18" deep to relieve compaction. Topsoil proportionate to the acreage reclaimed and consistent with the site-specific plan approved with the APD would be spread over the recontoured portion of the well location and would be reseeded within one or two years, subject to weather conditions and time of year of the reseeded. The depth of topsoil redistributed would be equivalent to the depth removed at time of construction. (See Section 2.1.1.2, Well Location Construction). The remaining topsoil stockpile would be stabilized by seeding with a recommended seed mixture and left in place until the well location is ultimately reclaimed at the end of its productive life. Reseeding would be performed on outside portions of the road disturbance not needed to maintain the road. This would be 6 feet or more on both sides of the road. Reseeding would also be performed over the entire disturbed area of the pipeline ROW's, reducing the overall disturbance area. The entire

well location area and access roads for all unproductive locations would be reclaimed within two years, according to BLM requirements.

Seeding would typically take place during the spring and fall “seed window” as determined by the BLM, subject to weather conditions. Erosion control methods as agreed to by BLM and the Operator would be implemented. These could include water bars on contours, water diversion ditches, and other methods as appropriate on a site-specific basis. Compacted soils will be ripped 12 to 18 inches deep prior to reseeded.

At the end of the project’s useful life (10-30 years or more), the Operator would obtain any necessary authorization from the appropriate regulatory agency to abandon facilities. Orders for procedure to plug and abandon the wells and production facilities would be received from the BLM. Plugging and abandonment of a well would be consistent with the guidelines and regulations of the WOGCC. The gas wells would be permanently plugged, or temporarily shut-in until decisions are reached regarding future production options. Upon abandonment, the pipelines would be purged of all combustible products and retired in place to avoid unnecessary additional disturbance. All above-ground facilities would be removed, and all recontouring and reseeded of disturbed land areas (if applicable) would be completed. Abandoned ROWs would revert to the appropriate agency control.

When determining to abandon the facilities authorized by each grant and/or permit, the Operator would contact the Authorized Officer to arrange a joint inspection of the ROW and well location. The inspection would be held to review implementation of abandonment procedures and the reclamation plan.

All disturbed areas not needed for production which had previously been covered with vegetation would be stabilized and revegetated following the drilling phase. Surface areas that previously had no vegetation would not be seeded unless it is determined by BLM that removing and replacing soil material might improve conditions that would make vegetation growth possible.

All disturbed areas will be seeded with the seed mixture provided in the Master SUP. Some proposed seed types for the various soils are indicated in **Table 2.2**. The actual seed mixture and seed quantity would be determined by the BLM and the Operator at the time of the APD or ROW application and reviewed at the time of seeding.

**Table 2.2 Proposed Reclamation Seed Mix**

Species	Scientific Name	Variety	Pounds PLS/Acre*
<b>Grasses</b>			
Slender wheatgrass	<i>Agropyron techycaulum</i>		2.0
Thickspike wheatgrass	<i>Agropyron dasystachyum</i>	Critana	4.0
Western wheatgrass	<i>Agropyron smithii</i>		2.0
Indian ricegrass	<i>Oryzopsis hymenoides</i>		1.0
Bottlebrush squirreltail	<i>Sitanion hystrix</i>		1.0
Needle-and-thread	<i>Stipa comata</i>		1.0
<b>Shrubs</b>			
Gardner's saltbush	<i>Atriplex gardnerii</i>		1.0
<b>Total</b>			<b>12.0</b>

Cited seed rates are for drill seeding, in pounds pure live seed (PLS) For broadcast seeding, double the rates indicated.

Seed will be broadcast or drilled depending on site conditions. Applicant would monitor reclamation effectiveness and replant, if needed, until successful.

**2.1.4 Summary and Mitigation Measures**

Implementation of the Proposed Action would result in short-term and long-term disturbances to the surface. Long-term disturbance is that associated with the life of the Project. Short-term disturbance would occur during a portion of the Project life, typically prior to commencement of the production phase. Short-term disturbance would affect approximately 138 acres, or 1.1 percent of the Project Area. Well pads represent the largest component of short-term disturbance. Interim reclamation would occur after a well is drilled, completed, and pipelines and compressor stations are installed. Interim reclamation restores areas not needed for production to their approximate original state. Existing long-term disturbance within the HRU is approximately 318 acres. This represents a reduction of approximately 9% in total long-term disturbance within the federal unit resulting from reclamation of abandoned wells. After interim reclamation takes place, the Proposed Action's disturbance would be reduced to approximately 81 acres, or 0.7 percent of the Project Area. Total long-term existing and proposed disturbance would be approximately 400 acres, or 3.4% of the HRU.

A summary of short- and long-term disturbance associated with the Project is indicated in **Table 2.3**.

**Table 2.3 Disturbance Summary, Proposed Action**

Facility	Short-Term Disturbance			Long-Term Disturbance		
	Length (Mis) or Count	ROW (Feet)	Area (Acs.)	Length (Mis) or Count	ROW (Feet)	Area (Acs.)
<b>EXISTING</b>						
Roads				37.03		
Local		NA		8.83	40	42.8
Resource		NA		28.20	15	51.3
Wells		NA		47	1.5 Acs./pad	70.5
Pipelines		NA		42.30	30	153.8
Total Existing						318.4
<b>PROPOSED</b>						
Roads (Est.)						
Local	0.00	40	0.0	0.00	40	0.0
Resource	8.00	15	14.5	8.00	15	14.5
Wells	25	3.0 Acs/pad	75.0	25	1.5 Acs./pad	37.5
Pipelines (Est.)	8.00	50	48.5	8.00	30	29.1
Total Proposed			138.0			81.1
Total Proposed and Existing			456.4			399.5

The results of the scoping process were used to identify major issues of concern regarding the Proposed Action. The BLM and the Operator have identified appropriate mitigation measures designed to minimize potential impacts from the Project. Some of these measures have been incorporated by the Operator into the design of the Proposed Action. Other applicant-committed mitigation measures are indicated in **Appendix B**.

## 2.2 NO ACTION ALTERNATIVE

The National Environmental Policy Act (NEPA) requires that a “no action” alternative be considered in all environmental documents. For the HRIP proposal, the “no action” alternative would preclude the oil and gas development described in the Proposed Action. The No Action alternative would not, however, preclude the future consideration or proposal of additional development. It is likely, furthermore, that proposals for development of the oil and gas resources in this area, and possibly actual development, would continue outside the unit at their current rate.

Examples of findings that could result in selection of this alternative include:

- 1) the level or rate of development is no longer in the best interest of the public;
- 2) endangered or threatened species and/or their habitat would be adversely affected; or
- 3) the environmental impacts of the proposed action are unacceptable.

Federal, state, and fee oil and gas leases grant the right and privilege to drill for, mine, extract, remove, and dispose of all the oil and gas deposits in the leased lands, subject to the terms and conditions incorporated in the lease. The denial of the right to drill could void the lessee's contractual rights.

## **2.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL**

Some of the issues raised during the scoping process suggested potential alternatives to the Proposed Action. These issues have been examined and a determination has been made that:

- The suggested alternative is non-viable for reasons indicated, or
- Applicant-committed mitigation measures will eliminate or mitigate the concern.

Proposed alternatives are required to be technically and economically feasible and to provide the opportunity to achieve the Proposed Project (CEQ, Forty Questions, 2a).

BLM-mandated directional drilling was considered as an alternative. However, it was decided that the geologic nature of the target horizons, comprising series of discontinuous, lenticular, low permeability sand reservoirs at both shallow and deep stratigraphic levels, rendered mandatory directional drilling technology technically and economically unfeasible. While directional drilling may be possible in some, perhaps many cases, mandating that every single well be directionally drilled is not reasonable or practical in this case. Under the Proposed Action, directional drilling would be available to the Operator where such technological requirements are warranted, such as the situation of reaching a specific target below the Hay Reservoir.

There is currently a citizen's proposal to designate an area of approximately 20,000 acres around the dry Red Lake, west of the Hay Reservoir Unit, a Wilderness Study Area (WSA). The proposal includes a portion of the existing federal unit. The proposal was not analyzed in detail because:

- Designation of WSAs is beyond the scope of this analysis;
- The BLM can not legally designate WSAs; and
- The proposed WSA is located within an area of extensive leasing and development.

The responses from the public scoping period were considered to identify any unresolved resource conflicts. The BLM determined that no unresolved resource conflicts remained, with mitigation, that would require analysis of additional alternatives.

# CHAPTER 3 - AFFECTED ENVIRONMENT

## 3.0 INTRODUCTION

Implementation of the HRIP could potentially affect certain critical elements of the human environment, as defined in the BLM Handbook H-1790-1 (NEPA Handbook), Appendix 5, as amended. These elements must, at a minimum, be considered in all EAs developed by the BLM. The status of the critical elements for the HRIP are indicated in **Table 3.1**.

**Table 3.1 Critical Elements of the Human Environment, HRIP**

Element	N/A or Not Present	Applicable or Present, No Impact	Discussed in EA
Air Quality			X
Areas of Critical Environmental Concern (ACEC)	X		
Cultural Resources			X
Environmental Justice			X
Farm Lands (Prime or Unique)	X		
Floodplains	X		
Invasive, Non-Native Species			X
Migratory Birds			X
Native American Religious Concerns			X
Threatened or Endangered Species			X
Wastes, Hazardous or Solid			X
Water Quality Drinking/Ground		X	X
Wetlands/Riparian Zones		X	X
Wild and Scenic Rivers	X		
Wilderness	X		

Source: BLM, 2003f

If the resource or value is not present or is not affected by the Proposed Action, this will be documented as a negative declaration. These items will not be discussed further in this EA. In addition to the critical elements, this EA discusses the current status and potential environmental effects from the Project in the areas of geology, minerals, and paleontology, climate and air quality, soils, water resources, vegetation and invasive weeds, range resources, wildlife and special status species, recreation, visual resources, cultural resources, socioeconomics, transportation, health and safety, and noise.

## 3.1 GEOLOGY, MINERALS, AND PALEONTOLOGY

### 3.1.1 Geology

The Project Area lies within the Great Divide Basin of southwestern Wyoming. The basin is bounded by the Rock Springs Uplift on the southwest, the Wind River Mountains on the north, the Rawlins Uplift on the north and east, and the Wamsutter Arch on the south. The current structural setting was determined during the Laramide Orogeny (Late Cretaceous-Late Eocene)

with the creation of the mountain uplifts as sediment sources and the intermontane basins as sediment receptors (Mallory, 1972, pgs. 35-44).

Surface rocks in the area are comprised of brown sandstones, carbonaceous shales, and coal from the Niland Tongue of the Tertiary Wasatch Formation; oil shales, carbonaceous shales, and coal from the Luman Tongue of the Tertiary Green River Formation; dunal sands and loess (including active and dormant dunes) from the Quaternary period; and clay, silt, and fine sand from playa lake and other lacustrine deposits from the Quaternary period. Underlying rocks penetrated by drilling are the Tertiary Fort Union Formation, the Upper Cretaceous Lance Formation, the gas productive Cretaceous Lewis Formation, and the underlying Cretaceous Mesaverde Group. The latter unit is subdivided in the Project Area into the Almond Formation, Ericson Sandstone, Rock Springs Formation, and Blair Formation, in descending order. Virtually all of the subsurface rocks are composed of lenticular, discontinuous sand and shale units deposited in fluvial to marine marginal environments (Love and Christiansen, 1985).

Surface deposits within the vicinity of the Project Area are dominated by residuum mixed with alluvium, eolian clastics, and slopewash. Alluvial deposits with subsidiary amounts of residuum, slopewash, and eolian clastics are more common in southern portions of the Project Area and eolian deposits dominate T23N, R97W. Playa deposits are scattered throughout much of the area and lake deposits occur in association with Hay Reservoir and Lost Creek Lake (Case *et al*, 1998).

Rock units below the Upper Cretaceous would not be penetrated by HRIP drilling, and are not discussed further in this EA. A stratigraphic column illustrating the Project Area Tertiary and Upper Cretaceous rock units is indicated in **Figure 3.1**.

### **3.1.2 Mineral Resources**

Mineral resources with proven economic reserves known at this time are limited to gas and condensate. All of the Upper Cretaceous units noted above are known to be productive within the vicinity of the Project Area. There are currently 47 producing wells located within the Project Area. WOGCC data (WOGCC, 2004, online data) indicate that 61 wells have been completed in the Hay Reservoir Field, including those within the HRU. Production is from the Almond, Lance, Lewis and Mesaverde formations, with the Lewis Formation accounting for almost all of the 152 billion cubic feet (BCF) of gas produced from the Hay Reservoir Field since discovery in 1977 (WOGCC, 2004, online data). The HRU is located immediately west of the Wind Dancer Exploratory Unit (WDU). The WDU contains five existing producing gas wells and approval has recently been granted by BLM to drill up to an additional 12 locations. Existing and expected production is from the same horizons that are productive within the HRU (BLM, 2004a, pgs. 2-1 to 2-2).

Although underlain by coal-bearing strata, the Project Area is not within an area with coal development potential (BLM, 1987, Map 24). Uranium is present north and east of the study area, but is not known to exist within the Project Area (BLM, 1987, Map 27). Potentially commercial aggregate materials are located in alluvial deposits to the north of the Project Area (Harris, 1996) and sodium sulfate deposits have been located in the Lost Creek Lake area

approximately six miles east of the Project Area (Harris et al., 1985). Oil and gas development does not preclude development of other minerals if they should be determined to be economically viable in the future. There is no other known economically important mineral resource in the area.

### **3.1.3 Geological Hazards**

There are no known noteworthy geological hazards in the Project Area (Case, 1986; Case, 1986a; Case, 1997; Case and Boyd, 1987; Case and Green, 2000; Newman, 2004, personal communication).

### **3.1.4 Paleontologic Resources**

Surface formations in the Project Area are composed primarily of the Niland Tongue of the Wasatch Formation and, in the southwest portion of the Project Area, the Luman Tongue of the Green River Formation, both of Eocene age (Love and Christiansen, 1985). No scientifically important paleontological resources have been identified within the areas of potential disturbance (BLM, 2003).

The BLM is cooperating with the USFS Rocky Mountain Region and the University of Wyoming in an experimental program to classify geological formations according to their probability of containing vertebrate fossil resources. The classification system is being developed by the Paleontology Center for Excellence. The paleontological classification system is designed to provide BLM management with a way to prioritize protection of paleontological resources. The program has resulted in the development of the Probable Fossil Yield Classification (PFYC) system. The objective of the program is to develop a predictive model that will better focus agency management activities and budgets for protection of paleontological resources. Under this system, surficial formations are classified on a scale of 1 (lowest) to 5 (highest) to reflect the likelihood of containing vertebrate fossils. Numeric classifications have been developed for both geological formations and individual localities; however, formation rankings determine what formations are investigated in detail. Locality or site rankings provide an indication of the presence of fossils in exposures of a given formation at a specified site.

Under the PFYC classification system, both the Wasatch and Green River formations are ranked as PFYC Class 5 (Newman, 2004, personal communication).

Figure 3.1 Stratigraphic Column, HRIP Area

Period	Formations	Project Area Production
<p style="text-align: center;"><b>Tertiary</b></p>	<p>The Tertiary section shows the Wasatch Formation at the top, which tapers to the right and meets the Green River Formation. Below the Wasatch are the Tipton, Niland, and Luman Toggles, which are wedge-shaped units. The base of the Tertiary section is labeled as the Main Body.</p>	
	<p style="text-align: center;"><b>Upper Cretaceous</b></p>	Ft. Union Formation
Lance Fm.		
<p>Fox Hills Ss.</p>		
<p>Lewis Sh.</p>		
<p>Mesaverde Grp.</p> <p>Almond Fm.</p>		
<p>Ericson Ss.</p>		
<p>Rock Springs Fm.</p>		

Source: Love and Christiansen, 1985, as modified from McMillen and Winn, 1991

## 3.2 CLIMATE AND AIR QUALITY

### 3.2.1 Climate and Precipitation

The Project Area lies within the Great Divide Air Basin (BLM, 1987, Map 42), in which the terrain is essentially homogeneous and regional transport is from the southwest throughout the year (Western Regional Climate Center, 2004, online data). Elevations range generally from approximately 6,600 to approximately 6,900 feet above sea level. The main air quality pollutant is total suspended particulates (TSP). The concentration of pollutants is inversely proportional to wind speed. Wind speed data from Rawlins, on the eastern edge of the air basin, tend to indicate adequate dispersion potential in the Project Area (BLM, 1987, Figure 9). Average annual wind speed in the Rawlins area, located 60 miles east southeast of the Project Area, is approximately 13.6 mph, and average annual precipitation is less than 10 inches (Western Regional Climate Center, 2004, online data). Average annual pan evaporation measured at Green River, approximately 60 miles to the southwest, is 50.25 inches (Western Regional Climate Center, 2004, online data).

Precipitation data from the nearest station at Wamsutter, approximately 25 miles south, indicates average annual precipitation of approximately 7.5 inches (Curtis and Grimes, 2004, online data). Mean annual temperature is 41.4 degrees Fahrenheit, mean annual minimum temperature is 27.3 degrees Fahrenheit, and mean annual maximum temperature is 55.2 degrees. January is the coldest month with mean minimum temperature of 8.1 degrees Fahrenheit. July is the hottest month with mean maximum temperature of 83.7 degrees Fahrenheit. The area receives a mean of 18.2 inches of snow annually (NOAA, 2004, online data).

### 3.2.2 Air Quality

Air quality modeling has not been conducted within the Project Area. Regional background air quality data, however, suggest that local air quality conditions are well within minimums for both Wyoming Ambient Air Quality Standards (WAAQS) and National Ambient Air Quality Standards (NAAQS). The area is characterized by few emission sources and good atmospheric dispersion conditions (BLM, 2003a, pg. 3-14). With respect to classification in terms of Prevention of Significant Deterioration (PSD) of air quality values, the Project Area is a Class II area. A summary of some regional criteria pollutant background levels is indicated in **Table 3.2**.

**Table 3.2 Regional Air Pollutant Background Concentrations and State and Federal Ambient Air Quality Standards, HRIP ( $\mu\text{g}/\text{m}^3$ )**

Pollutant/Averaging Time	Measured Background Concentration	State and National Ambient Air Quality Standards	PSD Class I Increment	PSD Class II Increment
Carbon Monoxide (CO) <sup>1</sup> 1-hour	2,299	40,000	None	None
	1,148	10,000	None	None
Nitrogen dioxide (NO <sub>2</sub> ) <sup>2</sup> Annual	3.4	100	2.5	25

Pollutant/Averaging Time	Measured Background Concentration	State and National Ambient Air Quality Standards	PSD Class I Increment	PSD Class II Increment
Ozone <sup>3</sup>				
1-hour	169	235	None	None
8-hour	147	157	None	None
Particulate Matter (PM <sub>10</sub> ) <sup>4</sup>				
24-Hour	47	150	8	30
Annual	16	50	4	17
Particulate Matter (PM <sub>2.5</sub> ) <sup>4</sup>				
24-Hour*	15	65	None	None
Annual*	5	15	None	None
Sulfur dioxide (SO <sub>2</sub> ) <sup>5</sup>				
3-hour	29	1,300	25	512
24-hour	18	260	5	91
Annual	5	80	2	20

\* WDEQ-AQD will not enforce the PM2.5 standard pending issuance of an implementation rule by EPA. (WDEQ-AQD, 2002)

1. CDPHE, 1996 - Data collected at Rifle and Mack, Colorado in conjunction with proposed oil shale development during early 1980s.
2. Background data collected at Green River Basin Visibility Study site, Green River, Wyoming, during period January-December 2001 (ARS, 2002).
3. Background data collected at Green River Basin Visibility Study site, Green River, Wyoming, during period June 10, 1998 through December 31, 2001 (ARS, 2002).
4. Background data collected by WDEQ-AQD at Emerson Building, Cheyenne, Wyoming, Year 2002.
5. CDPHE-APCD 1996 - Data collected at the Craig Power Plant site and at Colorado oil shale areas from 1980 to 1984.

Source: Desolation Flats Natural Gas Field Development Final EIS, Table 3.8, Sweetwater and Carbon counties, WY, 2004.

### 3.3 SOILS

#### 3.3.1 Soil Types within the HRIP Area

Soils within the Project Area are forming in mostly residual sandy materials weathering from the sandstones and shales of the Wasatch and Green River formations (Love and Christiansen, 1985) within the Great Divide Basin of southwestern Wyoming. Limited areas of alluvium and aeolian deposits occupy some of the drainage bottoms in the mostly rolling topography of the Project Area. Soils mapping compiled in the STATSGO data based (NRCS, 1995) identifies three mapping units within the boundaries of the HRIP as indicated in **Table 3.3**.

