ENVIRONMENTAL ASSESSMENT for the Hanna Draw Coalbed Natural Gas Pilot Project

Carbon County, Wyoming

January 2007

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-07/009+1310

WY-030-07-EA-083

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

January 29, 2007

In Reply Refer To:
1790 (030)

Re: Environmental Assessment for the
Hanna Draw CBNG Pilot Project

Dear Reader:

This is to inform you of the availability of the Hanna Draw Coalbed Natural Gas (CBNG) Pilot Project (Project) Environmental Assessment (EA) at the Wyoming Bureau of Land Management's (BLM) website:

www.wy.blm.gov/rfo/nepa.htm

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 coalbed natural gas wells north of Hanna, Wyoming.

It is expected that this EA can be viewed at our website beginning January 29, 2007. 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 February 28, 2007.

Comments may be submitted via regular mail to:

Travis Bargsten, Project Manager
Bureau of Land Management
Rawlins Field Office
P.0. Box 2407
Rawlins, Wyoming 82301

or may be submitted electronically at the address shown below (please refer to the Hanna Draw CBNG Pilot 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 Travis Bargsten, Project Manger, at the Rawlins address or phone (307) 328-4387.

Sincerely,

Field Manager

Enclosure

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LIST OF ACRONYMS AND ABBREVIATIONS

AADT	Annual Average Daily Traffic
ANC	acid neutralizing capacity
APC	Anadarko Petroleum Corporation
APCD	Air Pollution Control Division
APD	Application for Permit to Drill
APLIC	Avian Power Line Interaction Committee
AQRV	Air Quality Related Values
ARS	Air Resource Specialists
BA	Biological Assessment
BACT	best available control technology
bbl/day	barrels per day
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
CBNG	coalbed natural gas
CCF	central compressor facility
CDPHE	Colorado Department of Public Health and Environment
CEQ	Council on Environmental Quality
cfs	cubic feet per second
CIAA	cumulative impact assessment area
CO	carbon monoxide
COA	Conditions of Approval
CR	county road
dBA	decibels on the A-weighted scale
EA	environmental assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FO	Field Office
FY	fiscal year
g/bhp-hr	grams per brake horsepower hour
gpm	gallon per minute
H_3	tritium
HAP	hazardous air pollutant
HDPE	high-density polyethelene
hp	horse power
HU	Hydrologic Unit
HUD	Department of Housing and Urban Development
I-80	Interstate 80
IDT	BLM interdisciplinary team
IC	internal combustion
km	kilometer
kV	kilovolt
LOP	life-of-project
MBTA	Migratory Bird Treaty Act
MCF	thousand cubic feet
MDP	Master Drilling Plan
uS/cm	micro siemens per centimeter
µg/l	micrograms per liter
$\mu g/m_3$	micrograms per cubic meter

LIST OF ACRONYMS AND ABBREVIATIONS

mg/l	milligrams per liter
MMCF	million cubic feet
MMCFD	million cubic feet per day
mph	miles per hour
MSUP	Master Surface Use Plan
NAAQS	national ambient air quality standards
NAICS	North American Industry Classification System
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_x	nitrogen oxides
NO_2	nitrogen dioxide
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRWQC	National Recommended Water Quality Criteria
O_3	ozone
OHV	off-highway vehicle
OSHA	Occupational Safety and Health Administration
PA	Physician's Assistant
Pb	lead
PFC	Proper Functioning Condition
PFWC	Probable Fossil Yield Classification
Pilot Project	Hanna Draw Coalbed Natural Gas Pilot Project
PM_{10}	particulate matter less than 10 microns in diameter
POD	Plan of Development
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
RAM	Ranching, Agricultural, Mining
RCSC	Rosebud Sales Coal Company
RMP	Resource Management Plan
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
ROW	right-of-way
ROWs	rights-of-way
RV	recreational vehicle
SEO	State Engineers Office
SH	State Highway
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
TDS	total dissolved solids
TEG	tri-ethylene glycol
tpy	tons per year
TSP	total suspended particulates
USDOT	U.S. Department of Transportation
USEIA	U.S. Energy Information Administration
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOCs	volatile organic compounds
VRM	Visual Resource Management

VSMOW	Vienna Standard Mean Ocean Water
WAQSR	Wyoming Air Quality Standards and Regulations
WES	Western Economic Services, LLC
WDAI	Wyoming Department of Administration and Information
WDEQ	Wyoming Department of Environmental Quality
WDEQ-AQD	Wyoming Department of Environmental Quality, Air Quality Division
WDOE	Wyoming Department of Employment
WDOR	Wyoming Department of Revenue
WES	Western Economic Services
WET	Whole Effluent Toxicity
WGFD	Wyoming Game and Fish Department
WIC	Wyoming Interstate Company
WMP	Water Management Plan
WNDDB	Wyoming Natural Diversity Database
WOGCC	Wyoming Oil and Gas Conservation Commission
WOS	Wildlife Observation System
WRCC	Western Regional Climate Center
WSA	Wilderness Study Area
WYDOT	Wyoming Department of Transportation
WyCRO	Wyoming Cultural Records Office
WYPDES	Wyoming Pollutant Discharge Elimination System

CHAPTER 1

PURPOSE AND NEED

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1.1 INTRODUCTION

Anadarko Petroleum Corporation (APC) proposes to explore and potentially develop coalbed natural gas (CBNG) wells near Hanna Draw, which is located within the administrative boundaries of the Rawlins Field Office (FO) of the Bureau of Land Management (BLM). The proposed well sites for the Hanna Draw Coalbed Natural Gas Pilot Project (Pilot Project) are located in Township 23 North, Range 81 West, Section 2, in Carbon County, Wyoming. The project area is located approximately 10 miles northeast of Hanna, Wyoming (Figure 1-1) on BLM-administered federal surface and mineral estate. Access to the project area is provided by Carbon County Road 291 from Hanna.

The Pilot Project would entail the construction, drilling, completion, and production of up to a maximum of 15 CBNG wells in the project area and the construction, utilization, and maintenance of appurtenant access roads, pipelines, and production facilities. The Pilot Project would be production tested for a period of 12 to 18 months. If economically viable, the total life-of-project (LOP) is estimated at 10 to 20 years.