**Table 3.3 STATSGO Soil Information, HRIP**

STATSGO Unit ID	Unit Name	Location	HRIP Area (Acres)	% Area
WY 139	Huguston-Teagulf-Wint	Northwestern and Southeastern Project Area	7,206	62.0%
WY 170	Dines-Fluvents-Chrisman	Central Project Area along Red Creek drainage and including Hay Reservoir	3,341	28.8%
WY 173	Dune Land-Cotopaxi-Terada	Southern Project Area	1,068	9.2%
TOTAL			11,615	100.0%

Source: STATSGO soil mapping

The dominant upland soils are predominately fine sandy loam to loam surface soils over bedrock to loamy subsoils that are shallow to moderately deep and well drained. Slopes range from gently sloping (3 percent) to steep (30 percent) with some isolated rock outcrops supporting very steep slopes (75 percent). The remaining mostly upland soils, occupying lower slopes, range from fine sandy loam to loam surface soils over fine sand to sandy clay loam subsoils that are moderately deep to deep and well drained. Slopes range from level (0 percent) to sloping (6 percent).

The potential for accelerated soil water erosion and soil loss is limited to the mostly shallow to moderately deep soils of the steeper slopes (generally greater than 15 percent). Areas with slopes in excess of 15 percent represent approximately 5 to 10 percent of the Project Area. The potential for wind erosion is mostly moderate for the soils in the Project Area with the exception of the fine sandy soils forming in the limited aeolian dune deposits which make up about 9 percent of the Project Area.

Rogrube soils likely occupy the bottoms of the larger drainages and closed playas in the Project Area. These loamy soils comprise approximately 5 percent of the Project Area and have elevated salinity (4 to 8 mmhos/cm) and sodic (SAR) (5 to 8) levels in surface and subsoil horizons (NRCS, 1995). Surface horizon values for salinity and SAR range from 0 to 4 mmhos/cm (non-saline to slightly saline) and 2 to 5 (SAR values), respectively. Neither range of values for the surface horizon would pose limitations on vegetative productivity (BLM, 2003d).

### 3.4 WATER RESOURCES

Historical precipitation for the study area is reported by the National Weather Service Oceanic and Atmospheric Administration (NOAA) weather stations at Wamsutter, Bitter Creek, South Pass, and Sand Draw, Wyoming. These recording gauges surround the Project Area. The gauge elevations average is 7,243 feet above mean sea level. The average annual precipitation data for the gauges are: Wamsutter, 7.4 inches; Bitter Creek, 6.7 inches; South Pass, 14.1 inches; and Sand Draw, 9.66 inches. The Cyclone Rim precipitation gauge, located in Section 36, T25N, R96W, approximately six miles northeast of the Project Area, has recorded an annual

precipitation average of 4.75 inches (Calton, 2004, personal communication). The winter period (November 15 through April 30) accounts for approximately 20 percent of the average annual precipitation. Average annual pan evaporation measured at Seminoe Dam in Carbon County, approximately 80 miles to the east, is 36.21 inches. Average annual pan evaporation measured at Green River, approximately 60 miles to the southwest, is 50.25 inches (Western Regional Climate Center, 2004, online data).

### **3.4.1 Surface Water**

The Project Area is located within the Great Divide Basin physiographic province which is internally drained. Red Creek, which flows south from Cyclone Rim and Honeycomb Buttes into Hay Reservoir, crosses the south-central portion of the Project Area. Almost all of the Project Area drains into Red Creek. The extreme northern portion of the HRU drains north into Bush Creek which is itself a tributary of Red Creek. The confluence of Bush Creek with Red Creek is located approximately 2.5 miles northeast of the HRU. The main stem of Red Creek is a moderately entrenched alluvial channel dominated by a sand substrate throughout its length. Field examination by WDEQ personnel indicate the stream is appropriately classified as Riverine, Intermittent, Streambed, Temporarily Flooded by USFWS on its National Wetlands Inventory maps. All streams in the vicinity are ephemeral, flowing only in response to runoff. The water table remains below the channel bottom throughout the year. No evidence of emergent wetland vegetation has been observed along the channel, nor were seeps or springs identified. In September, 2002, Red Creek was reclassified by WDEQ from class 3B to class 4B, indicating a cessation from protection for aquatic life (WDEQ-WQD, 2002, online data). Due to the current drought conditions and extremely dry conditions in this basin, the limited run-off seeps into the ground and/or evaporates almost immediately.

Hay Reservoir is located within the eastern portion of the Project Area. The dam for the reservoir is on private land and in the past the dam had been maintained by ranchers, but washed out many years ago. The current landowner in recent years repaired the dam and the reservoir is again functional, holding water during infrequent runoff periods (Bargsten, 2004, personal communication).

### **3.4.2 Groundwater**

Groundwater aquifers in the area are principally lower Tertiary, primarily Wasatch and Ft. Union formations, although deeper aquifers in Upper Cretaceous sandstone units are known to exist. Aquifers within the Great Divide Basin comprise a portion of the Upper Colorado River Basin regional aquifer system (USGS, 1996).

#### **3.4.2.1 Wasatch-Ft. Union Aquifer**

Permeability of the lower Tertiary aquifers is variable and somewhat dependent on the degree of secondary porosity. The upper part of the Wasatch aquifer interfingers with shales and mudstones of the overlying Green River Formation, and portions of these units form the surface within the Project Area. The Wasatch-Ft. Union aquifer is frequently confined and artesian flows are common. Most of the freshwater within the Upper Colorado River Basin regional

aquifer system is contained within the Wasatch and Ft. Union formations. The combined thickness of the two contiguous units is approximately 7,000 feet near the center of the Great Divide Basin.

Potentiometric surface mapping of the Wasatch-Ft. Union aquifer indicates that groundwater flow is generally towards the center of the Great Divide Basin. A local depression of the surface in northeastern Sweetwater County is the result of extensive groundwater withdrawals. Estimated depth to groundwater is generally less than 200 feet in the vicinity of the Project Area (USGS, 1996, pg. I-19).

### **3.4.2.2 Mesaverde Aquifer**

Sandstone units within the Upper Cretaceous Mesaverde Group comprise the Mesaverde aquifer. Shales may form locally confined units, but in general the Mesaverde exists in hydraulic continuity with the overlying lower Tertiary aquifers. The Mesaverde, in turn, is hydraulically separated from underlying aquifers by thick, confining Lower Cretaceous shale formations. The Mesaverde is exposed around the margins of the Rock Springs Uplift, and relatively fresh water may extend a limited distance down dip. Groundwater flow is toward the central portion of the Great Divide Basin. In the deeper portions of the basin, the formation's groundwater tends to be saline or briny. In the vicinity of the Project Area, regional salinity, as measured by Total Dissolved Solids (TDS) values, is in the range of 3,000-35,000 mg/l (USGS, 1996, pg. I-19).

The online database of the Wyoming State Engineer's Office (WSEO) was searched for water well locations within one mile of the Project Area. Nine active permits were located as indicated in **Table 3.4**:

Data from the WSEO for the above and nearby wells with both active and voided water rights suggest that the shallow Wasatch aquifer is reached with wells of generally less than 500 feet depth. Static water levels typically ranged from 100 to 330 feet, but have been found as shallow as 30 feet. Actual yields from the shallow aquifer typically range from approximately 20 gallons per minute (gpm) to approximately 70 gpm. Wells in Section 36, T24N, R97W in the vicinity of the Hay Reservoir produced from a deeper Wasatch/Ft. Union aquifer at depths of approximately 3,200 feet to 5,200 feet. Artesian flow was observed with rates up to 225 gpm. Wells with currently valid permits near the Project Area are principally used for stock watering (WSEO, 2004, online data).

**Table 3.4 Active Water Well Permits Within One Mile of HRIP**

Permit #	Priority	Status	Twp.	Rge.	Sec.	Qtrqtr	Applicant	Facility Name	Uses
P10695P	7/1/1948	GST	24N	97W	17	NENE	Bureau Of Land Management	Rasmussen Well #1	STO
P127204W	7/20/2000	GSE	24N	97W	22	NWSW	USDI, Bureau Of Land Management**William H. & Sally Jolley	Luman #42	STO
P152043W	6/9/2003	GST	24N	97W	26	NESW	Tom Brown, Inc.	Hay Reservoir Camp Water Well #1	MIS
P156175W	5/6/2003	GSI	24N	97W	26	NESW	William H. & Sally Jolley** USDI, Bureau Of Land Management	Camp Well	MIS
P142290W	1/28/2002	GSI	24N	97W	29	NWNE	USDI, Bureau Of Land Management**William H. Jolley	Jolley # 1	STO
P155773W	5/6/2003	GST	24N	97W	35	SESE	William H. & Sally Jolley** USDI, Bureau Of Land Management	House Well	DOM,STO
P36618W	3/21/1977	GST	24N	97W	35	SESE	P H Livestock	Davis - Luman Ranch Water Well #1	STO
P156174W	5/6/2003	GST	23N	97W	11	NWNE	William H. & Sally Jolley** Wy State Board Of Land Commissioners	Old Well B. H.	STO
P55107W	12/24/1980	GST	23N	97W	13	SESE	USDI Blm, Rawlins District	Sand Dune	STO

Source: WSEO, 2004. GST - Good Standing, GSI - Good Standing Incomplete, GSE - Good Standing Extended.

A summary of characteristics of potential aquifers within the Project Area is indicated in **Table 3.5**.

**Table 3.5 Water-Bearing Characteristics of Some Formations, HRIP Area**

Formation	Approximate Depth,	Characteristics
Wasatch	Surface	Flows to 250 gpm, TDS < 2,800 ppm
Ft. Union	4,400	Flows to 300 gpm, TDS < 3,350 ppm
Lewis	10,600	Sands may have artesian flows
Almond	11,300	Flows to 100 gpm, TDS > 10,000 ppm

Source: BLM, Rawlins Field Office

Water produced in association with gas and condensate in the Hay Reservoir Unit is stored in on-site tanks prior to trucking to a disposal facility not located on BLM surface. Water production averages less than 5 bbls per day per well. No produced water is discharged to water courses or to the surface in the Project Area. The produced water exhibits TDS values greater than 10,000 ppm and is not suitable for stock-watering purposes (Webb, 2004b, personal communication).

### 3.5 VEGETATION, WETLANDS, AND INVASIVE WEEDS

#### 3.5.1 Vegetation Cover Types

Vegetative cover in the Project Area is representative of the semi-arid Wyoming Basin floristic region, where precipitation and soil parent material are controlling factors for plant composition. Vegetation may be sparse in areas. Cover of the Project Area is a mix of vegetation types typical of the basins of south-central Wyoming and is dominated by plant species that are drought tolerant: big sage, black sagebrush, rabbitbrush, winterfat, shadscale saltbush, Gardner saltbush, horsebrush, spiny hopsage, greasewood, bud sage, mustard, buckwheat, phlox, purple aster, paintbrush, cactus, thickspike wheatgrass, needle and thread, squirreltail, bluegrass, Indian and contracted ricegrass. The percent composition of major vegetation types within the Project Area is presented in **Table 3.6**.

**Table 3.6 Type and Relative Amounts of Vegetation within the HRIP Area**

Type	Relative Amount of Vegetation
Grassland	60%
Sagebrush	15%
Saltbush	10%
Greasewood	15%

\* Percentages are approximations from a recent survey near the Project Area and from the Hay Reservoir EA (BLM, 1992).

### **3.5.1.1 Grassland Type**

Within the Project Area, grasslands make up approximately 60 percent of the vegetative cover. The major grass species comprising this type are Indian ricegrass (*Oryzopsis hymenoides*), needle-and-thread (*Stipa comata*), bluebunch wheatgrass (*Agropyron spicatum*), western wheatgrass (*Agropyron smithii*), and thickspike wheatgrass (*Agropyron dasystachyum*) (BLM, 1992).

### **3.5.1.2 Sagebrush Type**

Wyoming Big sagebrush (*Artemisia tridentata wyomingensis*) is the most common constituent of the sagebrush type. Predominant associated species include black sagebrush (*Artemisia nova*), bud sagebrush (*Artemisia spinescens*), Douglas rabbitbrush (*Chrysothamnus vicidiflorus*), and rubber rabbitbrush (*Chrysothamnus nauseous*) (BLM, 1992).

### **3.5.1.3 Saltbush Type**

The dominant shrub is Gardener saltbush (*Atriplex nuttallii*) with shadscale saltbush (*Atriplex confertifolia*) and winterfat (*Ceratoides lanata*) common at some locations. Understory species include bluegrass (*Poa spp.*), bottlebrush squirreltail (*Sitanion hystrix*), Indian ricegrass, Phlox, and summer cypress (*Kochia americana*) (BLM, 1992).

### **3.5.1.4 Greasewood Type**

This type is normally located in narrow gulches and low flats which are heavily impregnated with alkali. Shrubs dominate the composition of this vegetation type. The dominant shrub is greasewood (*Sarcobatus vermiculatus*) with rabbitbrush and saltbush common in the overstory. Bottlebrush squirreltail, foxtail barley (*Hordeum jubatum*), and summer cypress are common in the understory (BLM, 1992).

## **3.5.2 Wetlands and Riparian Areas**

As indicated in Section 3.4.1, no evidence of emergent wetland vegetation has been observed along the channel of Red Creek (WDEQ-WQD, 2002, online data). Within the Project Area, riparian vegetation is limited to a small area immediately downstream of the Hay Reservoir dam.

## **3.5.3 Invasive/Noxious Weeds**

Increased occurrences of non-native invasive species, as well as those noxious weeds defined by Wyoming Statute (WS 11-5-102.a.xi) may accompany oil and gas development. Noxious weeds are defined as "the weeds, seeds or other plant parts that are considered detrimental, destructive, injurious or poisonous, either by virtue of their direct effect or as carriers of diseases or parasites that exist within this state, and are on the designated list" (National Agricultural Library, 2004, online data) The Wyoming Board of Agriculture has designated 24 species of noxious weeds. In addition, under authority of the Wyoming Weed and Pest Control Act of 1973 (WS 11-5-119), counties may designate additional weeds of concern.

The Project Area supports the following noxious weeds:

- hoary cress (*Cardaria spp.*)
- Russian knapweed (*Centaurea repens*)
- Canada thistle (*Cirsium arvense*)
- perennial pepperweed (wet areas) (*Lepidium latifolium*)
- saltcedar (*Tamarix spp.*)

A Sweetwater county weed of concern is black henbane (*Hyoscyamus niger*), which may occur along roads and ditches (Cotterman, 2004, personal communication). Other invasive species occurring in the project area are: halogeton (*Halogeton glomeratus*), gumweed (*Grindelia squarrosa*), and kochia (*Kochia scoparia*).

## **3.6 RANGE RESOURCES AND OTHER LAND USES**

Livestock management operations and oil and gas extraction characterize the major land uses in the Project Area.

### **3.6.1 Range Resources**

Due to arid conditions and limited water resources, livestock grazing of federal lands represents the primary form of agriculture in the HRIP. Federal allotment 10103, Cyclone Rim, comprising 291,954 acres of public lands and assigned 40,661 Animal Unit Months (AUMs) includes the entire HRIP (BLM, 2003). The primary livestock use within the HRIP is summer cattle with transitory winter sheep (Calton, 2004, personal communication). Estimated carrying capacity in the area is 9 to 11 acres per AUM, although this value may vary significantly depending upon individual site conditions, season, and type of livestock.

### **3.6.2 Other Land Uses**

The Project Area is comprised of approximately 11,618 acres of federal, State of Wyoming, and private surface. State of Wyoming surface comprises approximately 1,227 acres and an additional approximately 558 acres of surface is privately owned. Other land uses within and adjacent to the Project Area, in addition to livestock grazing, are wildlife habitat, oil and gas exploration, development and transmission, and dispersed recreation.

Conventional oil and gas resources have been developed in and around the HRIP. Fifty-two wells have been drilled in the Project Area with 47 currently in production. Approximately 321 acres have been disturbed by previous oil and gas development in the Project Area.

## 3.7 WILDLIFE AND FISHERIES

### 3.7.1 General Wildlife

Mammals found in the vicinity of the Project Area include jackrabbit (*Lepus spp.*), cottontail rabbit (*Sylvilagus spp.*), coyote (*Canis latrans*), Richardson's ground squirrel (*Spermophilus richardsonii*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), badger (*Taxidea taxus*), and various mice. Areas of tall (over 4 feet) sagebrush along drainages serve as wildlife corridors, providing hiding cover from predators as well as thermal shelter for wintering wildlife. White-tailed prairie dogs (*Cynomys leucurus*), a BLM sensitive species, is known from sagebrush plain areas (BLM, 1987; Whitaker, 1992).

Local bird species include horned lark (*Eremophila alpestris*), sage thrasher (*Oreoscoptes montanus*), mourning dove (*Zenaida macroura*), and common raven (*Corvus coras*). Small stock ponds in the vicinity of and immediately southwest of the Project Area and Hay Reservoir provide water for migratory waterfowl.

### 3.7.2 Big Game

Most of the Project Area is habitat for pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*). The combination of hills, rough breaks, draw and flats provide a mixture of microhabitat sites in terms of snow depth, exposure to wind, sun and forage availability. This is a dynamic system, as snow falls and then moves across the topography in response to the wind. Antelope and deer move around throughout the winter in response to weather conditions and the protection provided by these microhabitats. No crucial big game winter range has been identified within the Project Area (WGF, 2002).

Wyoming Game and Fish Department (WGF) has defined the entire Project Area as winter/year long range for antelope. A portion of the antelope population makes use of the local habitat on a year long basis. During the winter months (December 1 through April 30), the area is host to a sizeable influx of animals from other seasonal ranges. An antelope migration corridor has been identified extending from the northern end of the HRU several miles to the northwest. Antelope in the Project Area belong to WGF herd unit 615 (Red Desert) (WGF, 2002, GIS data). Herd Unit 615 comprises approximately 2.16 million acres. Estimated population counts for this herd unit for 2002 were 14,000 individuals with a target population of 15,000 (WGF, 2003, Lander Region, Red Desert Herd Unit, pgs 2-10).

WGF has defined a spring/summer/fall range for mule deer in an area around Hay Reservoir. A portion of the population frequents this range outside of the winter months (December 1 through April 30). The range around Hay Reservoir extends over approximately 70 percent of the Project Area, excluding only the northern and extreme western portions of the HRU. The defined range forms a rough rectangle about 40 sq. miles in extent, with Hay Reservoir in the northeastern part of the area. Segments of mule deer migration corridors have been identified several miles southwest of the HRU. Mule deer in the Project Area belong to WGF herd unit 430 (Steamboat) (WGF, 2002, GIS data). Herd Unit 430 comprises approximately 2.5 million acres. Estimated

population counts for this herd unit for 2002 were 3,100 individuals with a target population of 4,000 (WGF, 2003, Green River Region, Steamboat Herd Unit, pgs 202-222).

Wyoming Game and Fish observation data from 1986-1991 showed the number of antelope in the Project Area (T24N R96W) to be 239 and mule deer to be 4 (BLM, 1987, pg. 43). Antelope fawn production has been low in the Red Desert Herd Unit for at least ten years. Mule deer population in the Steamboat Herd Unit has grown slowly since 1993, until 2002 when an estimated 10% decline was observed. It is believed this decline is associated with the third year of severe drought in the area (WGF, 2003, Green River and Lander Region Herd Unit reports).

Elk (*Cervus elaphus*) are not commonly found in the study area. Sightings generally occur during hunting season when pressure from that activity tends to drive them from their normal habitat. WGF data indicate habitat within the Project Area is of limited importance to individuals in the area, a portion of herd unit 426 (Steamboat) (WGF, 2002, GIS data). Estimated population counts for this herd unit for 2002 were 1,660 individuals with a target population of 1,200 (WGF, 2003, Green River Region, Steamboat Herd Unit, pgs 270-290).

### **3.7.3 Upland Game Birds**

The Project Area is located within sagebrush/grassland habitat common in southwestern Wyoming. The Project Area potentially supports areas of prime habitat for greater sage-grouse (*Centrocercus urophasianus*). Important components of prime habitat for these birds are strutting grounds (leks), nesting grounds, and wintering areas; all of these components potentially occur in the vicinity of the Project Area. Within this EA, the term "sage-grouse" refers to the greater sage-grouse. Sage-grouse is designated a BLM sensitive species and is discussed further in Section 3.9.

### **3.7.4 Raptors**

The Project Area contains habitat suitable for raptors. A number of raptor species, including golden eagles (*Aquila chrysaetos*), northern harriers (*Circus cyaneus*), ferruginous hawks (*Buteo regalis*), Swainson's hawk (*Buteo swainsoni*), prairie falcon (*Falco mexicanus*), burrowing owl (*Athene cunicularia*), and red-tailed hawks (*Buteo jamaicensis*) have been observed in the vicinity of the Project Area.

Raptors are considered sensitive species and are also discussed in Section 3.9.