If the Pilot Project wells produce marketable quantities of gas, APC would complete construction of a CBNG interconnect pipeline. If this Pilot Project demonstrates CBNG production in the project area is economically feasible, then additional development of this resource may be proposed. Any additional development would require further environmental analysis under the National Environmental Policy Act (NEPA).

APC drilled one test well in the Pilot Project area (Hanna Draw Federal 2-2), along with construction of an access road and water disposal pipeline. NEPA analysis for the test well and associated road and pipeline was completed by BLM (2005a). The purpose of the test well is to provide data that will be used to refine the Pilot Project. The well also will provide produced water for additional testing, particularly Whole Effluent Toxicity (WET) tests.

1.2 PURPOSE AND NEED

1.2.1 Purpose of and Need for the Proposed Development

Exploration and development of federal mineral resources by private entities is an integral part of the BLM's national energy policy. BLM is authorized to lease the federal lands for oil and gas development 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.

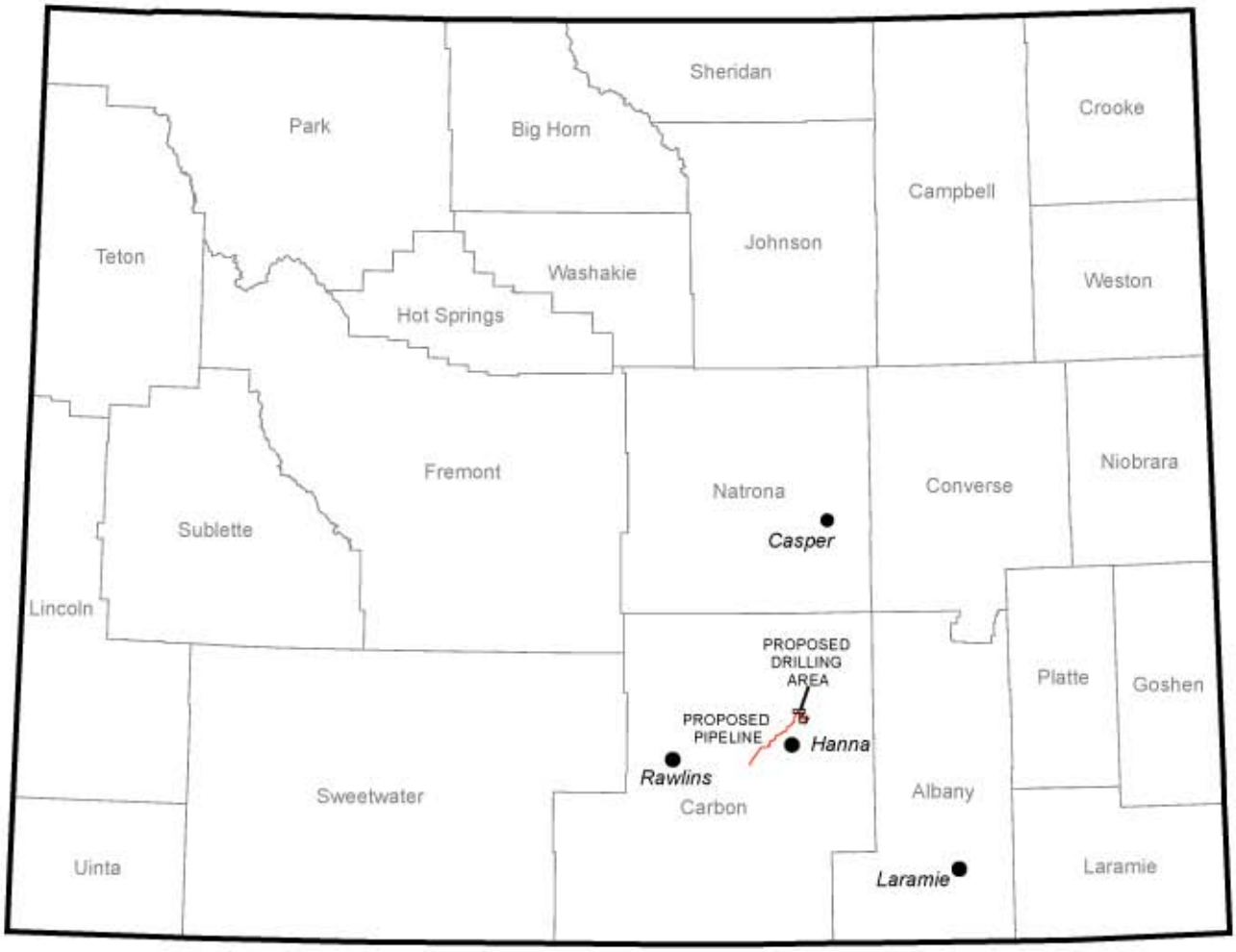
The purpose of the Proposed Action is to determine whether, given current technology, the coalbeds in the project area can be economically developed. If it is determined that such resources were suitable for commercial extraction, additional oil and gas resources would be evaluated and developed.

1.2.2 Conformance with Great Divide Resource Area RMP

The BLM's Great Divide Resource Management Plan (RMP) and Record of Decision (ROD) (BLM 1987, 1988, 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 is to provide for leasing, exploration, and development of oil and gas while protecting other resource values. The ROD found that public lands in the resource area are suitable for oil and gas leasing and development, subject to certain stipulations. The BLM has determined that impacts from CBNG exploration and development are similar in scope to those for oil and gas development and that the RMP provides for exploration and testing to determine the viability of CBNG development.

1.2.3 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 Carbon County Land Use Plan (Pederson Planning Consultants 1997, 1998) and would comply with relevant federal, state, and local laws and regulations. The development of this project would not affect the achievement of the Wyoming Standards for Healthy Rangelands, produced in August 1977 and updated in May 2003 (BLM 2003a).



BUREAU OF LAND MANAGEMENT RAWLINS WYOMING FIELD OFFICE HANNA DRAW COALBED NATURAL GAS PILOT PROJECT			PROJECT LOCATION MAP
			FIGURE 1-1

CHAPTER 2

PROPOSED ACTION AND ALTERNATIVES

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Two alternatives are currently proposed for the Hanna Draw Environmental Assessment (EA). The Proposed Action would encompass up to 15 CBNG exploration wells and associated facilities. The No Action Alternative would result in denial of the Proposed Action. Under the No Action Alternative, no pilot testing of CBNG production would occur, as described for the Proposed Action. Other project alternatives that were considered but eliminated from detailed analysis are discussed further in Section 2.3.

2.1 PROPOSED ACTION

APC is proposing to construct and operate a pilot CBNG project in Carbon County, Wyoming, approximately 10 miles northeast of Hanna (Figures 2-1 and 2-2). The Proposed Action would involve the development of up to 15 wells and associated facilities on federal lands and the construction and operation of a CBNG interconnect pipeline. The project's Master Surface Use Plan (MSUP) and Master Drilling Plan (MDP) are presented in Appendix A and B, respectively. Therefore, this EA analyzes the maximum potential surface disturbance from drilling up to15 CBNG producing well sites, associated roads and facilities, and an interconnect pipeline. Table 2-1 provides a summary of surface disturbance areas for the project.

The BLM has received all 15 Applications for Permit to Drill (APDs) for the project; however, the rights-of-way (ROWs) for the interconnect pipeline and power line have not yet been submitted by APC. This EA, then, considers the site-specific impacts from the Proposed Action, but is limited in assessing the impacts associated with the interconnect pipeline and power line. If impacts not analyzed in this EA would be necessary (such as access road construction) for installation and use of the interconnect pipeline and power line, these will be identified upon the BLM's receipt of the ROWs, and additional NEPA analysis would be completed, as necessary, prior to authorization.

Project area access is from the town of Hanna along Carbon County Road 291 (i.e., Hanna Draw Road). The exploration project would consist of drilling, casing, completing, and producing up to 15 wells on public lands administered by the BLM. All wells would be located to minimize potential environmental impacts, where feasible.

Ancillary facilities would include access roads, buried utility lines, buried gas and water gathering lines, an above ground electric power distribution line, associated substation, central compressor facility (CCF), and a CBNG interconnect pipeline. A previous action was authorized (Hanna Draw Federal 2-2) that resulted in the construction of a pipeline from Section 2 to the existing reservoir in Section 13. An additional pipeline is being considered under this Proposed Action to construct and operate a return pipeline from this existing reservoir back to Section 2.

Production water would be discharged to an existing reservoir located in Section 13, in accordance with an existing Wyoming Pollutant Discharge Elimination System (WYPDES) permit approved by the Wyoming Department of Environmental Quality (WDEQ). The expected volume of produced water proposed for discharge would be no more than 40,000 barrels per day (bbl/day), or approximately 2.6 cubic feet per second (cfs). Produced water quality would be monitored in accordance with state and federal regulations.

Table 2-1 Disturbance Areas

Feature	Length/ Dimensions	Short-term Project Disturbance[1] (acres)				Long-term Project Disturbance[2] (acres)			
		BLM	Private	State	Total	BLM	Private	State	Total
New Roads [3]	2.11 Miles	11.5	---	---	11.5	7.7	---	---	7.7
Drill Pads [4]	200 ft. x 300 ft.	21.0	---	---	21.0	11.0	---	---	11.0
Facility Area	700 ft. x 700 ft.	---	11.1	---	11.1	---	11.1	---	11.1
Return Pipeline[5]	2.46 Miles	3.0	6.0	---	9.0	0.0	0.0	---	0.0
Interconnect Pipeline[6]	26.5 Miles	150.3	142.5	13.1	305.9	0.0	0.0	0.0	0.0
Gathering Pipelines[5]	4.6 Miles	9.2	3.7	---	12.9	0.0	0.0	0.0	0.0
Power Line [7]	7.6 Miles	13.5	10.5	3.7	27.7	<.1	<0.1	<0.1	<0.1
Total Areas	**---**	**208.5**	**173.8**	**16.8**	**399.1**	**18.7**	**11.1**	**<0.1**	**29.8**

[1] Short-term Disturbance: Maximum initial project disturbance prior to interim reclamation.

[2] Long-term Disturbance: Project disturbance after interim reclamation; LOP disturbance.

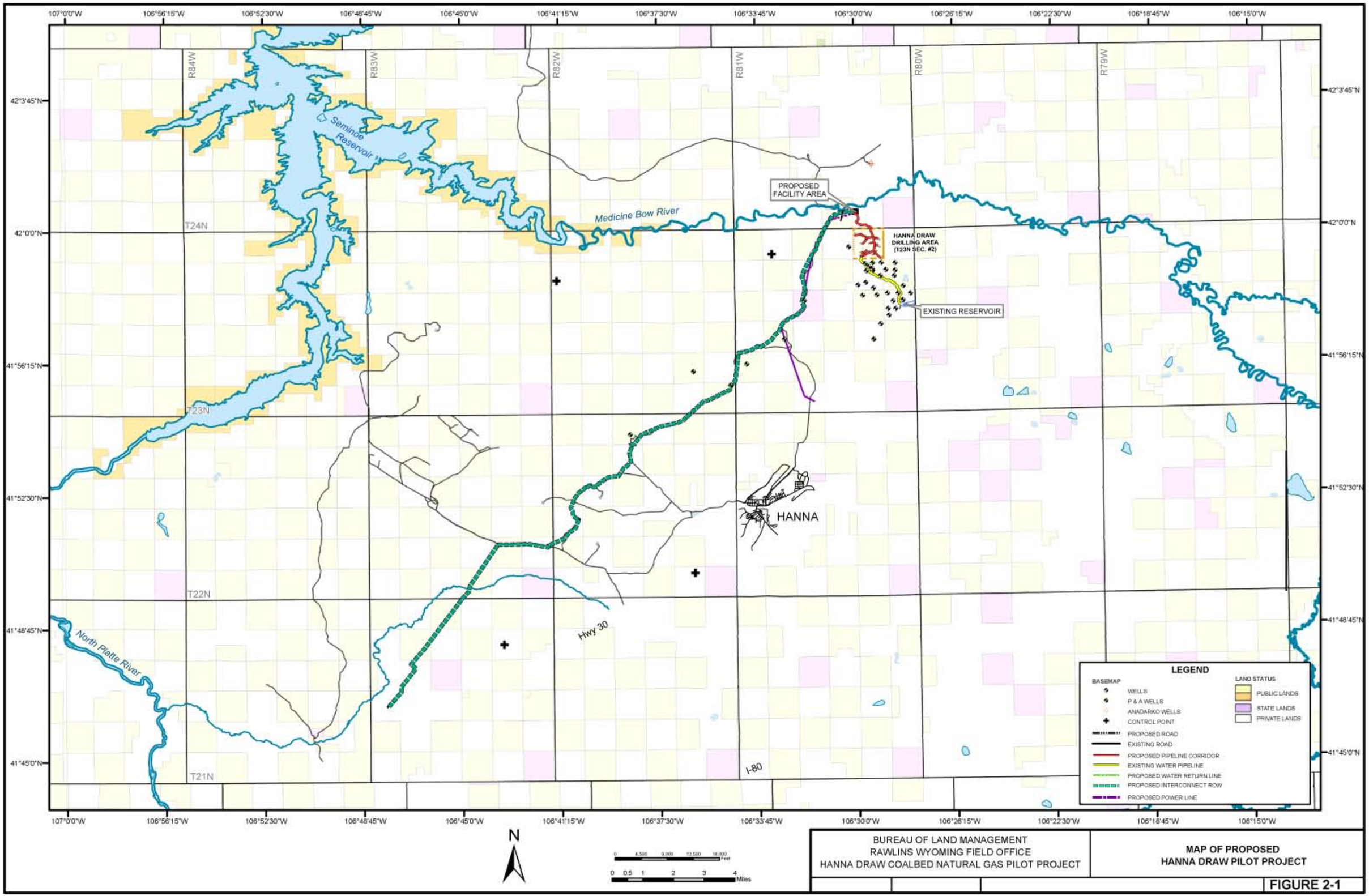
[3] Road disturbance width = 60-foot (short-term, including gathering lines constructed along new roads); road disturbance width = 30-foot (long-term).