### 3.8 WILD HORSES

The Project Area lies near the juncture of three wild horse Herd Management Areas (HMA). The HRU is largely contained within the northwestern portion of the Lost Creek HMA. The Lost Creek HMA encompasses 250,000 acres, 94 per cent of which is BLM administered land. The BLM has established an appropriate management level (AML) for each HMA to ensure a balance among all users and resources. The AML for the Lost Creek HMA is 70 horses, with a current population estimated at 143 horses. The western portion of the Project Area is contained within the Great Divide Basin HMA which is managed by the BLM's Rock Springs Field Office. The HMA comprises approximately 780,000 acres, of which approximately 72 per cent is managed by BLM. The current AML for this HMA is 500 head, with an estimated current population of 812 horses. Approximately six miles north of the HRU is the Antelope Hills HMA which is managed by the BLM's Lander Field Office. The HMA comprises approximately 57,000 acres, of which approximately 96 per cent is managed by BLM. The current AML for this HMA is 60-82 head, and the current population is estimated at 166 horses (BLM, 2004b, online data; BLM, 2004c, pgs. 46 to 48). Use by horses in the Project Area may be considered transient (Bargsten, 2004a, personal communication).

### 3.9 SPECIAL STATUS PLANT, WILDLIFE, AND FISH SPECIES

For the purposes of this EA, special status species are those listed by the Fish and Wildlife Service (USFWS) as threatened, endangered, proposed, or candidate species (USFWS, 2003, online data); or species included on BLM's Wyoming state sensitive species list (BLM, 2002, online data); or on the WGF native status species list (Fertig et al., 1999, online data). Only those species which are known or suspected to occur within the vicinity of the Project Area are discussed.

#### 3.9.1 Threatened, Endangered, Proposed, or Candidate Species

Four federally designated species have the potential to exist within the vicinity of the Project Area, as indicated in **Table 3.7**.

**Table 3.7 Threatened and Endangered Species , HRIP Area**

Species	Scientific Name	Status
<b>Plants</b>		
Blowout pestemon	<i>Penstomen haydenii</i>	Endangered
Ute ladies'-tresses	<i>Spiranthes diluvialis</i>	Threatened
<b>Mammals</b>		
Black-footed ferrets	<i>Mustela nigripes</i>	Endangered
<b>Birds</b>		
Bald eagle	<i>Haliaeetus leucocephalus</i>	Threatened

Source: BLM, 2003c.

Although no threatened or endangered wildlife species (TES) have been observed in the study area, there is potential for three of these species to occur within the vicinity of the HRIP. Bald

eagle foraging probably takes place during winter, but this would be on an infrequent opportunistic basis. Bald eagles prefer habitat near water and cliffs or large trees for nesting. No such habitat exists in the area.

Black-footed ferrets have been sited in the vicinity of Wamsutter (approximately 30 miles SE) in 1977, 1978 and 1983. A white-tailed prairie dog complex approximately 450 acres in extent has been mapped in the vicinity of the Project Area (WGF, 1988, GIS data), indicating the potential presence of black-footed ferret habitat. Large prairie dog colonies have not been observed within the Project Area. (BLM, 2003c, pgs. 15-16; Falvey, 2004, personal communication). Although the USFWS has determined that portions of an area that includes the Project Area meet ferret habitat criteria, black-footed ferret surveys are no longer required in this township (Kelly, 2004, letter). However, to protect both potential black-footed ferret habitat and white-tailed prairie dog (a BLM Sensitive Species), the BLM does attempt to avoid impacts to prairie dog towns, which are also utilized by mountain plover, burrowing owls, and swift fox.

Two federally listed plant species were identified by the USFWS as potentially present in the general area. Ute ladies'-tresses (threatened) occurs in seasonally moist soils and wet meadow drainages below 7000 feet elevation. Blowout penstemon (endangered) has been documented in Wyoming from two occurrences located in northwestern Carbon County (University of Wyoming, 2004, online data). Habitat for Ute ladies'-tresses does not occur within the Project Area.

Blowout penstemon is restricted to sparsely vegetated, early successional, shifting sand dunes and the lee slopes of blowout depressions created by wind erosion, primarily on sandy aprons or the lower half of sandy slopes deposited at the base of mountains or ridges. Prior to its discovery in Wyoming in 1996 the plant was thought to be endemic to Nebraska. Wyoming populations occur at elevations of 6680-7440 feet exclusively on gently undulating dune fields associated with steep mountain slopes (University of Wyoming, 2004, online data). Nonetheless, the species' occurrence in Nebraska suggests that many sparsely vegetated dune fields would also constitute potential habitat. Sand dunes occur in the extreme southwestern corner of the Project Area and to the south of the HRU. This dune field has been surveyed recently for blowout penstemon by a BLM botanist, but no representatives of the species were identified (Falvey, 2004, personal communication).

As this is a closed drainage basin and does not contribute to the Colorado River watershed, there would be no impact on Colorado River endangered species.

If, through a biological assessment, the BLM determines that the Proposed Action may affect a listed species or critical habitat, consultation with the USFWS would be required.

### **3.9.2 Sensitive Species**

A number of animal and plant species potentially present in the Project Area have been accorded "sensitive species" status by BLM. Thirty-five of the 78 Wyoming species occur within the boundaries of the Rawlins Field Office (BLM, 2002, online data). Based upon habitat criteria,

sensitive species potentially present in the vicinity of the Project Area are indicated in **Table 3.8** (BLM, 2003c, pg. 19).

**Table 3.8 BLM Sensitive Species Potentially Found in the Vicinity of HRIP**

Common Name	Scientific Name	Agency Status	Heritage Program Status *
<b>Birds</b>			
Ferruginous hawk	<i>Buteo regalis</i>	BLM, FSR2	Not Listed
Western burrowing owl	<i>Athene cunicularia</i>	BLM, FSR2	G4/S3B,SZN
Mountain plover	<i>Charadrius montanus</i>	BLM, FSR2	G2/S2B,SZN
Loggerhead shrike	<i>Lanius ludovicianus</i>	BLM, FSR2	G5/S4B, SZN
Sage thrasher	<i>Oreoscoptes montanus</i>	BLM	G5/S3B, SZN
Baird's sparrow	<i>Ammodramus bairdii</i>	BLM, FSR2	G5/S3B, SZN
Brewer's sparrow	<i>Spizella breweri</i>	BLM, FSR2	G5/S3B,SZN
Grasshopper sparrow	<i>Ammodramus savannarum</i>	WYGF	G5/S3B,SZN
Sage sparrow	<i>Amphispiza belli</i>	BLM, FSR2	G5/S3B,SZN
Greater sage-grouse	<i>Centrocercus urophasianus</i>	BLM, FSR2	Not Listed
<b>Mammals</b>			
White-tailed prairie dog	<i>Cynomys leucurus</i>	BLM, FSR2	G4/S2S3
Swift fox	<i>Vulpes velox</i>	BLM, FSR2, WGF	G3/S2S3
Townsend's big-eared bat	<i>Plecotus townsendii</i>	BLM, FSR2, WGF	G4/S1B,S2N
<b>Plants</b>			
Nelson's milkvetch	<i>Astragalus nelsonianus</i>	BLM	G2/S2
Cedar rim thistle	<i>Cirsium aridum</i>	BLM	G2Q/S2
Gibben's beardtongue	<i>Penstemon gibbensii</i>	BLM	G1/S1

\* Heritage Program Rankings

FSR2 - Forest Service Region 2 Sensitive Species.

WYNDD uses a standardized ranking system developed by The Nature Conservancy's Natural Heritage Network to assess the global and statewide conservation status of each plant and animal species, subspecies, and variety. Each taxon is ranked on a scale of 1-5, from highest conservation concern to lowest. Codes are as follows:

G Global rank: Rank refers to the rangewide status of a species.

T Trinomial rank: Rank refers to the rangewide status of a subspecies or variety.

S State rank: Rank refers to the status of the taxon (species or subspecies) in Wyoming. State ranks differ from state to state.

1 Critically imperiled because of extreme rarity (often known from 5 or fewer extant occurrences or very few remaining individuals) or because some factor of a species' life history makes it vulnerable to extinction.

2 Imperiled because of rarity (often known from 6-20 occurrences) or because of factors demonstrably making a species vulnerable to extinction.

3 Rare or local throughout its range or found locally in a restricted range (usually known from 21-100 occurrences).

4 Apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.

5 Demonstrably secure, although the species may be rare in parts of its range, especially at the periphery.

H Known only from historical records. 1950 is the cutoff for plants; 1970 is the cutoff date for animals.

X Believed to be extinct.

A Accidental or vagrant: A taxon that is not known to regularly breed in the state or which appears very infrequently (typically refers to birds and bats).

B Breeding rank: A state rank modifier indicating the status of a migratory species during the breeding season (used mostly for migratory birds and bats).

N Nonbreeding rank: A state rank modifier indicating the status of a migratory species during the non-breeding season (used mostly for migratory birds and bats)

ZN or ZB Taxa that are not of significant concern in Wyoming during breeding (ZB) or non-breeding (ZN) seasons. Such taxa often are not encountered in the same locations from year to year.

U Possibly in peril, but status uncertain; more information is needed.

Q Questions exist regarding the taxonomic validity of a species, subspecies, or variety.

? Questions exist regarding the assigned G, T, or S rank of a taxon.

Western burrowing owls and loggerhead shrikes are summer residents of grasslands and prairie shrub habitat. Furthermore, Western burrowing owls also utilize prairie dog towns as nesting habitat. Sage thrashers and sage sparrows are found in prairie and mountain shrub environments. Brewer's sparrows are summer residents found principally in shrubland habitats. Baird's sparrows are uncommon summer residents typically found in short-grass prairie locales (Wyoming GAP Analysis, 2001, online data; Udvardy, 1993, BLM, 2002).

Swift fox are fairly common residents occurring over much of Wyoming and will also commonly utilize old prairie dog burrows as den locations. It is a mostly solitary, nocturnal predator. Townsend's big-eared bat is a widely distributed but rare species which forms nursing colonies in caves, mines, and sometimes buildings (Wyoming GAP Analysis, 2001, online data; Whitaker, 1992; Falvey, 2004, personal communication).

### **3.9.2.1 Raptors**

BLM digital mapping data from the Rawlins Field Office show 16 raptor nest sites within one mile of the Project Area, including five nests within the HRU (BLM, 2004d, GIS data). Thirteen of these have been identified as ferruginous hawk nests; two of the thirteen are artificial ferruginous hawk nest structures. The remaining three nests are: a burrowing owl (most likely within a prairie dog burrow); a Northern Harrier (ground nest); and a long-eared owl (nesting in a cottonwood tree). All of these three remaining nests are either within the project area, or within  $\frac{3}{4}$  of a mile of the project boundary. No raptor nests are known to occur within two miles of the portion of the Project Area under jurisdiction of the BLM Rock Springs field office (Alley, 2004, personal communication).

### **3.9.2.2 Mountain Plover**

Mountain plover was classified as a species proposed for listing by USFWS, but that agency has dropped the species from further consideration at this time. BLM considers this species as sensitive and protective measures continue to apply to actions potentially affecting mountain plover. Much of the Project Area has potential habitat for mountain plover, which is often associated with prairie dog towns. BLM biologists surveyed for the presence of mountain plover within the Project Area in late spring of 2004. Several plovers were noted exhibiting breeding behavior.

### **3.9.2.3 Sage-Grouse**

BLM records show six greater sage-grouse leks and/or nesting habitat within approximately six miles of the Project Area. Two leks occur within two miles of the Project Area. Consequently, there are portions of the Project Area within the BLM's two mile timing stipulation buffer for these leks, with construction (noise-producing activities) restricted between March 1 and June 30. Probable sage-grouse habitat is present in the Project Area. Statewide, sage-grouse have exhibited a fluctuating, but overall decreasing population trend since WGF began monitoring in 1967, although maximum lek count numbers in Wyoming have been fairly stable since 1984 (Connelly *et al*, 2004, pg. 6-59). Disruption and fragmentation of sagebrush habitat may be

responsible for a part of the long-term decline (Bill Barrett Corporation, 2004, pg. 3-87). The species has also shown a high sensitivity to West Nile virus (Bills, 2004, personal communication). On April 15, 2004, the USFWS announced its intention to initiate a review of the status of the greater sage-grouse. The notice initiated a 90-day review to determine whether to propose the species for listing as threatened or endangered.

### **3.9.3 White-Tailed Prairie Dog**

White-tailed prairie dogs inhabit sagebrush plains at higher elevations than those frequented by their black-tailed cousins. White-tailed prairie dogs are less colonial, with only a few of their burrows interlinked with those of other individuals (Whitaker, 1992, pg. 411). A 1988 aerial survey by Wyoming Game and Fish did not locate large prairie dog towns within three miles of the Project Area. Towns smaller than 20 acres were mapped by the survey (WGF, 1988, GIS data). Specific colonies have not been located within the Project Area, although BLM has not conducted recent surveys in the vicinity (Cline, 2004, personal communication).

### **3.9.4 Sensitive Plant Species**

Potential habitat for three sensitive plant species occurs within the Project Area. Nelson's milkvetch occurs in alkaline, seleniferous soils in sparsely vegetated shale slopes and sagebrush communities between 5,200 and 7,600 feet elevation. Cedar rim thistle occurs on barren chalky and sandy-shaley soils between 6,700 and 7,200 feet. Gibben's beardtongue may be found in habitats similar to cedar rim thistle, but at elevations both slightly lower and higher (BLM, 2002). The Wyoming Natural Diversity Database does not indicate occurrences of either cedar rim thistle or Gibben's beardtongue near the Project Area (Fertig *et al*, 1999, online data). As of fall, 2004, the BLM had not conducted specific surveys for these species within the Project Area and possible occurrences are undetermined (Blomquist, 2004, personal communication).

## **3.10 RECREATION**

Recreation activities within the Project Area are characterized as dispersed; there are no developed recreational facilities or sites (BLM, 2003). Primary activities in the area include hunting for pronghorn, mule deer, upland game birds, coyotes, and small game. Camping, hiking, wildlife and wild horse viewing, off-road vehicle (ORV) use, and general sightseeing are other recreational opportunities provided in the area inclusive of the Project Area.

## **3.11 VISUAL RESOURCES**

The landscape of the Project Area is rolling sagebrush steppe comprised mostly of grassland and sagebrush vegetation types. The varying level of sagebrush dominance is the major source of natural visual contrast across the area in addition to the mostly rolling terrain and isolated rim areas. The Project Area is mostly free of tall rock outcrops or abrupt breaks in slope, with Luman Butte near the center of the Project Area being the dominant topographic feature. Although natural scenes dominate the area, human intrusions include existing oil and gas wells, bladed and two-track roads, stock ponds, and fences.

The BLM-administered federal lands that comprise all of the Project Area are classified by the BLM using the Visual Resource Management (VRM) System. All lands within the Project Area are classified as Class III (BLM, 1990, map 24). This classification indicates that the grass and sagebrush lands appear moderately altered by oil and gas development and grazing improvements. Additional modifications to the landscape from new activities in the area should be compatible or complementary to the existing scenic character and be moderate in extent

### 3.12 CULTURAL RESOURCES

#### 3.12.1 Cultural Chronology of the Project Vicinity

Archaeological investigations in the Great Divide Basin and the Washakie Basin indicate the area has been inhabited by prehistoric people for at least 10,000 years, from Paleoindian occupation to the present. The accepted cultural chronology of the Washakie Basin is based on a model for the Wyoming Basin by Metcalf (1987) and revised by Thompson and Pastor (1995). The Wyoming Basin prehistoric chronology is documented in **Table 3.9**.

##### 3.12.1.1 Paleoindian Period

The oldest period for which there is archaeological evidence is the Paleoindian, beginning ca. 12,000 years B.P. and ending around 8500 B.P. This is the transition period from the periglacial conditions of the Wisconsin ice advance during the terminal Pleistocene to the warmer and drier climatic conditions of the Holocene. A savanna-like environment with higher precipitation than occurs today was prevalent in southwest Wyoming. Understanding paleoenvironmental conditions operating at the end of the Pleistocene and into the Holocene will provide insights into the articulation between human populations and the environment (Thompson and Pastor 1995). Paleoindian sites are rare in southwest Wyoming. However, isolated surface finds of Paleoindian projectile points are not uncommon and suggest that site preservation may be a major factor affecting the number of known sites. The Paleoindian tool assemblage includes lanceolate points, gravers, and end-scrapers.

**Table 3.9 Prehistoric Chronology of the Wyoming Basin.**

Period	Phase	Age (Years BP)
Paleoindian		12,000 - 8500
Early Archaic	Great Divide	8500 - 6500
	Opal	6500 - 4300
Late Archaic	Pine Spring	4300 - 2800
	Deadman Wash	2800-2000/1800
Late Prehistoric	Uinta	2000/1800 - 650
	Firehole	650 - 300/250
Protohistoric		300/250 - 150

Source: Metcalf (1987), as modified by Thompson and Pastor (1995)  
B.P. is before present

### 3.12.1.2 Archaic Period

Settlement and subsistence practices, in southwest Wyoming, remained largely unchanged from the end of the Paleoindian period through the Archaic and continued until at least the introduction of the horse, or even until Historic Contact. Reduced precipitation and warmer temperatures occurred ca. 8500 B.P. The environmental change at the end of the Paleoindian period led to a pattern of broad spectrum resource exploitation which is reflected in the subsistence and settlement practices of the Archaic period which became more diverse. The Archaic period is divided into the Early and the Late periods and subdivided into the Great Divide and Opal and the Pine Spring and Deadman Wash phases, respectively. Large side- and corner-notched dart points and housepits are found during the Archaic period. The presence of ground stone implements suggests a greater use of plant resources during the Archaic period. Faunal assemblages from Archaic components document increased use of small animals (Thompson and Pastor, 1995).

At the Yarmony site in northern Colorado, at least one housepit has been investigated which produced radiocarbon dates of ca. 6300 B.P. (Metcalf and Black, 1991). The Yarmony housepit is a large, semi-subterranean, two-room dwelling containing four slab-lined storage bins, interior hearths and other floor features. Large side-notched points have not been recovered from components dated to the Great Divide phase in the Wyoming Basin. The High Point site is a multi-component residential camp occupied during the Altithermal period and one of the only Early Archaic housepit sites discovered to date within the interior basin. Most other Archaic housepit sites are located along the margins of the basins or in the uplifted areas. Radiocarbon analysis of the High Point site (48CR1790) places the occupations in the Great Divide and the Opal phases of the Early Archaic period. The earliest dated context for side-notched points are Component I at Maxon Ranch (6400-6000 B.P.). Large side-notched points from the Great Basin and Colorado Plateau occur as early as 7000 years B.P. Radiocarbon dates have been recovered from one open camp site and a burial southeast of the Project Area in the Washakie Basin. Site 48CR698, a prehistoric open camp, dates to the Deadman Wash phase of the Late Archaic period at 2190 B.P. Site 48CR4001, the Cornwell Burial site, dates to the Pine Spring phase of the Late Archaic period at 3250 B.P.

### 3.12.1.3 Late Prehistoric Period

The Late Prehistoric period 2000/1800 B.P. is subdivided into the Uinta and the Firehole phases. Large-scale seed processing and an increase in the number of features including roasting pits is noted in the Late Prehistoric period as is the presence of pottery and the introduction of bow and arrow technology. A characteristic of the Uinta phase is clusters of semi-subterranean structures dating to ca. 1500 B.P. At least two different types of structures have been identified: a more substantial, cold weather habitation is present at the Nova site (Thompson 1989) and a less substantial, warm weather structure serving more as a windbreak, is present at the Buffalo Hump site (Harrell 1989).

The Firehole phase is distinguished from the preceding Uinta phase by a dramatic decline in radiocarbon dates possibly related to a decline in population density. The South Baxter Brush

Shelter site (Hoefler et al. 1992) and Firehole Basin 11 site (Metcalf and Treat 1979) are attributed to the Firehole phase.

#### **3.12.1.4 Protohistoric Period**

The Protohistoric period begins sometime after 300 years B. P. with the first European trade goods to reach the area, and ends with the development of the Rocky Mountain fur trade 150 years ago. The Wyoming Basin was the heart of Shoshone territory during this period, with occasional forays into the area by other groups such as the Crow and Ute (Smith 1974). The most profound influence on native cultures during this time was the introduction of the horse, enabling Native Americans to expand their range. All forms of rock art denoting horses, metal implements, and other Euro-American goods are associated with the Protohistoric period. These include the Upper Powder Spring Hunting Complex site (Murcray 1993). Metal projectile points have been recovered from both surface and subsurface contexts in southwest Wyoming.

#### **3.12.1.5 Historic**

Historic use of the area is generally confined to limited ranching activities. Historic trails have not been identified within or adjacent to the Project Area.

### **3.12.2 Previous investigations**

For the purpose of documenting all known cultural resource sites and previous Class III cultural resource investigations within the study area, a records search was conducted through the Wyoming State Historic Preservation Office (SHPO) Cultural Records Office (CRO). A total of 26 sections was researched. The 26 sections consist of approximately 17,500 acres, including and overlapping the Project Area. The CRO records search results revealed a total of 165 previous Class III cultural resource investigations and 49 previously recorded or reported sites, including 34 sites contained within the Project Area. The previous investigations were comprised of both small (well-related) block inventories and linear surveys, primarily from pipeline construction. The small block investigations accounted for surface inspection of 2,070 acres, or approximately 12 percent of the area covered by the CRO records search. Acreage inventoried from linear investigations could not be computed from the available information (Pastor, 2004, personal communication; BLM, 1992, pg. 26).