[4] 15 drill pads; half of drill pad assumed to be reclaimed in the interim.

[5] Return Pipeline and Gathering Pipeline (where constructed along existing roads) short-term disturbance width = 30 feet.

[6] Short-term Interconnect Pipeline disturbance width = 100 feet.

[7] Power line short-term disturbance width = 30 feet.



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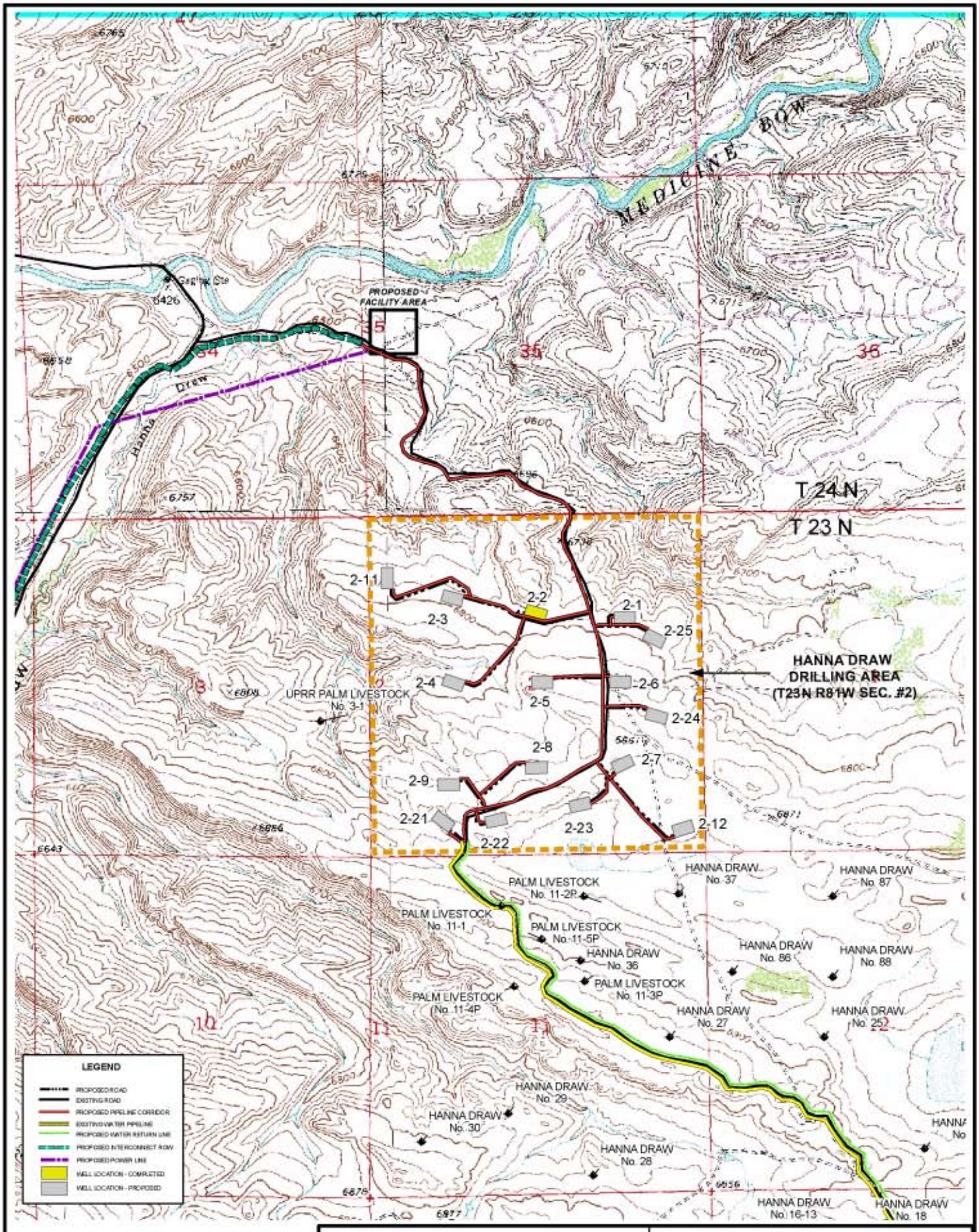
HANNA DRAW COALBED NATURAL GAS PILOT PROJECT

MAP OF PROPOSED HANNA DRAW PILOT PROJECT

FIGURE 2-1



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DETAILED MAP OF PROPOSED HANNA DRAW DRILLING AREA

FIGURE 2-2

One existing road provides the primary access to the proposed drilling area. Field development of 15 CBNG wells would require the construction/reconstruction of a maximum of 5 miles of access roads with an adjacent electric distribution line and produced gas/water gathering lines (i.e., facilities corridors). An estimated 4 miles of new road would be constructed on lands administered by the BLM and 1 mile of road/facilities corridors would be built on private lands.

Each well would require gas and water gathering lines for transportation to the CCF and an electric distribution line for its power source. Natural gas gathering lines (made of up to 2- to 12-inch-diameter, high-density polyethylene [HDPE]) from exploration wells would be connected into the CCF for gas metering and subsequent venting or flaring. Water would be metered and discharged via a pipeline. Gas and water lines would be installed adjacent to and overlapping with the access road ROWs, wherever possible. Electric power would be brought into the field on overhead lines. Within the field, power lines would be buried directly adjacent to access road ROWs.

It would require an estimated 7 to 10 days to drill, log, and case each well utilizing a conventional rotary drilling rig and associated equipment. It would require an additional 2 to 5 days to run a bond log, perforate, and set a pump with a completion rig. Road construction would occur prior to well drilling and testing.

The LOP for the proposed Hanna Draw Pilot Project would be approximately 10 to 20 years. Each well would be production tested for a period of 12 to 18 months. Production testing would evaluate the feasibility of CBNG production from the Pilot Project. Based upon this analysis, APC would determine whether full-field development would be economically viable. If the Pilot Project production wells produce marketable quantities of gas, APC could deliver the gas via an interconnect pipeline throughout a productive life of approximately 10 to 20 years. In the event APC would pursue additional CBNG drilling and/or alternate water disposal methods, additional consideration under NEPA and associated regulations would be required.

2.1.1 Plan of Development

APC would follow the procedures outlined below for activities proposed on BLM-administered lands or minerals within the project area. Project development also must be reviewed and approved, as required, by other associated agencies.

2.1.2 Preconstruction Planning and Site Layout

Considering CBNG production requirements, the locations of proposed project facilities have been sited to avoid or minimize, to the degree possible, disturbances to sensitive resources.

APC has submitted federal APDs and ROW applications along with the preliminary MSUP (Appendix A), MDP (Appendix B), associated Water Management Plan (WMP), and a project map to the Rawlins FO depicting the specific location of the proposed activities. These mapped activities would encompass individual drill sites, pipeline corridors, power line ROW, access roads, and other facilities. The applications include site-specific plans describing the proposed development (surface use plans with construction details for roads and drill pads, drilling plans with casing/cementing program, a water management plan, and site-specific reclamation plans. Approval of planned operations would be obtained in accordance with the applicable regulations and Onshore Oil and Gas Order No.1 (Approval of Operations on Onshore Federal and Indian Oil and Gas Leases). Stormwater discharges during construction would be managed in accordance with a stormwater permit issued by WDEQ.

The following discussion of general construction techniques would apply to the Hanna Draw Pilot Project. More detailed plans can be reviewed in Appendices A and B. These construction techniques would apply to drill sites, pipelines, power line, and access roads within the project area.

2.1.3 Project Construction

2.1.3.1 Well Pad Design and Construction

A graded well pad would be constructed at each drill location using cut and fill construction techniques. Figure 2-3 shows the layout for a typical drill site. Each well pad would extend approximately 200 feet x 300 feet, covering an estimated 1.4 acres, not including stockpiles and the cut and fill slopes.

A temporary reserve pit about 75 feet wide x 95 feet long x 8 feet deep would be excavated at each drill location. These reserve pits would be reclaimed after well completion operations end. Topsoil would be removed and stockpiled before the pit is excavated. APC estimates the reserve pit would be open for 6 to 12 months to allow fluids to evaporate. During this time, the pit would be fenced on all sides with three-strand, barbed wire fencing to prevent access from livestock.