The sections for which a CRO records search was conducted for the Proposed Action are:

- T23N, R96W: Section 6
- T23N, R97W: Sections 1, 2, 3, 10, 11, and 12
- T24N, R96W: Sections 30 and 31
- T24N, R97W: Sections 14, 15, 16, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 33, 34, 35, and 36

There are relatively few sites recorded in relation to the number of previous investigations conducted. When the total number of investigations (165) is divided by the total number of recorded sites (49), it indicates that previous investigations have identified and recorded

approximately 0.3 cultural site per survey. It is apparent that the Project Area is one of relatively low site density. Of the 49 recorded sites, six sites have been evaluated as eligible for listing on the National Registry of Historic Places (NRHP), including three sites within the Project Area.

### **3.12.3 Site Types To Be Expected**

#### **3.12.2.1 Prehistoric**

Based on the CRO records search information, and inventories from nearby areas, the most common site types to be expected are those associated with camp/occupation sites. Sites exhibit a variety of activities and manifestations, which may include:

- camp/occupation sites (i.e. hearths, stone circles and possibly pit houses)
- food cooking and processing
- lithic workshops (exhibiting the latter stages of tool manufacture or tool reworking); an abundance of camp related tools (such as manos, metates, pottery, awls, graters and needles)
- lithic scatter
- isolated hearths

The CRO records search for the Project Area indicated a total of 42 sites from previous inventories containing prehistoric elements, including 31 sites from within the Project Area. Three of the sites were evaluated as eligible for NRHP listing (WCRO, 2004).

Given the relative flatness of the local terrain, all of these cultural site types can be expected in nearly any topographic situation present in the Project Area. Experience in the general area has shown that sites typically cluster along major collection drainages (such as Red Creek and Cronin Draw), around playa lakes and in select dunal situations. A few sites have been located on exposed ridges, which are generally areas of perceived higher site density.

Other site types which may be present include stone alignments (cairns, circles, and drive lines). These site types are generally found on the crests and upper slopes of ridges, the tops of buttes, and in some other elevated topographic situations.

#### **3.12.2.2 Historic**

Thirteen sites containing historic elements were listed in the CRO records search, including eight within the Project Area. The sites consisted of debris scatter and stock herding camps. None of the sites has been found eligible for NRHP listing (WCRO, 2004).

### **3.12.4 Native American Religious Concerns**

Native American resources or religious concerns have not been previously identified in the Project Area. Tribal representatives did not respond to the scoping notice with concerns in this area. The BLM will consult with the tribes at the project-specific level if sensitive sites are identified as a result of the Project Class III inventory.

### 3.12.5 Current Investigations

Site-specific Class III Inventory surveys will be conducted in conjunction with APD submittals following finalization of drilling locations. The Operator anticipates that a site-specific inventory would be conducted of a 10 acre area centered around each well pad. Linear access features would be surveyed out to 50 feet on either side of the center line.

## 3.13 SOCIOECONOMICS

The Project Area occurs in a relatively isolated part of Wyoming, in the heart of the Great Divide Basin. The Project is located in Sweetwater County, close to the borders with Carbon County, on the east, and Fremont County on the north. Principal access is from the south, so it would be Sweetwater and Carbon counties and the communities of Rock Springs, Wamsutter, and Rawlins that may be primarily affected by the Proposed Action.

### 3.13.1 Population and Demographics

Both Sweetwater and Carbon counties are two of the four Wyoming counties which exhibited population declines between 1990 and 2000. Carbon County declined the greatest of any county in Wyoming, 6.1 percent. Sweetwater County's population declined by 3.1 percent. Population figures and trends for the two counties are illustrated in **Table 3.10** (WDAI, 2004, online data).

**Table 3.10 Population Trends, HRIP Project Vicinity**

County or Town	Population, 1990	Population, 2000	% Change
Carbon County	16,659	15,639	-6.1%
Rawlins	9,380	8,538	-9.0%
Sweetwater County	38,823	37,613	-3.1%
Rock Springs	19,050	18,708	-1.8%
Wamsutter	240	261	8.8%
State of Wyoming	453,588	493,782	8.9%

Source: U.S. Census Bureau, retrieved from WDAI (2004).

Carbon and Sweetwater counties, as well as the State of Wyoming, exhibit relatively low ethnic diversity with respect to the rest of the nation. Ethnicity statistics are indicated in **Table 3.11** (U.S. Census Bureau, 2004, online data).

**Table 3.11 Population Ethnicity, HRIP Project Vicinity, 2000**

Ethnic Group	Carbon County	Sweetwater County	State of Wyoming
White	90.1%	91.6%	92.1%
Black or African American	0.7%	0.7%	0.8%
American Indian and Alaskan Native	1.3%	1.0%	2.3%
Asian	0.7%	0.6%	0.6%
Native Hawaiian and other Pacific Islander	0.1%	-	0.1%
Other	5.2%	3.6%	2.5%
Persons reporting two or more ethnic groups	2.1%	2.4%	1.8%
Hispanic or Latino	13.8%	9.4%	6.4%
White, not of Hispanic or Latino origin	82.4%	86.9%	88.9%
Language other than English spoken at home	10.5%	6.4%	7.5%

Source: U.S. Census Bureau (2004).

High school graduates comprise 83.5 percent and 87.4 percent of the Carbon and Sweetwater counties populations, respectively, compared to 87.9 percent for the State of Wyoming. Residents achieving a college Bachelor's degree or higher comprise 17.2 percent and 17.0 percent, respectively for Carbon and Sweetwater counties, compared to 21.9 percent for the State of Wyoming.

### **3.13.2 Economy, Employment, and Housing**

Employment in Carbon and Sweetwater counties is dominated by services, retail trade, mining (including oil and gas development), and local government (including public schools). Only a miniscule fraction of employment is in the farming sector. Non-farm employment by industry sector, and changes over a 10-year period, are indicated in **Table 3.12** (U.S. Census Bureau, 2004, online data; WDOE, 2004, online data).

**Table 3.12 Employment by Industry Sector, HRIP Vicinity**

Industry Sector	Carbon County		% Change	Sweetwater County		% Change
	1990	2000		1990	2000	
Total Farm	538	603	10.8%	220	205	-7.3%
Total Non-Farm	9,352	9,201	-1.6%	22,636	24,231	6.6%
Total Private Sector	7,203	7,164	-0.5%	18,607	19,964	6.8%
Agricultural, Services, Forestry, Fishing	106	254	58.3%	81	163	50.3%
Mining (including oil and gas)	934	318	-193.7%	4,989	3,725	-33.9%
Construction	515	699	26.3%	1,533	1,540	0.5%
Manufacturing	684	625	-9.4%	745	1,639	54.5%
Transportation / Utilities	736	615	-19.7%	1,987	1,809	-9.8%
Wholesale trade	173	180	3.9%	648	637	-1.7%
Retail trade	1,686	1,757	4.0%	3,739	4,476	16.5%
Finance / Insurance / Real Estate	522	575	9.2%	1,125	1,210	7.0%

Industry Sector	Carbon County		% Change	Sweetwater County		% Change
	1990	2000		1990	2000	
Services	1,847	2,141	13.7%	3,760	4,765	21.1%
Government	2,149	2,037	-5.5%	4,029	4,267	5.6%

Source: U.S. Census Bureau (2004); WDOD (2004).

For 2002, the unemployment rate for Carbon and Sweetwater counties was 4.6 percent and 4.7 percent, respectively, compared to 4.2 percent for the State of Wyoming.

Mining and oil and gas activity represent fewer jobs than formerly, although the industry continues to be a significant employer in Sweetwater County. Significant losses in jobs from the mining and oil and gas sector have been offset by increases in services, retail trade, construction and manufacturing. Closure of several coal mines has been the main cause of loss of jobs in the mining sector in Carbon County (BLM, 2003a, pg. 3-48). Trona and coal mining, as well as natural gas development, are significant employers in Sweetwater County (Sweetwater Economic Development Association, 2004, online data). Sweetwater County ranks third among Wyoming counties in 2000 coal production with 9.96 million tons produced. In 2003, Carbon and Sweetwater counties ranked sixth and fourth in the state in numbers of APDs approved by the Oil and Gas Conservation Commission, and ranked third and sixth in gas production, respectively (WOGCC, 2004b, online data).

Median household income in 2000 was \$36,060 and \$46,537 in Carbon and Sweetwater counties, respectively. These levels represent 91.9 percent and 118.6 percent of the Wyoming statewide median income. The levels rank Carbon and Sweetwater counties tenth and fifth, respectively, among the 23 counties in Wyoming (WDAI, 2004, online data). The median value of owner-occupied housing units in 2000 was \$76,500 and \$104,200, respectively, for Carbon and Sweetwater counties (WDOE, 2004, online data). There were 8,380 and 16,053 housing units, respectively, in Carbon and Sweetwater counties in 2002 (U.S. Census Bureau, 2004, online data).

### 3.13.3 Local Government Revenues

A summary of county revenues is indicated in **Table 3.13**.

**Table 3.13 County Revenues, Carbon and Sweetwater Counties, 2003.**

Revenue Source	Carbon County FY 2003	Sweetwater County FY 2003
Property taxes	24,595,682	78,174,590
Sales taxes	13,245,550	52,141,752
Use taxes	1,277,668	8,422,017
Retail Taxes	4,700,804	17,543,954

Source: WDAI (2004), Wyoming Taxpayers Association (2003)

### **3.13.4 Environmental Justice**

Executive Order 12898 directs federal agencies to address disproportionately high or adverse effects to human health and environment on minority or low income populations. For Carbon County, 9.8 percent of families and 12.9 percent of individuals earned incomes placing them at poverty levels in 1999. For Sweetwater County, the poverty numbers in 1999 were 5.4 percent of families and 7.8 percent of individuals, respectively. This compares to numbers for the State of Wyoming of 8.0 percent of families and 11.4 percent of individuals in poverty in 1999. Carbon County thus has somewhat higher and Sweetwater County somewhat lower poverty levels than the state as a whole.

As discussed above, ethnic minorities make up a small portion of the population in both counties and in the State of Wyoming.

## **3.14 TRANSPORTATION**

Primary access to the HRIP is provided by a combination of Interstate Highway (I-80), county, and BLM improved and unimproved roads. Main routes to the Project Area are the county-maintained, dirt-surfaced Bar-X Road and Tipton Road, both of which exit I-80 west of Wamsutter, Wyoming. Both roads travel north to the county-maintained, dirt-surfaced Luman Road. From the Bar-X Road intersection with the Luman Road, travel east to the Tipton-North Road which is the principal route crossing the Project Area.

Traffic to and from the area stems mostly from oil and gas-related activity and livestock management. Supplies used for drilling and construction would likely be transported by truck to the site from supply centers in Rock Springs, Rawlins, and Casper, Wyoming. All materials and equipment would be packaged, loaded, and transported per state (Wyoming Public Utilities Commission) and federal (DOT) requirements.

The BLM requires that all roads on BLM-administered lands be designed and constructed or reconstructed to minimum standards per BLM Manual Section 9113. Existing roads in the Project Area are maintained in compliance with BLM standards.

## **3.15 HEALTH AND SAFETY**

Current activities and conditions potentially contributing to the health and safety of individuals working or recreating in the Project Area include:

- occupational hazards associated with oil and gas drilling and field operations,
- risks associated with vehicle operations on improved and unimproved county and BLM roads and potential for vehicle collisions with big game species,
- hunting associated firearm-related accidents, and
- natural hazards such as flash floods and range fires.

### **3.16 NOISE**

Sources of noise in the Project Area, other than those associated with natural sources such as wind and storms, would include vehicular traffic on local, county and BLM roads, temporary oil and gas maintenance and repair operations, and overhead aircraft passage. In general, day and night noise levels in the area would compare to typical levels representative of a rural environment with the absence of any noise generating facilities in the Project Area.

# CHAPTER 4

## ANALYSIS OF ENVIRONMENTAL CONSEQUENCES

### 4.0 INTRODUCTION

This chapter discusses environmental consequences of the Proposed Action and of the No Action Alternative. It also discusses potential cumulative impacts (i.e., those impacts resulting from the development of the Proposed Action added to existing and ongoing activities in the vicinity of the Project Area). Environmental consequences are discussed for each resource in the following sections. Mitigation measures and residual impacts are discussed, where appropriate, and have been summarized in **Appendix B**. Mitigation measures are recommended for some resources to further minimize impacts. The Proposed Action has been developed to minimize impacts.

An environmental consequence or impact is defined as a modification in the existing environment brought about by the Proposed Action or an alternative. Impacts can be a primary result of the action (direct) or a secondary result (indirect), and can be permanent or long-lasting (long-term) or temporary and of short duration (short-term). Impacts can vary in degree from only a slight discernible change to a total change in the environment.

Short-term impacts are effects on the environment that occur during and immediately after well pad construction, drilling, completion, testing, and/or production facility installation, and last up to one to two years, or until completion of interim reclamation. Although short in duration, such impacts can be obvious and disruptive. For this project, short-term impacts are defined as lasting two years or less. Long-term impacts are changes made in the environment during construction and operation of the project that remain longer than two years and perhaps for the life of the project (approximately 20 years) and beyond.

### 4.1 GEOLOGY, MINERALS, AND PALEONTOLOGY

#### 4.1.1 *The Proposed Action*

No specific issues relating to geology, topography, mineral development, or paleontological resources were raised during the scoping process. Construction using techniques approved by the BLM to minimize disturbance would result in some impact to local topography, including cut and fill operations for the well pads, facilities, and road construction. Currently, and in the foreseeable future, there are no known exploitable mineral resources within the vicinity of the Proposed Action. Development of the Proposed Action would have minimal impacts to local topography and none to mineral resources.

The Project Area is underlain by rock layers not known to exhibit high probabilities of containing important vertebrate fossils. Applicant-committed mitigation measures, discussed in **Appendix B**, would minimize the possibility of loss in the event of discovery of important fossils.

### **4.1.2 The No Action Alternative**

Impacts would be similar to the Proposed Action, with the exception that no modifications to local topography would occur. No negative impacts to paleontological resources would occur.

## **4.2 AIR QUALITY**

Issues relating to impacts from the Proposed Action were concerned with possible negative impacts to air quality resulting from increased emissions from drilling and production activities.

### **4.2.1 The Proposed Action**

Air quality impacts would result from particulates emissions from unpaved roads and well pads associated with construction and ongoing maintenance operations, from vehicle emissions during construction and operation, and from aspects of the gas and condensate production phase. The latter consist principally of:

- Three-phase separation (water, gas, and condensate)
- glycol dehydration and
- condensate storage (including flashing emissions).

Recently, the BLM has issued a Final Environmental Impact Statement for the Desolation Flats Natural Gas Development Project (BLM, 2004). The proposed project is located approximately 60 miles south of the Project Area and targets similar productive horizons. Detailed air quality modeling was conducted for Alternative A of this NEPA analysis. Alternative A consists of the drilling and production of 592 gas wells at 555 locations with an assumed 65 percent production rate, leading to 385 producing wells. Planned gas compression for the field development is estimated at 32,000 horsepower. Modeling was conducted at sub-grid, near-field (to 50 km) and far-field (50 to more than 200 kms) levels.

The results of modeling studies indicate that no adverse impacts to air quality from the Desolation Flats Project alone are anticipated as a result of development of any alternative for sub-grid or near-field domains and, therefore, no adverse impacts to air quality would be expected from the much lower levels of development for the Proposed Action by itself. The Proposed Action will comply with all state and national air quality standards.

Because the Proposed Action does not involve additional gas compression, the most comparable modeling results from Desolation Flats are those based on individual well studies. Individual well impacts are illustrated in **Tables 4.1** and **4.2**.

**Table 4.1 Ambient Air Quality Impacts Adjacent to a Single Well ( $\mu\text{g}/\text{m}^3$ )**

Pollutant	Averaging Period	Construction Impact	Drilling Impact	Completion Impact	Production Impact	Maximum Impact
NO <sub>2</sub>	Annual	0.0026 (400 meters from well pad)	1.92 (500 meters from drill rig)	0.014 (500 meters from flare)	0.02 (500 meters from production heater)	1.92 (500 meters from rig)
CO	1-hour	22.83 (400 meters from well pad)	123.61 (500 meters from drill rig)	438.83 (500 meters from flare)	0.22 (500 meters from production heater)	438.83 (500 meters from flare)
CO	8-hour	4.00 (400 meters from well pad)	59.79 (500 meters from drill rig)	191.64 (500 meters from flare)	0.09 (500 meters from production heater)	191.64 (500 meters from flare)
SO <sub>2</sub>	3-hour	0.83 (400 meters from well pad)	5.93 (500 meters from drill rig)	0.012 (200 meters from access road)	0	5.93 (500 meters from drill rig)
SO <sub>2</sub>	24-hour	0.17 (400 meters from well pad)	2.29 (500 meters from drill rig)	0.0027 (200 meters from access road)	0	2.29 (500 meters from drill rig)
SO <sub>2</sub>	Annual	0.00005 (400 meters from well pad)	0.032 (500 meters from drill rig)	0.00001 (200 meters from access road)	0	0.032 (500 meters from drill rig)
PM <sub>10</sub>	24-hour	23.69 (200 meters from access road)	3.48 (400 meters from well pad)	4.99 (200 meters from access road)	0.03 (400 meters from well pad)	23.69 (200 meters from access road)
PM <sub>10</sub>	Annual	0.0015 (200 meters from access road)	0.047 (400 meters from well pad)	0.012 (200 meters from access road)	0.001 (400 meters from well pad)	0.047 (400 meters from well pad)

**Table 4.2 Maximum Ambient Air Quality Impacts for an Individual Well ( $\mu\text{g}/\text{m}^3$ )**

Pollutant	Averaging Period	Maximum Single Well Impact	Monitored Back-ground Level	Maximum Impact Plus Back-ground	National Ambient Air Quality Standard	Wyoming Ambient Air Quality Standard	Colorado Ambient Air Quality Standard	Percentage of Most Stringent Ambient Air Quality Standard
NO <sub>2</sub>	Annual	1.92	3.4	5.32	100	100	100	5%
CO	1-hour	438.83	2,299	2,738	40,000	40,000	40,000	7%
CO	8-hour	191.64	1,148	1,340	10,000	10,000	10,000	13%
SO <sub>2</sub>	3-hour	5.93	29	34.93	1,300	1,300	700	5%
SO <sub>2</sub>	24-hour	2.29	18	20.29	365	260	365	8%
SO <sub>2</sub>	Annual	0.032	5	5.03	80	60	80	8%
PM <sub>10</sub>	24-hour	23.69	47	70.69	150	150	150	47%
PM <sub>10</sub>	Annual	0.047	16	16.05	50	50	50	32%

Source Tables 4.1 - 4.2: Desolation Flats Natural Gas Field Development Project Final EIS, BLM Rock Springs and Rawlins Field Offices.

Near-field modeling results for Alternative A from the Desolation Flats Final EIS are illustrated in **Tables 4.3** and **4.4**.

**Table 4.3 Near-Field Ambient Air Quality Impacts ( $\mu\text{g}/\text{m}^3$ )**

Pollutant	Averaging Period	Total Project Impact	Monitored Back-ground Level	Maximum Impact Plus Back-ground	National Ambient Air Quality Standard	Wyoming Ambient Air Quality Standard	Colorado Ambient Air Quality Standard	Percentage of Most Stringent Ambient Air Quality Standard
NO <sub>2</sub>	Annual	1.51	3.4	4.91	100	100	100	5%
SO <sub>2</sub>	3-hour	0.15	29	29.15	1,300	1,300	700	4%
SO <sub>2</sub>	24-hour	0.08	18	18.08	365	260	365	7%
SO <sub>2</sub>	Annual	0.02	5	5.02	80	60	80	8%
PM <sub>10</sub>	24-hour	4.88	47	51.88	150	150	150	35%
PM <sub>10</sub>	Annual	1.55	16	17.55	50	50	50	35%

**Table 4.4 Near-Field Increment Comparison ( $\mu\text{g}/\text{m}^3$ )**

Pollutant	Averaging Time	Total Project Impact	PSD Class II Increment	Percentage of Class II Increment
NO <sub>2</sub>	Annual	1.51	25	6%
SO <sub>2</sub>	3-hr	0.15	512	0.03%
SO <sub>2</sub>	24-hr	0.08	91	0.1%
SO <sub>2</sub>	Annual	0.02	20	0.1%
PM <sub>10</sub>	24-hr	4.88	30	16%
PM <sub>10</sub>	Annual	1.55	17	9%

Source Tables 4.3 - 4.4: Desolation Flats Natural Gas Field Development Project Final EIS, BLM Rock Springs and Rawlins Field Offices.

The Proposed Action is located approximately 60 miles southeast of the Bridger Wilderness and approximately 120 miles northwest of the Mt. Zirkel and Savage Run wilderness areas, all Class I sensitive receptor areas. Studies done for Alternative A for the Desolation Flats FEIS suggest the possibility of some contribution to far-field visibility reduction within certain Class I airsheds, as indicated in **Table 4.5**. Studies indicate that development associated with the Desolation Flats Project would contribute to far-field visibility impacts when combined with all other human development in the area, as discussed in Section 4.17.2. The Proposed Action would not materially detract from the area's far field visibility. Localized increases in criteria pollutants would occur, but maximum concentrations would be below applicable federal and state standards.