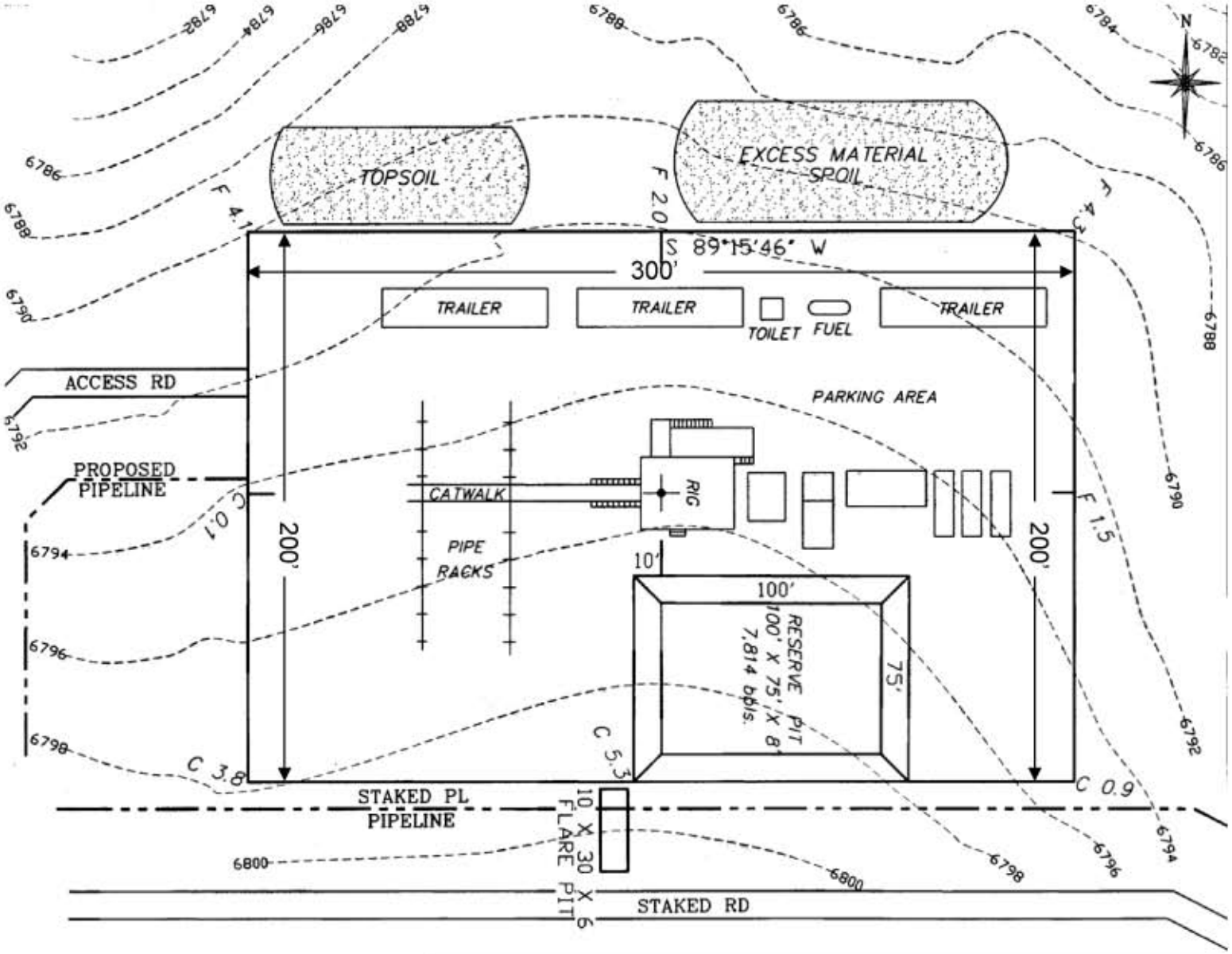
2.1.3.2 Access Road Construction

The primary access road to the project area would be County Road 291 (Hanna Draw Road). Access is provided by Jefferson Road on the north end of Hanna, Wyoming. Jefferson Road becomes Hanna Draw Road about 1 mile north of Hanna. Hanna Draw Road is an existing road that is graded and graveled. Access to drill locations from the existing network of roads would be provided by new and upgraded crowned, ditched, and surfaced roads. The access road would be upgraded from the point where it crosses into T24N, R81W, S35 to the southern edge of the project area in T23N, R81W, S2.

APC proposes to construct new access roads to the well locations in accordance with BLM standards (Manual 9113), applicable regulations, and private landowner direction for access (see MSUP in Appendix A). Figure 2-4 illustrates a typical profile for new road construction with adjacent gas and water gathering lines buried in a single trench along the access road ROW.

Roads associated with the proposed interconnect pipeline would be temporary and would be described in detail under the ROW application submitted to the BLM for approval prior to construction and use. No new access roads are being considered under this EA, since the ROW has not yet been submitted, and APC has not identified if roads would be necessary for the construction and operation of the pipeline. Although disturbance and associated impacts from construction within the pipeline ROW are considered in this EA, the construction of new access roads is not, and any use required for pipeline construction outside of the ROW and not considered by the BLM to be “casual use” would require consideration by the BLM and would likely require additional consideration under NEPA.

APC would close and reclaim roads when they are no longer required for production operations, unless otherwise directed by the BLM or the affected surface owner.



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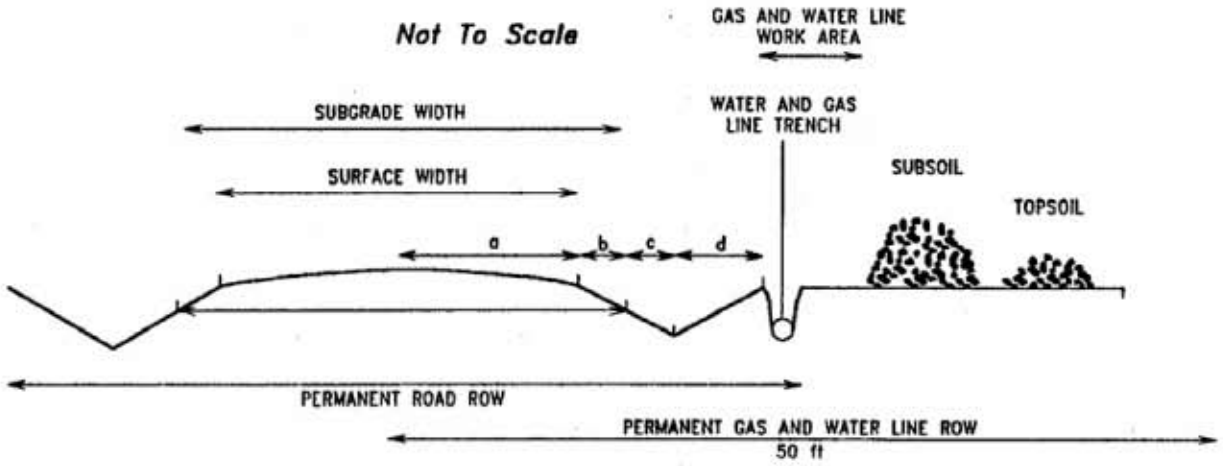
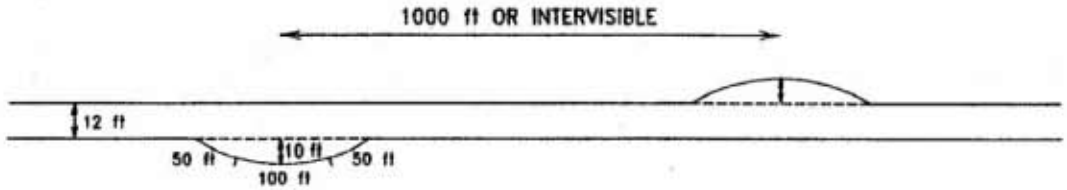
TYPICAL DRILL SITE LAYOUT

FIGURE: 2-3



	MINIMUM SUBGRADE WIDTH (ft)	MINIMUM SURFACED TRAVELWAY WIDTH (ft)	a (ft)	b (ft)	c (ft)	d (ft)	APPROXIMATE DISTURBANCE WIDTH (ft)	ROW WIDTH (ft)	DESIGN SPEED (mph)
RESOURCE ROAD	16	14	7	2	4	8	42	50	15–30
LOCAL ROAD	24	20	10	2	4	8	48	55	20–50

DIAGRAM OF TYPICAL TURNOUTS ON RESOURCE ROADS



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TYPICAL PROFILE OF NEW ROAD CONSTRUCTION

FIGURE: 2-4

The proposed facilities have been staked by APC and inspected by an interdisciplinary team (IDT) from the BLM to verify consistency with the Rawlins FO's Great Divide RMP, best management practices, and stipulations contained in the oil and gas leases. This pre-field planning and BLM onsite inspections, prior to the final facility siting and any surface disturbance, aided in identifying sensitive areas, modifying site locations, if applicable, and minimizing potential environmental effects.