**Table 4.5 Predicted Visibility Impacts From the Desolation Flats Project**

Sensitive Receptor Area	Maximum Visibility Impact (dv)	Visibility Significance Criteria (dv)	Number of Days Greater Than 0.5 dv	Number of Days Greater Than 1.0 dv
Bridger Wilderness (Class I)	0.079	0.5 / 1.0	0	0
Fitzpatrick Wilderness (Class I)	0.046	0.5 / 1.0	0	0
Wind River Roadless Area (Class II)	0.048	0.5 / 1.0	0	0
Popo Agie Wilderness (Class II)	0.073	0.5 / 1.0	0	0
Dinosaur National Monument (Class II)	0.239	0.5 / 1.0	0	0
Savage Run Wilderness (Class I)	0.115	0.5 / 1.0	0	0
Mount Zirkel Wilderness (Class I)	0.093	0.5 / 1.0	0	0

Sensitive Receptor Area	Maximum Visibility Impact (dv)	Visibility Significance Criteria (dv)	Number of Days Greater Than 0.5 dv	Number of Days Greater Than 1.0 dv
Rawah Wilderness (Class I)	0.079	0.5 / 1.0	0	0

Source: Desolation Flats Natural Gas Field Development Project Final EIS, BLM Rock Springs and Rawlins Field Offices. Impacts estimated in deciview units (dv). One dv indicates a "just barely perceptible" change in visibility.

The Operator would take measures to minimize impacts to air quality. Non-particulate emissions would be minimized by ensuring that vehicles, rig engines, and similar equipment are maintained in proper operational condition. Watering of Project access roads, as required, would achieve reductions in PM<sub>10</sub> particulate emissions of 50 percent (BLM, 2003b, pg 4-11), or better.

#### 4.2.2 The No Action Alternative

Under the No Action Alternative, proposed development would not occur and no Project emissions would be generated.

### 4.3 SOILS

Issues relating to potential impacts to this resource from development of the Proposed Action were concerned with possible negative impacts to sensitive soils and potential damage to biological soil crusts.

Sensitive soils in the HRIP are those occupying steeper slopes and the drainage and playa bottoms. Potential for accelerated erosion from steeper slopes and the potential limitations of reestablishing vegetation in disturbed saline and/or sodic soils are the issues of concern arising from proposed implementation of the Proposed Action.

#### 4.3.1 The Proposed Action

Implementation of the Proposed Action would result in disturbance to soils from construction of roads, pipelines, and well sites. Anticipated impacts are:

- Clearing or mowing of protective vegetative cover at well sites and along pipeline corridors resulting in increased potential for accelerated soil erosion.
- Burial and loss of productivity beneath all-season, graveled roads and maintained, graveled well pads.
- Mixing of soil materials by pipeline trenching and burial, and by excavation of reserve pits at each well site.

Total maximum, short-term soil disturbance would be approximately 138 acres of the approximately 11,918-acre project area for 25 well pads plus pipeline and access roads (**Table 2.3**). Following near-term, post-construction reclamation of those disturbed areas and soils no

longer subject to continuing use and disturbance, remaining long-term surface disturbance would total approximately 81 acres for both types of facilities. Proposed locations for facilities would be situated in areas of low slopes, and therefore the potential for accelerated erosion would be minimized under the Proposed Action (**Figure 1.2**). The proposed locations would avoid drainage bottoms and areas where overland flow could accumulate. Disturbance to potentially saline and/or sodic soils would be minimized by avoiding the routing of pipelines and access roads across these bottomland soils where feasible.

Biological soil crusts are well adapted to severe growing conditions, but poorly adapted to compressional disturbances such as those resulting from trampling or vehicle off-road driving (BLM, 2004, pgs. 2-56 to 2-57). Applicant-committed measures are designed to reduce off-road travel. Total long-term surface disturbance of the Project Area would be approximately one percent. Where biological crusts do occur in the vicinity of the Project Area, they can be adversely impacted or eliminated as a functional component of the soil.

All disturbed soils occupying areas of short-term disturbance would be reclaimed after cessation of drilling and construction of pipelines and access roads per BLM requirements and COAs presented in **Appendix B**. Areas of long-term disturbance would also be reclaimed following the decommissioning of facilities per BLM specifications.

### **4.3.2 The No Action Alternative**

Under the No Action Alternative, none of the proposed activities would occur. Disturbance of soils by oil and gas well drilling and field development would not occur. Grazing-associated impacts would continue at their current levels.

## **4.4 WATER RESOURCES**

Issues relating to potential impacts to this resource from development of the Proposed Action were concerned with possible negative impacts to groundwater resources, in particular possible effects associated with hydraulic fracturing technology.

### **4.4.1 The Proposed Action**

Produced water discharge from the Proposed Action would not adversely affect surface water because there would be no surface discharges. A Spill Prevention, Control and Countermeasure (SPCC) Plan, as required under federal law, would be prepared and submitted for each proposed site.

Surface water would be impacted by some short-term erosion. As a result of increased run-off from roads and well pads, there would be some erosion and resulting soil deposition into small intermittent drainages. Mitigation measures would be implemented to reduce these impacts. Because the Great Divide Basin is internally drained, there would be no impacts to the Colorado or North Platte river systems.

Groundwater would not be adversely affected because there would be no surface discharges which would infiltrate into the groundwater system, and because proper drilling practices would be utilized which would prevent cross-aquifer contamination from the drill holes. Produced water would be disposed off federal surface in a manner approved by the BLM.

Hydraulic fracturing is a recognized and mature technology widely used within the petroleum industry. Safe fracture stimulation performance would be achieved by ensuring that proper casing and cementing procedures had been followed prior to initiating stimulation. All fracture treatment fluids would flow back from the wellbore and would be recovered, to be disposed off federal surface in a manner approved by the BLM and consistent with WOGCC regulations. Only the target productive horizon would be impacted, within a short radius of the borehole. Data from the WSEO indicate that local stock aquifers occur at depths from near surface to approximately 700 feet. The Project objective horizons are located at depths of 8,000 to 10,000 feet and impermeable or low permeability rock layers occur between the objective horizons and the stock aquifers. No shallow aquifers potentially or actually used for stock watering purposes would be affected. The geologic nature of the target productive formations requires the use of hydraulic fracturing techniques to achieve economic success and accomplish the purpose and need of the Project.

#### **4.4.2 The No Action Alternative**

Under the No Action Alternative, proposed development would not occur and there would be no Project effects to surface water or groundwater.

### **4.5 VEGETATION, WETLANDS, AND INVASIVE WEEDS**

Issues of concern regarding implementation of oil and gas field development activities in the HRIP are the loss of vegetative cover, the successful revegetation of disturbed areas, and the control of non-native invasive weeds.

#### **4.5.1 The Proposed Action**

Surface disturbance to vegetative cover would result from construction of well pads, roads, and pipelines. Total maximum, short-term loss of vegetative cover would be approximately 138 acres of the approximately 11,618-acre project area for 25 well pads plus pipeline and access roads (**Table 2.3**). Following near-term, post-construction reclamation and revegetation of those disturbed areas no longer subject to continuing use and disturbance, remaining long-term loss of vegetative cover would total approximately 81 acres. The maintenance of BLM-standard roads comprises most of the long-term disturbance. Some permanent loss of vegetation cover would occur where roads are not reclaimed following the decommissioning of oil and gas operations in the Project Area. BLM-approved seed mixes will be applied to areas of disturbance following reclamation activities, including soil preparation, where appropriate.

Riparian vegetation in the Project Area is confined to a small area located immediately downstream of the Hay Reservoir dam. No surface disturbance would occur within at least 500 feet of any riparian vegetation and no impacts are anticipated.

There is an increased risk of noxious weed and invasive plant infestation and spread under this alternative. Noxious weed and invasive plant establishment and spreading would result from loss of existing vegetative cover and soil disturbance and/or from being brought into the area by vehicles/equipment carrying soil material and seeds picked up in another area infested with noxious weeds. Proposed reclamation and revegetation/reseeding would minimize the potential for noxious weed infestation. Noxious weed or invasive plant species infestations will be controlled using BLM-approved methods, as discussed in **Appendix B**.

#### **4.5.2 The No Action Alternative**

There would be no additional adverse effects to vegetation from proposed additional oil and gas development under this alternative. However, the potential for existing noxious weeds or invasive plants to spread, or for new infestations to become established, may result from other activities associated with existing oil and gas activities and ranching/grazing land uses.

### **4.6 RANGE RESOURCES AND OTHER LAND USES**

#### **4.6.1 The Proposed Action**

Anticipated impacts to range resources from implementation of the Proposed Action are restricted to a minimal loss of 81 acres of forage and associated AUMs, an increased potential for vehicle/livestock collisions, and an increased potential for spread of noxious and invasive weeds for the life of the project. The long-term loss of 81 acres of productive vegetation represents a reduction of 0.7 percent of the 11,618-acre Project Area. Livestock grazing would continue during the field development and operational phases of the project. Forage would be reduced in the short-term on a maximum of 138 acres until reclamation and revegetation of lands disturbed during drilling and construction activities are completed and a vegetative cover is reestablished.

Within the Project Area, the carrying capacity of the land is estimated at 9-11 acres per AUM, although this value may vary significantly depending upon individual site conditions, season, and type of livestock (BLM, 2003). Therefore, implementation of the Proposed Action would result in a maximum short-term productivity loss of approximately 14 AUMs and a maximum long-term productivity loss of approximately eight AUMs.

#### **4.6.2 The No Action Alternative**

Under the No Action Alternative, none of the proposed field development activities would occur. Loss of forage for livestock and wildlife due to soil disturbance would not occur. Grazing-associated impacts would continue at their current levels. Impacts from existing oil and gas operations would remain for the duration of production.

## **4.7 WILDLIFE AND FISHERIES**

Issues relating to potential impacts to this resource from development of the Proposed Action were concerned with potential effects to wildlife and their habitats.

### **4.7.1 The Proposed Action**

Wildlife would be affected by ground-disturbing activities, vehicle travel and drilling, and the presence of increased human activity and machinery operation. The area would continue to be available to wildlife. Big game animals would tend to move away from active construction, resulting in increased forage pressure on nearby areas. Levels of surface disturbance and human activity would be greater than present due to the increased number of wells in the Project Area (BLM, 1987, pg. 50). Man-made construction such as well pads and roads can reduce use of surrounding habitat by wildlife. Although these impacted sites reduce foraging due to the direct loss of native vegetation from ground disturbance, there is an area surrounding these sites that tends not to be utilized due to the increased human activity. This “zone” can extend up to a half mile from the developed area. Consequently, development impacts to wildlife can extend further offsite than the amount of disturbed area. Some individual animals can “habituate” to the increased infrastructure; it is generally assumed that overall, the increased human footprint on a previously lightly developed area is detrimental to big game species. In addition to the avoidance response, an increased human presence intensifies the potential for wildlife-human interactions ranging from the harassment of wildlife to poaching and increased legal hunting pressure. Also, increased traffic levels on new and existing access roads could increase the potential for wildlife-vehicle collisions..

No crucial big game winter range or birthing areas are present in this area (WGF, 2002, GIS data).

Short-term and long-term surface disturbance to the Project Area represent 1.1 percent and 0.7 percent, respectively. Reduction of available forage and useable habitat is expected to correspond with the extent of surface disturbance planned under this alternative.

### **4.7.2 The No Action Alternative**

There would be no effect to wildlife under this alternative. Livestock grazing would be expected to continue near its present levels.

## **4.8 WILD HORSES**

### **4.8.1 The Proposed Action**

Wild horses, especially young foals and pregnant mares, could react to increased noise levels in the area. Wild horses, while present in the vicinity of the Project Area, are infrequent transients (Bargsten, 2004b, personal communication). Animals present within the area are already acclimated to human presence and disturbance by local existing oil and gas developments.

Response to development of the Proposed Action would primarily involve avoidance within the available habitat in the vicinity.

### **4.8.2 The No Action Alternative**

There would be no effect to wild horses under this alternative.

## **4.9 SPECIAL STATUS PLANT, WILDLIFE, AND FISH SPECIES**

Issues relating to potential impacts to this resource from development of the Proposed Action were particularly concerned with possible effects to sage-grouse and mountain plover populations and habitat. Concerns were also expressed regarding the possibility of disruption of sensitive plant communities.

### **4.9.1 The Proposed Action**

#### **4.9.1.1 Federally Listed Species**

No threatened or endangered species have been identified in the Project Area and, therefore, no impacts to federally listed species are anticipated. If, during construction of the Proposed Action, a threatened or endangered species is observed, the USFWS would be notified immediately. The affected area would be further inventoried as per protocol and the appropriate mitigation and protective measures implemented.

#### **4.9.1.2 Sensitive Species**

Noise, vibrations, and construction caused by the proposed operations could cause white-tailed prairie dogs and other underground-dwellers to temporarily flee to their burrows while equipment is in close proximity. Large prairie dog towns have not been located within the Project Area (Falvey, 2004, personal communication). A 1988 aerial survey by Wyoming Game and Fish mapped prairie dog towns north and northwest of the HRU, but none closer than three miles to the Project Area (WGF, 1988, GIS data). Pre-approval onsite inspections would require that wells be located to avoid burrows, where possible, since prairie dog towns are also known to provide suitable habitat for other sensitive species such as the burrowing owl, swift fox, and mountain plover.. Damage (i.e., burrow failure) is not expected. No adverse effects to burrowing mammals are expected.

Construction and operations would occur outside critical time frames for certain species such as mountain plover, greater sage-grouse, and raptors; sensitive species which occur or have the potential to occur in the Project Area. Noise related to oil and gas development and road traffic may affect sage-grouse. Project construction activities could interfere with acoustic signals used by sage-grouse during mating (BLM, 2003a, pg. 4-147). Temporary waivers for the seasonal restrictions to protect sensitive species may be requested by the Operator. These waivers (“exception requests”) are considered on a case-by-case basis by the BLM and WGF. Approval

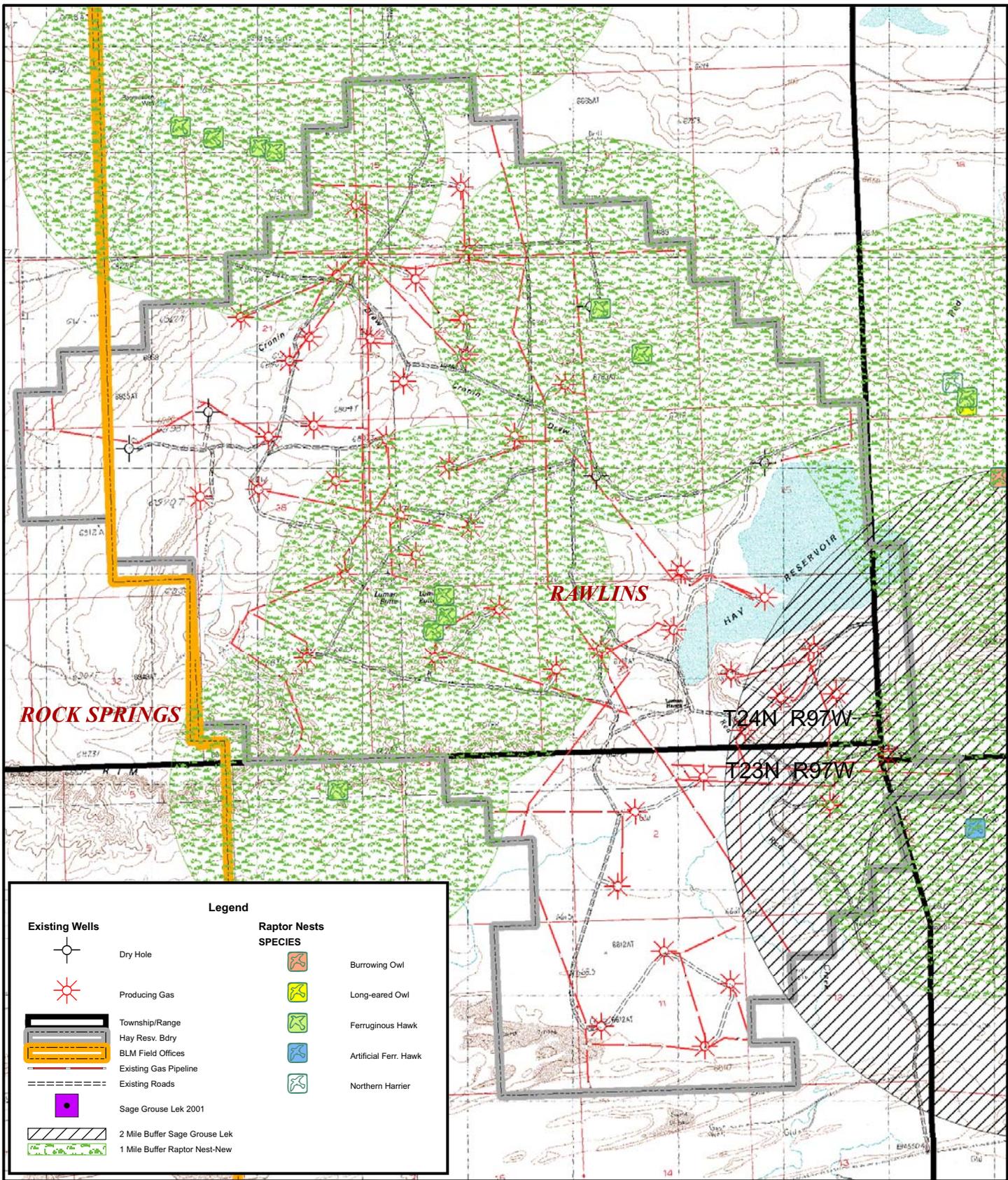
of the temporary waiver requires substantiation that the resource or biota of concern are not present. With timing and avoidance limitations, no impacts to these species are expected. Application of timing limitations or avoidance measures for mountain plover, raptors, and sage-grouse would benefit other sensitive species. Reduction of available forage and useable habitat is expected to correspond with the extent of surface disturbance planned under this alternative. Protective measures for certain sensitive species are discussed in **Appendix B**.

BLM data show 16 raptor nest sites within one mile of the Project Area (BLM, 2004d, GIS data). Thirteen of these have been identified as ferruginous hawk nests; two of the thirteen are artificial ferruginous hawk nest structures. The remaining three nests are: a burrowing owl (most likely within a prairie dog burrow); a Northern Harrier (ground nest); and a long-eared owl (nesting in a cottonwood tree). All of these three remaining nests are either within the project area, or within  $\frac{3}{4}$  of a mile of the project boundary. A one-mile buffer around the nests covers most of the Project Area. Prohibition of construction, drilling, and similar activities within one mile of active ferruginous hawk and eagle nests and within 0.75 mile of other active raptor nests between February 1 and July 31 would minimize potential impacts to these species.

The proximity of proposed well sites to potential mountain plover habitat would be identified during pre-approval onsite inspections. Construction activities would be prohibited in such habitat between April 10 and July 10. Potential sage-grouse habitat is widespread throughout the Project Area. Two identified leks occur within two miles of the HRU and approximately 1,815 acres, or 16 percent of the Unit (in the southeast and western portions) is located within two miles of one of these leks. Construction, drilling, and similar activities would be prohibited within two miles of known leks between March 1 and June 30.

Of the three special status plant species which may occur in the vicinity of the Project Area, the topographic limitations of two (cedar rim thistle and Gibben's beardtongue) suggest that their habitat, typically on sparsely vegetated slopes, is likely to fall outside of development areas. Similar considerations may apply to Nelson's milkvetch, although the species is also known to occur on alkali clay flats. Potential occurrences of these species would be investigated during pre-construction on-site inspections.

Locations of raptor nests and sage-grouse leks near the Project Area are indicated in Figure 4.1



Existing Wells		Legend		Raptor Nests SPECIES	
	Dry Hole		Burrowing Owl		Long-eared Owl
	Producing Gas		Ferruginous Hawk		Artificial Ferr. Hawk
	Township/Range		Northern Harrier		
	Hay Resv. Bdry				
	BLM Field Offices				
	Existing Gas Pipeline				
	Existing Roads				
	Sage Grouse Lek 2001				
	2 Mile Buffer Sage Grouse Lek				
	1 Mile Buffer Raptor Nest-New				



**FIGURE 4.1: LOCATIONS OF SAGE GROUSE LEKS AND RAPTOR NESTS**

Date: 10/4/04	File Location: C:\Project\Hay Reservoir\GISE 4.1-Sage Grouse Leks Raptor Nests_9/9/04.mxd
Created by: emj	Project No: 165-1
Data Sources: -Wyoming Natural Resources Data Clearinghouse -Wyoming Geographic Information Advisory Council -BLM	

### **4.9.2 The No Action Alternative**

There would be no effect to special status species under the No Action Alternative. Ongoing production activities at existing gas wells would occur and activity from livestock grazing would continue.

## **4.10 RECREATION**

### **4.10.1 The Proposed Action**

Implementation of the Proposed Action would likely cause the temporary displacement of hunters should drilling and construction coincide with hunting seasons for the various game species present in the Project Area. Displacement is expected to occur over a period of three hunting seasons as a result of construction and drilling activities.

Well drilling, facilities construction, and field operations could impact both hunters and other users due to the additional change in the character of the landscape. Although oil and gas facilities and operations are already present in the Project Area, the addition of more wells and facilities would increase visual impacts and would reduce use. Use is expected to be displaced to less affected areas. These effects would diminish with the completion of the drilling and construction phase of development. Some long-term (Project life) displacement of hunters and other users would likely occur from implementation of the Proposed Action. The amount of hunter displacement would coincide with the level of game animal displacement. The Proposed Action is not expected to affect harvest quotas, game hunting season timing or duration, or harvest success overall.

### **4.10.2 The No Action Alternative**

Recreational opportunities would likely remain the same or continue to follow existing trends should the No Action Alternative be implemented.

## **4.11 VISUAL RESOURCES**

### **4.11.1 The Proposed Action**

Implementation of the Proposed Action in the Project Area would add facilities and linear features such as roads and pipeline ROWs to an existing landscape that already supports facilities/features of oil and gas development, roads, and livestock grazing at a greater density than otherwise found in the general area. The Proposed Action would result in increased presence on the landscape from construction and operation of facilities and features similar in form, line, color, and texture to those previously introduced man-made features. Increased dust should also be apparent, especially during construction activities. Surface facilities at each well site will be painted a BLM standard environmental color to minimize contrast of colors between background and the proposed facilities.

### **4.11.2 The No Action Alternative**

Changes to the landscape and visual resources would not occur with implementation of the No Action Alternative.

## **4.12 CULTURAL RESOURCES**

### **4.12.1 The Proposed Action**

Direct impacts to cultural resources would result from construction of well pads, roads, and pipelines. Class III cultural resource inventories would be conducted for all lands proposed to be disturbed, including drillsites, new access roads, and pipelines on a site-specific basis. All sites potentially eligible for listing on the NRHP will be avoided or appropriately mitigated to the satisfaction of the BLM.

Effects to potentially eligible cultural resources will be alleviated either by avoidance or by data recovery, or by some combination of the two, as necessary. Avoidance consists of moving or realigning the proposed zone of construction so as to avoid eligible sites or eligible portions of sites when they are found. Avoidance is almost always the preferred plan of action. While data collection is the most common form of mitigation, if sites are avoided it is rarely necessary for project implementation.

Heritage information within the Project Area would be affected by unanticipated discoveries of cultural artifacts. Every discovery results in some, unavoidable loss of cultural resource information. Such information loss can be partially offset by the imposition of mitigation measures. The effect of mitigation is that information regarding cultural resources which would otherwise remain unavailable would be systematically recorded. Data recovery entails excavation of the site, or portion(s) of the site to be impacted, in a scientific manner by a qualified archaeologist so as to recover the important element(s) of the site prior to construction of the proposed well, access road, pipeline, etc. Prior to conducting any data recovery, a site-specific data recovery plan must be developed and approved by the BLM in consultation with the SHPO.

Indirect impacts to heritage resources could occur from increased access on Project roads leading to illegal collection activities. Through roads are not proposed, but there may be an increase in the amount of illegal collection as a result of increased access provided by the new roads. New road construction would serve to connect well pads to existing roads and, while providing access to humans, would not add to travel through the Project Area.

Native American resources or religious concerns have not been previously identified in the Project Area, but are likely present. Tribal representatives did not respond to the scoping notice with concerns in this area. The BLM will consult with local tribes at the project-specific level if sensitive sites are identified as a result of the Class III Inventory.

**4.12.2 The No Action Alternative**

There would be no effect to cultural resources under the No Action Alternative.

**4.13 SOCIOECONOMICS**

**4.13.1 The Proposed Action**

The Proposed Action would be planned such that drilling equipment and personnel already located in the area would be utilized. It is not anticipated that an outside temporary and transient workforce would be required. This would alleviate impacts on housing, government services, or facilities. The Project workforce with disposable income would generate spending in the local communities resulting in sales to local businesses with associated tax benefits.

Local sources would be used for the purchase of the materials needed by the operations whenever possible. There would be additional tax benefits, including property taxes on the capital infrastructure (ad valorem tax), gross products tax, and severance tax.

At current rates, the cost to drill and complete each well is approximately \$750,000, resulting in expenditures largely to the local economy of approximately \$18,750,000 from construction of the Project. It is estimated that each of the proposed locations in the Project would recover approximately 4 BCFE (billion cubic feet of gas equivalent) of additional gas reserves (BLM, 1992). These reserves would generate additional royalties and taxes to the federal government, State of Wyoming, and Sweetwater County.

The United States receives a 12.5 percent royalty on the fair market value of gas produced from federal leases, exempting production and transportation costs. Half of federal royalties would be returned to the State of Wyoming. The State of Wyoming collects a six percent severance tax on gas production, exempting federal royalties and production and transportation costs. The state also collects a 4 percent sales and use tax on gross receipts of tangible goods and certain services. Of the funds collected, 28 percent is returned to the local county. For the Proposed Action, assuming 25 Project wells, expenditures subject to the sales and use tax are estimated to be approximately \$6.25 million (BLM, 2003a, pg. 4-26).

An estimate of these additional revenues, assuming an average gas price of \$3.00/MCF over the life of the Project, has been indicated in **Table 4.6**.

**Table 4.6 HRIP Estimated Government Revenues, Life of Project**

Revenue Source	Payee	Percentage	Tax Basis	Estimated Government Revenue
Project royalty	United States	6.25%	\$300,000,000	\$18,750,000
Project royalty	State of Wyoming	6.25%	\$300,000,000	\$18,750,000
Severance tax	State of Wyoming	6.0%	\$300,000,000	\$18,000,000
Ad valorem	Sweetwater County	6.0%	\$300,000,000	\$18,000,000

Revenue Source	Payee	Percentage	Tax Basis	Estimated Government Revenue
property tax	(55.95 mills)			
Sales and use taxes	State of Wyoming	2.9%	\$6,250,000	\$181,250
Sales and use taxes	Sweetwater County	1.1%	\$6,250,000	\$68,750

Assumes 4 BCFE recovered/well location, \$3.00/MCF constant gas price, current mill levy, project life.

#### **4.13.2 The No Action Alternative**

Implementation of the No Action alternative would result in no change to the existing socioeconomic characteristics of the area.

### **4.14 TRANSPORTATION**

#### **4.14.1 The Proposed Action**

Implementation of the Proposed Action would result in intermittent and short-term (two years) use of the county and BLM roads providing access to and within the Project Area. Traffic on Bar X and Tipton roads would increase primarily in daylight hours. The intensity of vehicle use would range widely over the three-year drilling and construction period, reflecting type and level of well and facilities development activity. After the wells are drilled and construction and post-construction reclamation activities cease, traffic volume would subside as trips to and within the Project Area reflect reduced activity associated with routine operations by pumpers checking wells in pickups.

#### **4.14.2 The No Action Alternative**

Traffic levels would remain at existing levels under this alternative. No additional road construction would occur in the area to provide access to new oil and gas well sites.

### **4.15 HEALTH AND SAFETY**

#### **4.15.1 The Proposed Action**

Implementation of the Proposed Action would create a higher level of risk to persons in the area. The increased level of traffic for the three-year drilling and construction period would increase the risk of traffic accidents among oil and gas workers, livestock managers, and recreationists. A slight increase in traffic over existing levels for the period of field operations would result in a proportional increase in potential for traffic accidents for the duration of field operations.

Increasing the mileage of gas gathering pipelines in the Project Area would proportionally increase the potential for pipeline failure. Nationally, accident rates for gas transmission pipelines have historically averaged 86 per year from 1994 through 1998, with fatalities

averaging 23 per year over that five year period (USDOT, 1998, online data). During this period, average annual construction rates were approximately 9,200 miles.

The risk of fire/range fire would increase in the Project Area under the Proposed Action due to increased activities associated with industrial, construction activities and the presence of fuels, storage tanks, natural gas pipelines, and other natural gas production facilities. In compliance with BLM requirements and as listed in **Appendix B**, the Proponent is committed to the prevention and suppression of fires on public lands caused by its employees, contractors, or subcontractors and to the immediate reporting of any wildland fire to the BLM.

To minimize risks to health and safety of individuals in the HRIP, the Proponent would operate in compliance with BLM, OSHA, DOT, and WOGCC. The Proponent is also committed to using standard methods of handling any waste materials in compliance with methods outlined by the BLM in **Appendix B**.

#### **4.15.2 The No Action Alternative**

Implementation of the No Action alternative would result in no change to the existing health and safety characteristics of the area.

### **4.16 NOISE**

#### **4.16.1 The Proposed Action**

Noise associated with drilling and facilities construction over a two-year period of development would be increased near these operations when these individual activities occur. Drilling and facilities construction activities and associated increased noise levels would be temporary, lasting as long as the activities were ongoing at well sites and along access road and pipeline ROWs.

EPA has established a level of 55 dBA as a guideline for acceptable environmental noise. A noise level of 60 dBA is generated between two people engaged in normal conversation standing five feet apart. Anticipated background noise levels in rural areas is anticipated to be approximately 40 dBA. Given that the Project Area is subject to frequent winds, the natural noise levels in the Project Area may approximate 50 dBA during the daylight hours (BLM, 2003d, pg. 4-330). Wind typically adds 5 to 10 dBA. Damage to the unprotected human ear can occur at noise levels of 115 dBA and above (Farmingdale State University, 2004, online data). The 55 dBA EPA standard represents very low noise levels and indicates the level below which no environmental effects could reasonably be expected.

Based on an average noise level of 85 dBA measured at 50 feet from a typical construction site, the expected noise levels would be 85 dBA at 50 feet, 65 dBA at 100 feet, 59 dBA at 500 feet, 55 dBA at 1,500 feet, and 53 dBA at 2,000 feet from the construction equipment. The typical noise level associated with an operating drilling rig is 74 dBA at 200 feet (USGS, 1981). Noise from a typical drilling rig would decrease to 60 dBA at 1,000 feet, to 57 dBA at 1,500 feet, and to 54 dBA at 2,000 feet. Therefore, an area of somewhat less than 288 acres around a typical drilling site would temporarily experience noise levels in excess of the EPA standard. An area of

approximately 72 acres around each drilling location (circular radius of 1,000 feet) would experience temporary noise levels in excess of those associated with normal human conversation. The absence of any residence or human receptor likely to experience extended noise levels associated with oil and gas development under the Proposed Action minimizes potential impacts due to temporary and intermittent increases in noise levels for the duration of drilling and construction activity. Wildlife-associated impacts are also discussed in Section 4.9.1.2, including displacement and disturbance.

#### **4.16.2 The No Action Alternative**

Implementation of the No Action Alternative would result in no additional noise in the Project Area from drilling of oil and gas wells and associated construction and operations on federal lands. Noise levels would continue in response to natural conditions and ongoing human activity.

### **4.17 CUMULATIVE IMPACTS**

Cumulative effects are those determined by summarizing the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions in the Area of Influence (AOI). The AOI varies by resource. Cumulative effects can be identified both quantitatively and qualitatively, by magnitude of single actions, by the number of single actions combined, and by a time period in which the actions occur and have an effect on the environment.

Past and existing activities on or in the vicinity of the Project Area that have a major influence on the resources in the area include:

- Oil and gas exploration, production, and transport
- Livestock grazing activities (including fences, stock watering facilities, etc.)
- Recreation activities, principally hunting

Responses to the scoping notice for the Proposed Action expressed concerns relating to the cumulative effects of natural gas development activities when combined with other ongoing and proposed developments on lands within the BLM Rawlins Field Office area.

Increasing natural gas prices, geophysical exploration requests, and oil and gas development trends suggest that further environmental impacts in the Great Divide Basin would occur from oil and gas development, including potential CBNG development. Large increases in grazing and recreational pressures are not foreseen. Therefore, this discussion will focus on the effects of additional oil and gas development.

Existing petroleum fields located within six miles of the Project Area, all of which produce gas and condensate, are indicated in **Table 4.7**.

**Table 4.7 Existing Oil and Gas Fields Near the HRIP**

Field	Reservoir(s)	Discovery	Completed Wells	APDs and Spuds
Bush Lake	Lance, Lewis, Almond, Mesaverde	1978	ABD	0
Nickey	Lewis, Almond	1980	2	0
Gale	Lewis, Ericson	1980	2	0
Great Divide	Lance, Lewis	1978	9	0
Red Desert	Lewis, Mesaverde	1971	27	3
Lost Creek Basin	Lewis, Ericson, Mesaverde	1976	0	0

Source: WOGCC (2004). ABD indicates abandoned field.

The BLM is analyzing a number of potential oil and gas development projects within the Great Divide Basin. These projects are summarized in **Table 4.8**.

**Table 4.8 Potential Oil and Gas Development Projects, Great Divide Basin**

Name	Reservoir	Proposed Wells	Status
Continental Divide/Wamsutter II Natural Gas Project	Almond, Lewis, Mesaverde	3,000	EIS ROD signed 2000. Approximately half of the analysis area covers the Great Divide Basin, including the Project Area. 2,130 wells authorized pending planning review of the Great Divide Resource Area RMP by the Rawlins Field Office.
Wind Dancer Natural Gas Development Project	Lance, Lewis, Mesaverde	12	Analysis area of 6,400 acres. Approved July, 2004. Adjacent to Project Area.
Hay Reservoir CBNG	Ft. Union	8	Analysis area of 1,280 acres. EA in preparation. Six miles south of Project Area.
Lower Bush Creek CBNG	Ft. Union	20	EA in preparation, 20 producing wells plus 2 injection wells. 7-10 miles northwest of Project Area.
Hay Reservoir Natural Gas Infill Drilling	Almond, Lewis	25	EA in preparation. Comprises the Proposed Action .
Scotty Lake CBNG	Ft. Union	18	Finding of No Significant Impact made for EA 9/21/04, 18 wells over 3,000 acres, 3 current producing from re-entries. 10 miles north of Project Area.

Source: BLM Rawlins and Rock Springs field offices (2004).

In addition to the above drilling projects, the BLM Rawlins Field Office is considering or has approved three geophysical projects within the vicinity of the Project Area, the Hay Reservoir 3D Seismic Survey, the Osborne Springs 3D Seismic Survey, and Wind Dancer 3D/2D Seismic Survey projects.

### **4.17.1 Geology, Minerals, and Paleontology**

The AOI for geology, minerals, and paleontology would be the Project Area.

Existing, proposed, and reasonably foreseeable actions would not add to the level of geological hazards in the Project Area.

Existing and foreseeably developable mineral resources within the vicinity of the Project Area are restricted to oil and gas development. Development of oil and gas resources would result in minor alterations to the existing topography. The bulk (84 percent) of these resources within the Project Area would be developed on BLM surface or minerals and would require adherence to BLM reclamation stipulations. Standard stipulations, augmented by site-specific COAs, would effectively mitigate minor levels of topographic disturbance.

Ongoing development would have the potential to negatively impact paleontological resources. However, BLM requirements for the protection of such resources would effectively mitigate potential losses of fossil information. Net effects to paleontological resources are expected to be positive, with the potential for discoveries of scientifically important fossils resulting from development.

### **4.17.2 Air Quality**

The AOI for air quality would encompass the Great Divide Basin. Cumulative effects of development to air quality could conceivably affect a larger area than for any other resource.

Ongoing development of oil and gas resources within the Great Divide Basin would negatively impact air quality through increased criteria pollutant emissions associated with machinery engines and compressors, as well as from fugitive dust resulting from increased development-associated vehicular traffic. Most of the effects from seismic surveys would be limited to increases in fugitive dust emission. Cumulative impacts from the Proposed Action would be similar to those analyzed for the Continental Divide/Wamsutter II Natural Gas Project EIS (BLM, 2000) and the Desolation Flats Natural Gas Field Development Project FEIS (BLM, 2004). The Proposed Action would be responsible for relatively lower levels of emissions since additional compression is not planned.

As discussed in Section 4.2.1, previously, air quality modeling for the Desolation Flats FEIS suggests that air impacts from the Proposed Action would be below applicable federal and state standards. The Project would represent a very small fraction of emissions resulting from increased oil and gas development within the Great Divide Basin. As detailed in Section 4.2, there would be small but measurable effects in the immediate Project Area, small but measurable effects in the near field, and the Project would incrementally contribute to a reduced far field visibility effect (BLM, 2004, pg. 2-65).

Cumulative air quality impacts would include emissions from nearby oil and gas production, such as the adjacent Wind Dancer Exploratory Unit. Emissions associated with oil and gas fields will decline over time. At Hay Reservoir, 16 wells have been abandoned and reclaimed,

reducing emission levels. Modernization of facilities, including replacement of numerous, small compressors with three modern, lean-burning Western Gas compressors, has also acted to reduce overall emissions levels (WOGCC, 2004, online data; Webb, 2004, personal communication).

### **4.17.3 Soils**

The AOI for soils consists of the Project Area, including 47 existing and 25 proposed wells and ancillary facilities.

Cumulative soils impacts from past, present, and reasonably foreseeable activities combined with the Proposed Action would consist principally of soil impacts from on-going oil and gas production and exploration and development activities, continuing livestock management activities, and seasonal recreational/hunting activities. The drilling of approximately 25 wells and associated construction of ancillary facilities including roads and pipelines would contribute both short-term and long-term impacts in the form of soil disturbance for the life of the oil and gas projects. Total long-term cumulative surface disturbance would be approximately 408 acres, or 3.5 percent of the Project Area. Implementation of standard stipulations and site-specific construction and reclamation procedures for oil and gas facilities would minimize the cumulative impacts to soils.

### **4.17.4 Water Resources**

The AOI for surface water resources would be limited to several local watersheds in the vicinity of the Project Area. These include the Red Creek-Rocky Crossing watershed, comprising approximately 24,000 acres along Red Creek on the north side of the Project; Lower Bush Creek, comprising approximately 4,800 acres on the north of the Project; the Red Creek-Cronin Draw watershed, comprising approximately 12,000 acres along lower Red Creek and covering much of the HRU; and the North Red Desert Basin watershed, comprising more than 31,000 acres on and southwest of the western portions of the Project Area.

CBNG development at Scotty Lake, within the Red Creek watershed to the north of the Project Area, could contribute produced water to the Red Creek drainage. The project is a pilot development consisting of 18 potential wells and 15 surface discharge points. Volumes of produced water are anticipated to be small (initial production total from all wells estimated to be approximately 0.75 cfs), and it is likely that infiltration would prevent any discharge from reaching the Project Area. Water production is expected to decline between 10 percent and 30 percent annually. Produced water is a Class III groundwater, suitable for livestock and wildlife. The water is relatively high in barium (approximately 8.4 mg/l), but high sulfate content in soils in the area are expected to result in the precipitation of barite, a stable mineral. The target coals for the pilot have a very limited economic extent (BLM, 2004c, Appendix D). The Kennedy Hay Reservoir CBM pilot to the south is located within the North Red Desert Basin watershed, which is isolated from the Red Creek watershed, and would not contribute to cumulative impacts. All streams within the Great Divide Basin are internally drained and waters of the Colorado River System would not be affected. Neither the Wind Dancer nor the Hay Reservoir conventional gas development projects would cause additional effects to surface water since no

surface discharge is proposed for either. The same situation is true for other gas fields within watersheds located adjacent to the Project Area, including the Nickey and Gale fields.

As indicated in Section 4.4.1, impacts to surface water from the Proposed Action would be limited to some short-term erosion as a result of increased run-off from roads and well pads. There would be some resulting soil deposition into small intermittent drainages. Mitigation measures would be implemented to reduce these impacts. Therefore, no cumulative effects to surface water resources are anticipated for this alternative.

The AOI for groundwater resources would be the Great Divide Basin.

As discussed in Section 3.4.2 previously, groundwater flow is generally toward the basin center, which is located near the Project Area. CBNG developments could impact groundwater resources through withdrawal of groundwater and/or infiltration of produced water if surface discharge is used for disposal. Reinjection of produced water into a Ft. Union sand is proposed for disposal for the Lower Bush Creek Pilot (BLM, 2003e). The Scotty Lake, Lower Bush Creek, and Hay Reservoir CBNG pilots total 46 proposed wells. Potential volumes of produced water are unknown and disposal methods are undetermined at this time, precluding a more quantitative estimated of potential groundwater effects.

As discussed in Section 4.4.1 previously, the Proposed Action would not cause impacts to groundwater resources since no surface discharge is planned and no infiltration would result. Any Project produced water would be trucked from the location to an approved disposal site not located on federal surface. Required drilling, completion, and stimulation practices would protect aquifers from damage from wellbores or cross-contamination between aquifers. No cumulative effects are anticipated for this alternative.

#### **4.17.5 Vegetation, Wetlands, and Invasive Weeds**

The AOI for vegetation consists of the Project Area, including 47 existing and 25 proposed wells and ancillary facilities.