Culverts would be installed on ephemeral channel crossings, as described in the MSUP (see Appendix A). Rip-rap would be added at the outlet of each culvert to minimize erosion. Topsoil would be conserved before channel crossing construction occurs. Additional culverts would be placed as the need arises or as directed by the BLM's Authorized Officer (see Appendix A).

2.1.4 Drilling and Completion Operations

A conventional drilling rig would be used to drill the CBNG wells. Additional equipment and materials needed for drilling operations would be trucked to the drill location. The well control system would be designed to meet the conditions likely to be encountered and would conform to BLM and State of Wyoming requirements. Figure 2-5 depicts a typical well bore diagram for a vertical well drilling operation. Detailed drilling plans are included in Appendix B.

A mobile completion rig similar to the drill rig would be transported to the well site and used to complete each well. Completion operations are expected to average 2 to 5 days per well. In accordance with the applicable permits, natural gas may be vented or flared. Formation water may be temporarily contained in the reserve pit during drilling and well completion activities.

2.1.5 Production Operations

APC would operate all wells, pipelines, and associated ancillary production facilities in a safe manner, as set forth in standard industry operating guidelines and procedures. Routine maintenance of producing wells would be necessary to maximize performance and detect potential difficulties with production operations. Each well location would be visited approximately every other day to ensure that operations are proceeding in an efficient and safe manner. The visits would include checking separators, gauges, valves, fittings, tanks, generators, and pumps. The equipment onsite also would be routinely maintained, as necessary. Additionally, all roads and well locations would be regularly inspected and maintained to minimize erosion and assure safe operating conditions.

2.1.5.1 Well Production Facilities

Producing wells would be equipped with the appropriate wellhead facilities and would be shut in until pipelines and other production facilities are constructed. A weatherproof covering would be installed over the wellhead facilities. A downhole pump would be used to produce water from the cased and perforated pay intervals. Natural gas and produced water would be collected and transported from the wellhead via buried pipelines. Gas and water would be measured as specified in the MSUP (Appendix A).

The long-term surface disturbance at the location of each producing well would encompass approximately 0.7 acre (half of short-term disturbance), including cut and fill slopes. Typically, only the production facilities at the well site would be fenced or otherwise removed from existing uses. A loop road or a small, graveled pad area would provide a safe turnaround area for

vehicles. The perimeter of the pad area would be fenced if adjacent cut and fill slopes represent a safety hazard for vehicles. A typical gas production well site is shown in Figure 2-6.

2.1.5.2 Power Generation

Electricity to power pumps to initiate and maintain production, would be obtained from an electric distribution line constructed for the Pilot Project or from natural gas or propane-fired generators, based on cost comparisons. APC may construct an overhead electric distribution line from T23N, R81W, S33 to the CCF in T24N, R81W, S35. A small substation also would be constructed within the CCF to step-down the line voltage to a usable level. From the substation, an underground distribution system would provide power to wells and associated facilities. Utility lines would be installed directly adjacent to access road ROWs to minimize surface disturbance. Optionally, internal combustion (IC) engines fired by either natural gas or propane would be used to run generators in order to provide power to the project. For a temporary generator (operating less than 6 months), a Chapter 6, Section 2 waiver authorizing operation for a best available control technology (BACT) compliant generator would be obtained. If the unit operates longer than 6 months, a Chapter 6, Section 2 permit would be obtained prior to installing such unit. All utility lines within the test field would be buried. Anticipated noise levels associated with these generators, if warranted, are expected to approach 61 decibels, A-weighted (dBA), each at 50 feet.

2.1.5.3 Gas and Water Pipelines

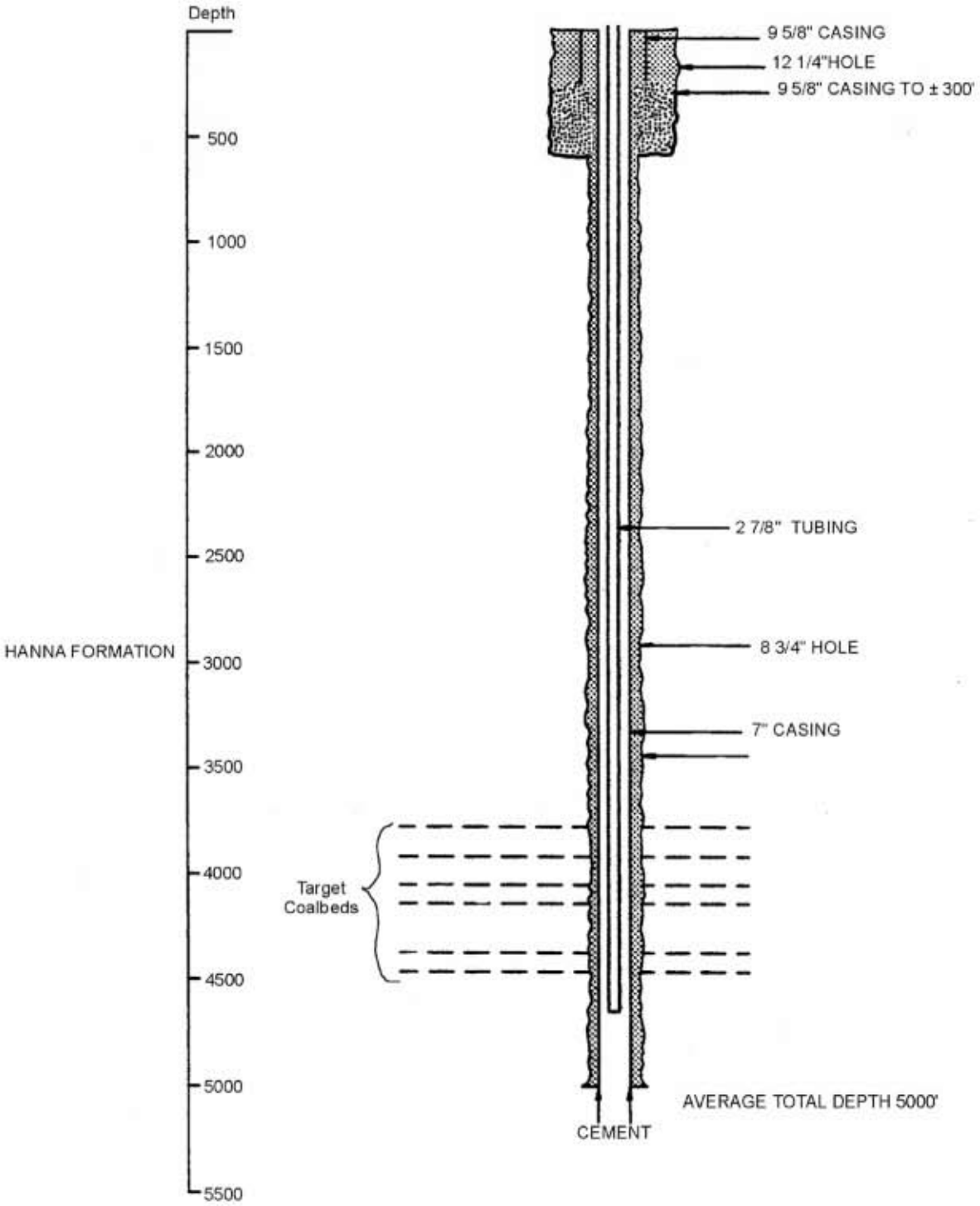
Construction and installation of gathering lines for gas and water would occur at the same time as access road construction or immediately after drilling has been completed. Construction and installation of the proposed CBNG interconnect pipeline to the Wyoming Interstate Company (WIC) 36-inch block valve would occur after project viability has been determined. All produced water used to test the integrity of the gas interconnect pipeline (142,800 gallons) would be disposed of in accordance with an approved WYPDES permit.