Cumulative impacts on vegetation from past, present, and reasonably foreseeable activities combined with the Proposed Action would consist principally of loss of vegetative cover and opportunities for current and new noxious weed infestation from on-going oil and gas production and exploration and development activities, continuing livestock management activities, and seasonal recreational/hunting activities. The drilling of approximately 25 wells and associated construction of ancillary facilities including roads and pipelines, in addition to disturbances associated with five existing wells and facilities, would contribute both short-term and long-term impacts in the form of loss of vegetative cover for the life of the oil and gas projects. Total cumulative long-term surface disruption would be approximately 408 acres. In combination with appropriate livestock use and off-road vehicle activity, primarily during hunting seasons; implementation of standard stipulations and site-specific construction and reclamation procedures for oil and gas facilities would minimize the cumulative impacts to vegetation and would minimize potentials for weed infestation and spread.

#### **4.17.6 Range Resources and Other Land Uses**

The AOI for range resources consists of the Cyclone Rim Allotment area of approximately 308,000 acres.

Cumulative impacts on livestock and big game management from past, present, and reasonably foreseeable activities combined with the Proposed Action would consist principally of the previously described loss of vegetative cover, increased potential for weed infestation, and subsequent reduction in available forage. These impacts would result from on-going oil and gas production and exploration and development activities, and to a lesser degree the continued grazing of lands and use for recreational hunting. The drilling of approximately 25 wells and associated construction of ancillary facilities including roads and pipelines, in addition to disturbances associated with five existing wells and facilities, would contribute both short-term and long-term impacts in the form of loss of vegetative cover and forage for the life of the oil and gas projects. Total long-term surface disruption within the Project Area would be approximately 81 acres.

Existing oil and gas development within the Cyclone Rim Allotment is approximately 147 wells (WOGCC, 2004a, GIS data). As discussed in Section 4.17.7, average per well long term surface disturbance for oil and gas development within the Great Divide Basin averages approximately 4.9 acres/well. Three foreseeable oil and gas projects occur within the Cyclone Rim Allotment, the Hay Reservoir and Scotty Lake CBNG projects and the Wind Dancer Natural Gas Development Project, totaling 38 wells. Therefore, planned, existing, and foreseeable long-term surface disturbance within the Cyclone Rim Allotment from oil and gas development is approximately 1,033 acres. Based upon the estimated carrying capacity of the land in the Project Area of 9-11 acres per AMU, cumulative long-term effects are estimated at approximately 103 AUMs. This represents approximately 0.3 percent of the total of the 40,661 AUMs in the allotment (Bargsten, 2004a, personal communication).

The Operator has executed Surface Use Agreements with surface owners affected by the Proposed Action. In combination with appropriate livestock use and off-road vehicle activity, primarily during hunting seasons, implementation of standard stipulations and site-specific construction and reclamation procedures for oil and gas facilities would minimize the cumulative impacts to forage availability.

#### **4.17.7 Wildlife and Fisheries**

The AOI for wildlife species would vary greatly in extent. Small, terrestrial mammals would not travel far from current habitat and impacts would be restricted to the Project Area. Big game species have the capability of roaming over much greater areas. For this EA, varying AOIs have been selected, as indicated in **Table 4.9**.

**Table 4.9 Areas of Influence Used for Cumulative Impacts Analysis**

Species	Area of Influence	Rationale
Big game	WGF herd unit	Potential range of herd
Wild Horses	BLM herd management areas	Potential range of herd
Raptors	Project Area + 1 mile buffer	Current nest stipulation
Sage-grouse	Project Area + 2 mile buffer	Current lek stipulation
Other birds	Project Area + 1 mile buffer	Based on raptor stipulation
Smaller mammals	Project Area	Limited mobility for smaller species
Aquatics	Streams and wetlands in project vicinity	Not present this project
Sensitive plants	Project Area	Limited mobility, habitat

Cumulative impacts to wildlife may result from harassment resulting from increased human access and presence, destruction of forage, increased mortality from collisions with vehicles, and fragmentation of habitat. The low levels of surface disturbance associated with most conventional oil and gas development projects would not necessarily guarantee a negligible level of impacts to wildlife. Several proximal projects occurring simultaneously could magnify the effects of the individual developments by hindering the ability of wildlife to relocate away from individual sources of disturbance.

Because of the size and range of herd units in the Great Divide Basin, cumulative impacts analysis required investigation of foreseeable oil and gas development projects on BLM land in areas under the jurisdiction of the Rawlins, Rock Springs and Lander field offices. The levels of surface disturbance from existing oil and gas development over the extent of each herd unit were estimated, based upon long-term disturbance information from recent NEPA analyses. No current or foreseeable projects from the Lander Field Office coincide with Project big game herd units. Two current projects from the Rock Springs Field Office with approximately 116 acres of long-term disturbance were included. For the Rawlins Field Office, the projects listed in **Table 4.8** were included, with the assumption that approximately half of the wells authorized under the Continental Divide/Wamsutter II Natural Gas Project would be located within the Great Divide Basin. A further assumption was that each location would contain a single wellbore, which is likely to be correct in most cases. Based upon all of the data, long-term direct habitat disturbance from foreseeable oil and gas development within the extent of Project herd units was estimated to approximate 4.9 acres/well for approximately 1,235 wells, for a total foreseeable impact of approximately 6,050 acres. As noted previously, big game avoidance away from infrastructure is harder to quantify. Some individual animals may habituate; these generally tend to be from the resident population (although certainly not all resident animals will show the same avoidance or habituation levels). Any animals that migrate in to or through area of increased human development would tend to show greater avoidance behavior.

The Proposed Action could have some (although relatively low) impacts to the elk population as elk may occasionally visit the Project Area and vicinity (WGF, 2002, GIS data). The nearest crucial winter/year-long range occurs in a 25,000 acre area located approximately two miles to the southwest. The local elk population belongs to the 2.5 million acre Herd Unit Area 426

(Steamboat). Within the Steamboat Herd Unit Area, elk are mainly concentrated within the central region, whereas the Project Area occupies the center of a large (700,000 acres) area of visitation to the east. Within the Steamboat herd unit, existing oil and gas development includes approximately 1,103 wells (WOGCC, 2004a, GIS data). At an average long-term habitat disturbance of 4.9 acres/well, plus 6,050 acres of foreseeable habitat disturbance, total existing and foreseeable disturbance would be approximately 11,455 acres. Project long-term disturbance of 81 acres represents 0.7% percent of the existing and foreseeable direct habitat disturbance. This direct habitat disturbance removes these acres from the forage base for big game animals; indirect big game avoidance of these areas can increase the total area of meaningful disturbance to a greater area.

The entire vicinity of the Project Area, and almost all of the 2.16 million acre Herd Unit Area 615 (Red Desert), comprises antelope winter/yearlong range. Antelope move freely over the area and have forage options beyond disturbance areas. Crucial winter range is located only along the southeastern margins of the Herd Unit Area, more than 20 miles beyond the Project Area (WGF, 2002, GIS data). Impacts are expected to be minor. Within the Red Desert herd unit, existing oil and gas development includes approximately 1,512 wells (WOGCC, 2004a, GIS data). At an average long-term direct habitat disturbance of 4.9 acres/well, plus 6,050 acres of foreseeable disturbance, total existing and foreseeable disturbance would be approximately 13,460 acres. Project long-term loss of forage of 81 acres represents 0.6 percent of the existing and foreseeable disturbance.

The local mule deer population belongs to the 2.5 million acre Steamboat Herd Unit Area. Mule deer utilize the identified spring/summer/fall range in the area immediately around and southwest of Hay Reservoir. This local population inhabits a 27,000 acre area located near the center of an area of approximately one million acres extent in which mule deer are infrequent visitors (WGF, 2002, GIS data). The nearest crucial winter range is located more than 30 miles to the west. Oil and gas development from the Proposed Action, the Wind Dancer Natural Gas Development Project, and the Kennedy Hay Reservoir CBM Pilot would occur within the approximate 42 square mile area of spring/summer/fall mule deer range. Approximately 53 existing, and an estimated 29 proposed wells would be located within this range. Based upon average long-term direct habitat disturbance levels for the Proposed Action of approximately 5.7 acres per well location, total long-term cumulative impact from existing and proposed oil and gas development would be approximately 467 acres removed from the forage base, or approximately 1.7 percent of the local mule deer range. Within the entire Steamboat herd unit, existing oil and gas development includes approximately 1,265 wells (WOGCC, 2004a, GIS data). At an average long-term habitat disturbance of 4.9 acres/well, plus 6,050 acres of foreseeable disturbance, total existing and foreseeable forage loss would be approximately 12,250 acres. Project long-term direct habitat disturbance of 81 acres represents 0.7 percent of the existing and foreseeable disturbance.

CBNG pilot developments are probably too remote from the Project Area to add to wildlife effects from the Proposed Action for most terrestrial species, other than big game populations. The Wind Dancer Natural Gas Development Project, located immediately adjacent to the Project Area, and which is likely to be constructed more or less simultaneously with the Proposed Action, could potentially magnify the effects of surface disturbance. Cumulative long-term

surface disturbance from existing and proposed wells and ancillary facilities within the Project area is approximately 408 acres, or 3.5 percent of the Project Area.

#### **4.17.8 Wild Horses**

Cumulative impacts to wild horses would be similar to those for big game species. The AOI would comprise the BLM herd management areas. Approximately 700 existing oil or gas wells are located within the area of the Lost Creek and Great Divide Basin herd management areas. These areas also comprise approximately 35 percent of the area analyzed Continental Divide/Wamsutter II Natural Gas Project EIS (WOGCC, 2004a, GIS data). At an average long-term disturbance of 4.9 acres/well, existing oil and gas development disturbance within the herd management areas is approximately 3,400 acres. Adding in approximately 3,900 acres of foreseeable disturbance from an estimated 800 wells, total existing and foreseeable disturbance would be approximately 7,300 acres. Project long-term disturbance of 81 acres represents 1.0 percent of the existing and foreseeable disturbance.

#### **4.17.9 Special Status Plant, Wildlife, and Fish Species**

The cumulative impacts areas of influence for certain sensitive species are indicated in **Table 4.9**.

Two active sage-grouse leks are located within two miles of the Project Area and eight leks have been identified within 10 miles. Sixty-five existing wells and ancillary facilities are located in a two mile buffer around the Project Area, with an approximate long-term surface disturbance of 371 acres. An estimated 7 future wells are likely to be drilled within two miles of the Project Area within the Wind Dancer Unit, with an estimated long-term disturbance of approximately 36 acres. Total long-term surface disturbance from existing and foreseeable oil and gas development within the Project Area and a two mile buffer, including 25 wells from the Proposed Action, is approximately 547 acres, or 1.2 percent of the area. Impacts to the existing leks from human disturbance are likely to increase over time as additional traffic and human presence in the area become established.

The situation for raptors, principally ferruginous hawks, is similar to that for sage-grouse. Numerous nests have been identified within the general vicinity of the Project Area. Stipulations on development imposed by BLM would act to protect raptors. Fifty-six existing wells and ancillary facilities are located in a one mile buffer around the Project Area, with an approximate long-term surface disturbance of 319 acres. An estimated one future well is likely to be drilled within one mile of the Project Area within the Wind Dancer Unit, with an estimated long-term disturbance of approximately five acres. Total long-term surface disturbance from existing and foreseeable oil and gas development within the Project Area and a two mile buffer, including 25 wells from the Proposed Action, is approximately 464 acres, or 1.8 percent of the area. As with sage-grouse, increased human use of the project area is likely to impact raptor use of the area in as yet unquantified ways. Many raptors, particularly ferruginous hawks, are highly sensitive to human disturbance (noise and close encroachment on nest sites) during their egg-laying and incubation phase.

Fish species are not known from the vicinity of the Project Area and Red Creek, which crosses the western edge of the Project Area, is a Class 4 stream.

The habitat for sensitive plant species which may occur in the Project Area is likely to be outside of the locations of most oil and gas facilities. Cumulative long-term surface disturbance from existing and proposed wells and ancillary facilities within the Project area is approximately 408 acres, or 3.5 percent of the Project Area. The required application of existing USFWS and BLM mitigation measures is expected to reduce any potential impacts to sensitive plant species which may occur in the Project Area.

#### **4.17.10 Recreation**

The AOI for recreational resources would include the Project Area and a surrounding buffer area. The buffer would encompass an area in which certain wildlife species, notably big game and raptors, could be temporarily displaced by, principally, construction and drilling activities. The size of the buffer is estimated to be a maximum of two miles. Total long-term surface disturbance from existing and foreseeable oil and gas development within the Project Area and a two mile buffer is approximately 547 acres, or 1.2 percent of the area, as discussed in Section 4.17.8.

Cumulative impacts of implementing the HRIP in combination with past, present, and reasonably foreseeable activities would affect recreational activities within the Project Area and beyond. Within the Project Area, the addition of roads to the existing network would facilitate roaded travel for recreationists/hunters to more parts of the Project Area. Disturbance from operations and construction may temporarily displace game animals and hunters. This displacement would be short-term.

#### **4.17.11 Visual Resources**

The AOI for visual resources would be areas within visual range of the Proposed Action, principally an area within approximately one mile of the Project Area.

As previously discussed in Section 3.11, existing visual qualities in the HRIP and adjacent lands have already been affected by ongoing oil and gas development, including road building and pipeline construction. Livestock management and recreational uses have also contributed less noticeable features to the visual quality of the Project Area and adjacent lands including fences and off-road tracks in addition to use of the existing road network. The Proposed Action along with ongoing and proposed oil and gas projects in and adjacent to the Project Area would add to the level of impact to visual resources in the immediate area. However the added features of the HRIP would be consistent with the existing well site, roads, and reclaimed pipeline features in line, form, color, and texture; and would still be consistent with the current VRM Class 3 designation with implementation of standard best management practices for all oil and gas projects including specifically the mitigation measures proposed in Chapter 2 and **Appendix B** of this EA. Cumulative impacts on visual resources are expected to occur.

#### **4.17.12 Cultural Resources**

The AOI for cultural resources is the Project Area.

Provisions of the National Historic Preservation Act and other regulations require identification and protection of heritage resources on public lands. In compliance with these requirements, oil and gas operators have conducted or would conduct archeological inventories prior to development. Cultural sites would be identified and in most cases avoided. Where avoidance is impossible, mitigation measures would protect or recover information about the site. The completion of these inventories would result in an increase in heritage information and a beneficial impact.

#### **4.17.13 Socioeconomics**

The AOI for socioeconomics is Sweetwater and Carbon counties, including the communities of Rawlins, Rock Springs, and Wamsutter.

With the completion of several programmatic NEPA analyses covering oil and gas development in the Green River, Great Divide, and Washakie basins, southwestern Wyoming is likely to experience an increase in the levels of natural gas development activities.

As discussed in Section 3.13 previously, both counties and the municipalities of Rock Springs and Rawlins have experienced net population losses over the last decade. This suggests that municipal infrastructures would be able to accommodate any limited and temporary population increases associated with initial phases of expanded oil and gas development, including the Proposed Action. Should economic conditions continue to favor development, it is possible that infrastructure upgrades would be required by local governments and housing shortages could occur. The community of Wamsutter has experienced a nearly 9 percent population growth in the last decade, potentially resulting in local housing shortage. However, the very small size of the town (261, 2000 census) and the availability of temporary housing units suggest that initial phases of expanded gas development would have minor negative impacts to Wamsutter.

Ongoing and expanded gas development in southwestern Wyoming could affect the attitudes of local populations by visually altering the landscape and possibly displacing recreational opportunities.

Overall, the Proposed Action and other currently-active gas development projects would have a beneficial effect on government revenues, local employment, and local merchandising.

#### **4.17.14 Transportation**

The AOI for transportation issues would include the I-80 corridor and roads reaching the vicinity of the Project Area from I-80, principally Bar X, Tipton, and Luman roads.

These roads provide adequate capacity for existing uses, principally recreational hunting and livestock ranching in addition to oil and gas production. Foreseeable increases in natural gas

development could result in higher maintenance requirements for gravel-surfaced roads north of I-80. Large increases in oilfield traffic associated with oil and gas development in both the Great Divide Basin to the north and the Washakie Basin to the south could result in increased maintenance requirements for I-80.

#### **4.17.15 Health and Safety**

The AOI for health and safety issues would be similar to that for transportation, described in Section 4.17.13.

The most likely sources of risks to human health and safety are anticipated to be from potential industrial accidents associated with drilling and completion activities and pipeline construction, and from potential vehicular accidents associated with increased traffic on Project access routes. Cumulative impacts are expected to be those described for the Proposed Action.

#### **4.17.16 Noise**

The AOI for noise would be the Project boundary plus a 2,000 foot buffer, which would encompass the area within which noise during drilling operations would exceed the EPA standard, as discussed in Section 4.16.1.

No cumulative effects from noise above or beyond those discussed in Section 4.16.1 are expected.

# CHAPTER 5 - CONSULTATION AND COORDINATION

## 5.0 CONSULTATION AND COORDINATION

This EA was prepared by a third-party contractor working under the direction of, and in coordination with, the Bureau of Land Management's Rawlins, Wyoming Field Office. During the preparation of this EA, the preparers have consulted with representatives of, or otherwise obtained information from, the following governmental agencies:

- State of Wyoming, Department of Administration and Information, Division of Economic Analysis
- State of Wyoming, Department of Environmental Quality
- State of Wyoming, Game and Fish Department
- State of Wyoming, Oil and Gas Conservation Commission
- State of Wyoming, State Historic Preservation Office
- State of Wyoming, State Engineer's Office
- U.S. Bureau of Land Management, Rawlins, Wyoming Field Office
- U.S. Census Bureau
- U.S. Department of Agriculture, Natural Resources Conservation Service
- U.S. Department of Transportation
- U.S. Fish & Wildlife Service, Ecological Services Office
- U.S. Geological Survey

## 5.1 PUBLIC PARTICIPATION

As part of the preparation of an Environmental Assessment, the Council on Environmental Quality (CEQ) requires (40 CFR 1500-1508) an initial public scoping process to assist in the determination of issues of concern and provide information to be used in the selection of potential alternatives to the Proposed Action.

A scoping notice was prepared by BLM and submitted to the public on March 24, 2004. The notice was sent to all individuals, agencies, companies, and organizations listed on the BLM's NEPA mailing list. The 30 day public comment period ended April 26, 2004. Comments were received from the following individuals, agencies, or organizations:

- Biodiversity Conservation Alliance / Wyoming Outdoor Council
- Petroleum Association of Wyoming
- State of Wyoming, Department of Agriculture
- State of Wyoming, Department of Game and Fish
- State of Wyoming, Department of Environmental Quality
- State of Wyoming, Office of State Lands and Investments
- U.S. Department of Agriculture Natural Resources Conservation Service
- U.S. Fish and Wildlife Service
- U.S. Forest Service, Bridger-Teton National Forest

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# **Appendix A**

## **Approvals and Authorizing Actions**

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**Appendix A: Approvals and Authorizing Actions Necessary for Construction, Operation, Maintenance and Abandonment of the Proposed Action**

Issuing Agency/Permit	Nature of Permit	Authority	Applicable Project Component
<b>FEDERAL PERMITS, APPROVALS AND AUTHORIZING ACTIONS</b>			
<b>U.S. Bureau of Land Management</b>			
Permit to Drill, Deepen or Plug Back (APD Process)	Controls drilling for oil and gas on federal onshore leases	Mineral Leasing Act of 1920 (30 U.S.C. 181 et seq.)	Well pad construction and drilling and completing activities
Approval of Unitization	Provides for efficient and timely development and production of federal oil and gas leases	Mineral Leasing Act of 1920 (30 U.S.C. 181 et seq.); 43 CFR 3180	Wind Dancer Unitization
Rights-of-way Grants and Temporary Use Permits	Right-of-way grants on BLM-managed lands	Mineral Leasing Act of 1920 (30 U.S.C. 181 et seq.)	Pipelines on BLM-managed lands
Rights-of-way Grants and Temporary Use Permits	Right-of-way grants on BLM-managed lands	Federal Land Policy and Management Act of 1976 (43 U.S.C. 1761-1771); 43 CFR 2800	Access road on BLM-managed lands
Antiquities and Cultural Resources Permits	Issue antiquities and cultural resources use permit to excavate or remove cultural resources from federal lands	Antiquities Act of 1906 (16 U.S.C. Sections 432-433); Archaeological Resources Public Protection Act of 1979 (16 U.S.C. Sections 470aa-47011); 43 CFR Part 3	All proposed action and alternative components
Approval to dispose of produced water	Controls disposal of produced water from federal leases	Mineral Leasing Act of 1920 (30 U.S.C. 181 et seq.); 43 CFR 3160	Wells
<b>U.S. Department of the Army (Corps of Engineers)</b>			
Section 404 Permit (nationwide)	Controls placement of dredged or fill material in Waters of the U.S. including adjacent wetlands	Section 404 of the Clean Water Act of 1972 (40 CFR 122-123)	Pipeline and road crossings of streams
<b>U.S. Fish and Wildlife Service</b>			
Consultation Process, Endangered or Threatened Species	Preliminary Biological Assessment	Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. et seq.)	All surface disturbing activities

Issuing Agency/Permit	Nature of Permit	Authority	Applicable Project Component
<b>STATE PERMITS, APPROVALS AND AUTHORIZING ACTIONS</b>			
<b>Wyoming Department of Environmental Quality - Water Quality Division (WDEQ-WQD)</b>			
Water Quality Permit	Regulate disposal of drilling fluids from abandoned reserve pits	Wyoming <i>Environmental Quality Act</i> , Article 3, Water Quality, as amended (W.S. 35-11-301 through 35-11-311)	Reserve pits
SWPP Permit	NPDES permits for discharging produced water and stormwater runoff	WDEQ-WQD Rules and Regulations, Chapter 18; Wyoming <i>Environmental Quality Act</i> , Article 3, Water Quality, as amended (W.S. 35-11-301 through 35-11-311); Section 405 of the <i>Federal Water Pollution Control Act (Clean Water Act)</i> (codified at 33 U.S.C. 1345)	Well pads
Hydrostatic Discharge Permit	Administrative approval for discharge of hydrostatic test water	Wyoming <i>Environmental Quality Act</i> , Article 3, Water Quality, as amended (W.S. 35-11-301 through 35-11-311)	Pipelines
Water Quality Permits	Temporary sewage facilities (W.S. 35-11-301 through 35-11-307)	Wyoming <i>Environmental Quality Act</i>	Temporary housing drilling
<b>Wyoming Department of Transportation</b>			
Oversize and Overlength Load Permits	Permits for oversize, overlength and overweight loads regulations	Chapters 17 and 20 of the Wyoming Highway Department Rules	Transportation of equipment and materials on state highways
<b>Wyoming Oil and Gas Conservation Commission</b>			
Gas Flaring Permit	Authorization for flaring or venting of gas	WOGCC Regulations, Chapter 3, Operational and Drilling Rules, Section 45 Authorization for Flaring or Venting of gas	Wells

Issuing Agency/Permit	Nature of Permit	Authority	Applicable Project Component
Injection of Produced Water	Permit for Class II underground injection wells	Underground Injection Control Program: Criteria and Standards, as amended (40 C.F.R. 146); state Underground Injection Control Programs, State-administered program - Class II Wells, as amended (40 C.F.R. 147.2551)	Wells
Plugging Abandoned Wells	Well plugging and abandonment	WOGCC Regulations, Chapter 3, Section 14, Reporting (Form 4); Section 15, Plugging of Wells, Stratigraphic Tests, Core, or Other Exploratory Holes (Form 4)	Wells
Change in Depletion Plans	Regulates drilling of additional wells	Wyoming Oil & Gas Act (W.S. 30-5-110)	Drilling and completing activities
Drilling on State/Fee Minerals	Regulates drilling of wells	Wyoming Oil & Gas Act (W.S. 30-5-110)	Drilling and completing activities - state/fee minerals
<b>State Land Board</b>			
Rights-of-way Grants	Rights-of-way on State Lands	W.S. 35-20 and 36-20	Roads and pipelines
<b>State Engineers Office</b>			
Water Well Permit	Grant Permit to drill water well and appropriate groundwater	W.S. 41-121 through 147	Water Well
<b>LOCAL PERMITS, APPROVALS AND AUTHORIZING ACTIONS</b>			
<b>Sweetwater County, Wyoming</b>			
Class II Permit	Controls industrial development within the county	Section 4.6 of the County Permit System	All proposed action and alternative components
Oil and Gas Location Permit	Controls industrial development within the county	County Permit System	Wells
County Road Crossing Permit	Controls construction within county road rights-of-way		Pipelines
Road Use Agreements and/or Oversize Trip Permit	Oversize, overlength and overweight truck use of county roads	Transportation of equipment and materials on county roads	

# **Appendix B**

## **Applicant-Committed Mitigation Measures**

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## **APPENDIX B: APPLICANT-COMMITTED MITIGATION MEASURES**

### **Surface Use Plan**

#### **Existing Roads:**

1. All existing roads to be used for this project shall be reconstructed and/or maintained consistent with BLM minimum standards as found in BLM Manual Section 9113.
2. Existing roads shall be maintained in a condition as good as or better than the condition prior to the beginning of operations. The existing access road shall be regularly maintained in a safe and usable condition. A regular maintenance program may include, but is not limited to, blading, ditching, culvert installation, and gravel surfacing.
3. All vehicles shall use only the authorized access road(s), as depicted in the approved APD. Vehicles shall not use any other access route to the drill/well pad and any ancillary facilities including, but not limited to, any two-track roads or trails and pipeline rights-of-way.
4. If snow removal outside the new and existing roadways is undertaken, equipment used for snow removal operations shall be equipped with shoes to keep the blade at least six inches off the ground surface. Special precautions shall be taken where the surface of the ground is uneven to ensure that equipment blades do not destroy the vegetation.
5. Unless otherwise exempted, free and unrestricted public access shall be maintained on the access road.

#### **Roads to be Constructed or Reconstructed:**

6. In the event production is established, the sub-base of the proposed road shall be thoroughly compacted (to at least 85% maximum dry density), and surfaced with at least four inches of gravel where road alignment-specific conditions require or as directed by the BLM. A temporary variance to this condition of approval may be granted if the Operator requests such a variance, in advance and in writing, during periods when soil moisture is low.
7. Additional culverts (in addition to those specified in the APD) shall be placed along the proposed access road if the need arises, or as directed by the BLM Authorized Officer. The minimum diameter for culverts shall be 18 inches. All culverts shall have a minimum of 12 inches fill or  $\frac{1}{2}$  the pipe diameter of fill, whichever is greater, placed on top of the culvert, and shall be of length sufficient to allow at least 24 inches of culvert to extend from the fill slope face (on both the inlet and outlet sides). The inlet & outlet shall be set at the gradient of the native ground or existing channel. If the culvert is being placed in an existing watercourse channel, the culvert shall be aligned with the existing channel. The entire length of pipe shall be bedded on native material before backfilling. Backfilling shall be completed using unfrozen material and rocks no larger than two inches in diameter. Care

shall be exercised to thoroughly compact the backfill around and under the culvert. Tamp each corrugation with a shovel handle. The backfill shall be brought up evenly in 6" lifts on both sides of the culvert and compacted. A permanent marker shall be installed at the inlet and outlet of the culvert to prevent vehicles from damaging the culvert.

8. After the road is crowned and ditched, any berm located above the cutslope shall be removed, to allow overland flow to sheet across the cutslope into the ditch.
9. Before proposed road construction activities begin, the topsoil (to a depth of at least 6 inches) must be bladed to the side of the road and stockpiled to a depth of no greater than 24 inches. The topsoil stockpile shall be contoured so as to prevent water ponding or flow concentration. Once the barrow ditch and the cut slopes are constructed, the topsoil shall be spread over the cut slopes.
10. No construction or routine maintenance activities shall be performed during periods when the soil is too wet to adequately support equipment. If equipment (including licensed highway vehicles) creates ruts in excess of 4 inches deep, the soil shall be deemed too wet to adequately support construction equipment.
11. Construction-related traffic shall be restricted to routes approved by the BLM Authorized Officer. New access roads or cross-country vehicle travel will not be permitted unless prior written approval is granted by the BLM Authorized Officer.
12. Upon completion of the proposed access road(s), the roads shall be regularly maintained in a safe and usable condition. A regular maintenance program may include, but is not limited to, blading, ditching, culvert installation, and gravel surfacing.

**Existing and/or Proposed Facilities if Productive:**

13. The Operator shall comply with all federal, state, and local laws/regulations pertaining to disposal of produced water, including the use of properly permitted and authorized disposal sites.
14. All storage batteries and compressor facilities constructed or utilized as components of this project, including drain sumps and sludge holdings at compressor facilities, shall be surrounded by an impervious dike of sufficient size to hold the entire storage capacity of the largest tank in the facility and still allow one foot of freeboard or 110% of the capacity of the largest tank in the facility. The containment or diversionary structure shall be impervious to any oil, glycol, produced water, or other toxic fluid for 72 hours and would be constructed so that any discharge from a primary containment system would not drain, infiltrate, or otherwise escape to ground water, surface water, or navigable waters before cleanup is completed.

**Location and Type of Water Supply:**

15. The water supply source for drilling must be approved and authorized by the State of Wyoming.

**Methods for Handling Waste Disposal:**

16. The Operator shall comply with the Hazardous Materials Management Summary provided in the Continental Divide/Wamsutter II EIS for hazardous materials that may potentially be used, produced, transported, disposed of, or stored on the well location.
17. The Operator shall comply with all federal, state, and local laws and regulations pertaining to disposal of human and solid wastes.
18. Fluids containing any hydrocarbons (condensate, diesel, etc.) shall not enter the reserve pit or production pit.
19. Produced fluids shall be contained in test tanks during completion and testing. This fluid shall not be placed into the reserve pit without prior written approval from the BLM Authorized Officer.
20. Within 90 days of initial production start-up, the Operator shall submit to the BLM Authorized Officer an analysis of the produced water. Produced water will be trucked off-site to an approved location not located on federal surface, or will be disposed of by other approved methods. Produced water pits will not be used.
21. The reserve pit shall be lined with an impermeable liner. The impermeable liner shall have a permeability less than or equal to  $1 \times 10^{-7}$  cm/sec. The liner shall be installed so that the liner will not leak and shall be chemically compatible with all substances which may be placed into the pit. Liners made of any man-made synthetic material shall be of sufficient strength and thickness to withstand normal installation and pit use.
22. After evaporation and when dry, the reserve pit liners (if any) shall be cut off as near to the mud surface as possible and hauled to a legal landfill prior to backfilling the pit with a minimum of 5 feet of soil material.
23. Fracturing fluids shall not be released into the flare pit.
24. No fluids containing hydrocarbons or hazardous substances shall be allowed to accumulate in the flare pits.

**Well Site Layout:**

25. For the protection of livestock and wildlife, all pits and open cellars shall be fenced. Fencing shall be in accordance with BLM specifications. Netting shall be placed over all open production pits to eliminate any hazard to migratory birds or other wildlife. Netting is

also required over reserve pits which have been identified as containing oil or hazardous substances (CERCLA Section 101(14)). The mesh diameter of netting shall be no larger than one inch. The reserve pit shall be fenced on three sides during drilling, and the working side shall be fenced immediately after the drilling rig is moved. Fencing shall meet BLM specifications. The reserve pit shall remain fenced until reclamation is initiated.

26. At least 6 inches of topsoil shall be stripped from the well pad and stockpiled within the designated topsoil storage areas.
27. If water is encountered within 50 feet of the surface, during construction of the rathole, reserve pit, or drilling of a water well, the Operator must contact the BLM Authorized Officer.

**Surface Reclamation Plans:**

28. The following seed mixture shall be used, unless other mixes are requested by the Authorized Officer.

Species	Scientific Name	Variety	Pounds PLS/Acre*
<b>Grasses</b>			
Slender wheatgrass	Agropyron techycaulum		2.0
Thickspike wheatgrass	Agropyron dasystachyum	Critana	4.0
Western wheatgrass	Agropyron smithii		2.0
Indian ricegrass	Oryzopsis hymenoides		1.0
Bottlebrush squirreltail	Sitanion hystrix		1.0
Needle-and-thread	Stipa comata		1.0
<b>Shrubs</b>			
Gardner's saltbush	Atriplex gardnerii		1.0
<b>Total</b>			<b>12.0</b>

\* These seed rates are for drill seeding, in pounds PLS (Pure Live Seed). If broadcast seeding, double the rates provided.

29. Seeding shall be completed either late in the autumn (September 15 to November 15, before freeze up) after completion, or as early as possible the following spring to take advantage of available ground moisture. Seeding shall be repeated until a satisfactory stand is established as determined by the BLM Authorized Officer. If the seed is broadcast, twice the proposed drilled rate shall be used.
30. After (1) recontouring all disturbed areas of the project to the original topography and (2) final grading and replacement of topsoil, the entire surface of the well site and access road shall be ripped to a depth of 18 to 24 inches on 18 to 24 inch centers.
31. Rat and mouse holes (subgrade excavations for the conduct of drilling operations) shall be filled and compacted from the bottom to the top immediately upon release of the drilling rig from the location.

32. After the access road is completed, any of the original two-track roads and trails that remain shall be reclaimed by ripping to a depth of 18 to 24 inches at 18 to 24 inch spacing.
33. All equipment, debris, and trash must be removed from the site prior to final reclamation operations.
34. In the event the well is productive, or shut in, the reclamation of all disturbed areas not needed for production operations shall commence as soon as possible, but within two years of the initial disturbance. Reclamation shall include backfilling, grading, contouring, topsoil placement, and ripping, and re-seeding as outlined in the approved APD and these COA, under plans for reclamation.
35. The reserve pit shall be dry and void of free liquids prior to backfill and reclamation, which shall commence and be completed within the first year of completion of the well, unless otherwise approved by the authorized officer.

#### **Pipeline Rights of Way (Pipe < 6 inches Inside Diameter)**

36. Where pipelines cross ephemeral drainages, the Right-of-Way Holder(s) (Holder) shall ensure that the channel geometry after construction is nearly identical to that prior to construction, and that ephemeral flows will not be diverted or otherwise result in accelerated rates of erosion.
37. The Holder is prohibited from discharging oil or other pollutants into or upon the navigable waters of the United States, adjoining shorelines, or the waters of the contiguous zone in violation of Section 311 of the Clean Water Act as amended, 33 U.S.C. 1321, and the regulations issued thereunder, or applicable laws of the State of Wyoming and regulations issued thereunder. Holder shall give immediate notice of any such discharge to the Authorized Officer and such other federal and state officials as are required by law to be given such notice.
38. Prior to any discharge, hydrostatic testing water will be tested and processed, if necessary, to ensure that the water meets local, state or federal water quality standards. Prior to discharge of hydrostatic testing water from the pipeline, the Holder shall design and install a suitable energy dissipater at the outlets, and design and install suitable channel protection structures necessary to ensure that there will be no erosion or scouring of natural channels within the affected watershed as a result of such discharge. Sandbags, rock, or other materials or objects installed shall be removed from the site upon completion of hydrostatic testing.
39. The Holder shall comply with all applicable Federal laws and regulations existing or hereafter enacted or promulgated. In any event, the Holder(s) shall comply with the Toxic Substances Control Act of 1976, as amended (15 U.S.C. 2601, et seq.) with regard to any toxic substances that are used, generated by or stored on the right-of-way or on facilities authorized under this right-of-way grant. (See 40 CFR, Part 702-799 and especially, provisions on polychlorinated biphenyls, 40 CFR 761.1-761.193.) Additionally, any release

of toxic substances (leaks, spills, etc.) in excess of the reportable quantity established by 40 CFR, Part 117 shall be reported as required by the Comprehensive Environmental Response, Compensation and Liability Act of 1980, Section 102b. A copy of any report required or requested by any Federal agency or State government as a result of a reportable release or spill of any toxic substances shall be furnished to the authorized officer concurrent with the filing of the reports to the involved Federal agency or State government.

**Other:**

40. The Operator shall have a qualified individual to serve as Compliance Coordinator available during active operations. This individual will be responsible for ensuring that all requirements of the Surface Use Plan and appropriate Conditions of Approval are applied.
41. The construction of the well pad and all roads constructed or reconstructed on public lands shall be monitored by a licensed professional engineer or a qualified inspector (not the dirt contractor) to ensure that the construction of the well pad and road meets Bureau of Land Management standards as outlined in the approved APD.

**Resource Protection Measures**

**Cultural and Paleontological Resources Protection:**

42. A BLM-approved archaeologist will complete a Class III cultural resources field inventory over all surfaces where disturbance is proposed. Upon completion of the inventory, the BLM would review the reports generated by the archaeologist, and the BLM would ensure that the appropriate avoidance and mitigation measures were applied as COAs for the permit (whether for APD or ROW).
43. The Operator shall be responsible for informing all personnel associated with this project that those persons shall be subject to prosecution for damaging, altering, excavating, or removing any archaeological, historical, or fossil objects or sites. If archaeological, historical, or fossil materials are discovered, the Operator shall immediately suspend all operations that may further disturb or damage such materials. The BLM Authorized Officer shall immediately be contacted and informed of the discovery of such materials. Operations shall not resume until written authorization to proceed is issued by the BLM Authorized Officer.
44. Within five working days, the BLM Authorized Officer will evaluate the discovery of such materials, and the Operator will be informed of the mitigations and/or actions necessary to prevent the loss of significant cultural or scientific values.
45. The Operator shall be responsible for the cost of any mitigation required by the BLM Authorized Officer. The BLM Authorized Officer will provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the BLM Authorized Officer that the required mitigation(s) have been completed, the Operator will be allowed to resume operations.

### **Recreational and Visual Resources Protection:**

46. All above-ground structures, production equipment, tanks, transformers, and insulators not subject to coloring requirements for safety shall be painted the color of “Carlsbad Canyon” (2.5Y 6/2). Further detail on the coloring requirements may be obtained from the BLM Authorized Officer, if necessary.

### **Soil and Plant Community Resources Protection:**

47. The Operator shall be responsible for the total control of all invasive/noxious weed species on any and all disturbed sites associated with this APD, including, but not limited to, the drill/well pad, access road(s), and pipeline rights-of-way. The Operator is responsible for consulting with the BLM Authorized Officer and, if necessary, local authorities prior to control activities of weed-infested areas. The Operator shall notify the Authorized Officer if invasive and/or noxious weeds are observed within the disturbed areas associated with this APD. The Operator shall obtain written approval from the BLM Authorized Officer prior to initiating weed control operations.
48. The Operator or contractor will obtain proper BLM pesticide application permits and would comply with the applicable federal and state laws and regulations concerning the use of pesticides (e.g., insecticides, herbicides, fungicides, rodenticides, and other similar substances) in all activities/operations under this permit. Pesticides will not be permanently stored on public lands.

### **Wildlife Resource Protection:**

49. If a raptor tries to nest on or in any well buildings or facilities, the Operator shall immediately notify the BLM Authorized Officer.
50. Within one mile of active ferruginous hawk and eagle nests, and within  $\frac{3}{4}$ -mile of all other active raptor nests, construction, drilling and other activities potentially disruptive to nesting raptors are prohibited during the period of February 1 to July 31.
51. Within two miles of identified sage-grouse leks, construction, drilling and other activities potentially disruptive to strutting and nesting sage/sharp-tailed grouse are prohibited during the period of March 1 to June 30.
52. All surface-disturbing activities shall be restricted from encroaching to within  $\frac{1}{4}$ -mile of identified sage-grouse leks.
53. When located in mountain plover habitat, construction, drilling, reclamation and other activities are prohibited during the reproductive period of April 10 to July 10. Should construction, drilling and other activities be anticipated between these dates, an exception must be granted by the BLM Authorized Officer, and consistent with the March 2002 USFWS Mountain Plover Survey Guidelines.

54. If it were determined there is any activity in the area by endangered species not previously discovered, the BLM and Operator will confer and any necessary and appropriate steps would be taken.

### **Miscellaneous Permitting Requirements**

55. All survey monuments found within the area of operations shall be protected. Survey monuments include, but are not limited to, (1) General Land Office and Bureau of Land Management Cadastral Survey Corners, reference corners, witness points, U.S. Coast and Geodetic Survey benchmarks and triangulation stations, military control monuments, and recognizable civil (both public and private) survey monuments. In the event of obliteration or disturbance of any survey monuments, the incident shall be reported in writing to the BLM Authorized Officer.
56. The Operator shall be held responsible for the prevention and suppression of fires on public lands caused by its employees, contractors, or subcontractors. During conditions of extreme fire danger, surface use operations may be either limited or suspended, or additional measures may be required by the BLM Authorized Officer. The occurrence of any wildland fire shall be reported immediately to the BLM Fire Dispatch, 1 (800) 295-9953.
57. No flaring of gas shall be allowed into the reserve pit without prior approval by the BLM Authorized Officer.
58. The Operator shall comply with all Federal, State, and local laws, rules, and regulations, including the acquisition of any necessary Federal, State, and/or local permits.
59. The Operator will construct, operate, and maintain the facilities and structures within the grants and/or permits in conformance with the descriptive and technical data which were furnished the BLM in connection with the application for these grants and/or permits. Any relocation, additional construction, or use which is not in accord with such data may not be initiated without prior written approval of the Authorized Officer.
60. Monitoring of construction, drilling, and rehabilitation operations will be provided by the Operator. A BLM compliance officer may make regular inspections of all activities during construction, drilling, and follow-up restoration/reclamation.
61. Discharges, spills, fires, accidents, or blowouts will be reported to the Authorized Officer in accordance with "Notice to Lessee-Reporting of Undesirable Events" (NTL-3A), or an applicable Onshore Oil and Gas Order. Containment of hydrocarbons and procedures for handling the above is contained in the Operator's Spill Prevention Control and Countermeasure Plan (SPCC) as required under 40 CFR, Part 112.
62. Operator will assist in the prevention of illegal discharge of firearms whenever possible. This measure would help reduce vandalism and wildlife violation incidents.