Three types of buried pipelines would be constructed as part of the proposed Hanna Draw Pilot Project:

1. A gas-gathering pipeline system (low pressure) would be constructed from the wellheads to the CCF. This system would use HDPE pipe, starting with 4-inch-diameter pipe at the wellhead, graduating up to 10- to 20-inch-diameter pipe at the inlet to the CCF.

2. Produced water-gathering pipeline systems (low pressure) would be constructed from the wellheads to the centralized facilities and from the centralized facilities to the reservoir outfall. This network of water lines would use 4- to 12-inch-diameter pipe made of HDPE.

3. A CBNG interconnect pipeline (high pressure) would be constructed from the CCF to an existing transmission pipeline. The pipe would be constructed of 8- to 12-inch-diameter steel.



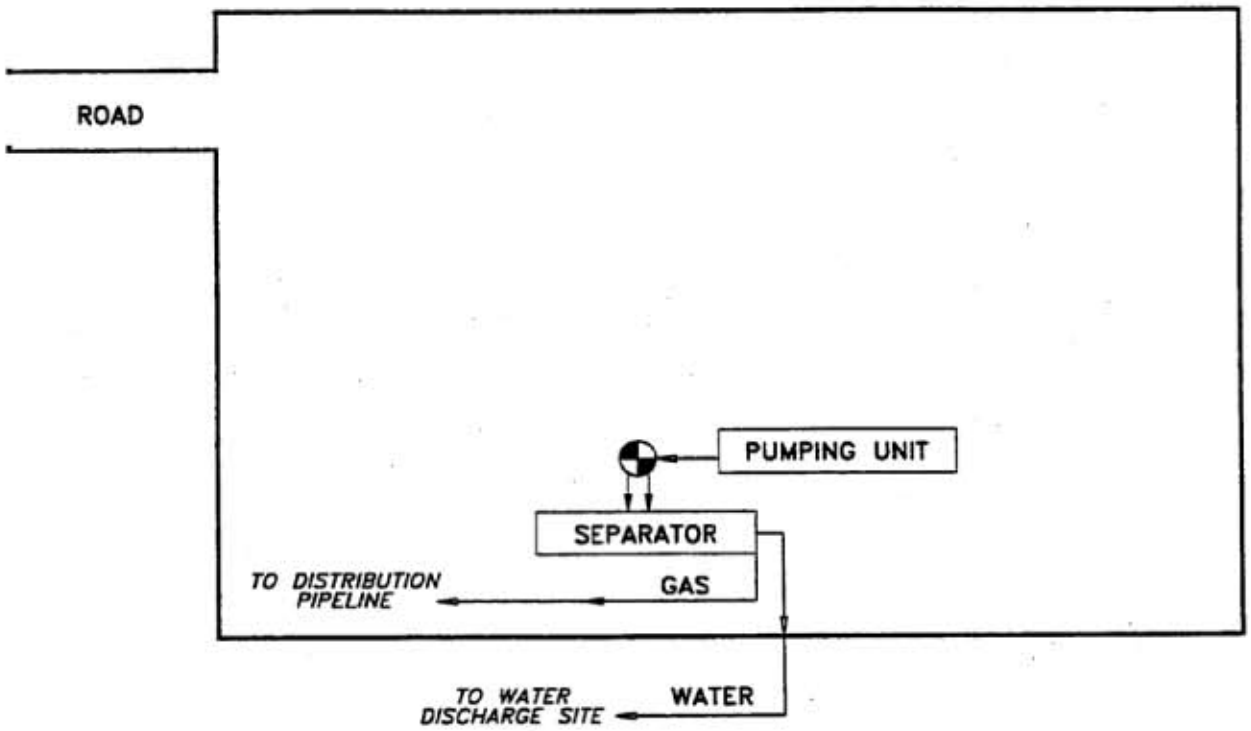
BUREAU OF LAND MANAGEMENT
RAWLINS WYOMING FIELD OFFICE
HANNA DRAW COALBED NATURAL GAS PILOT PROJECT

TYPICAL WELL BORE

FIGURE: **2-5**

TYPICAL PRODUCING WELL LAYOUT

Not To Scale



BUREAU OF LAND MANAGEMENT RAWLINS WYOMING FIELD OFFICE HANNA DRAW COALBED NATURAL GAS PILOT PROJECT	TYPICAL WELL SITE
	FIGURE: 2-6

The ROWs for the gathering systems would follow access roads. Trenches would be excavated to install the flow lines and electrical lines and then backfilled. Gas-gathering and produced water-gathering pipelines would be laid together in the same trench when practical. Trenches excavated for well gathering lines and electrical lines would result in temporary construction corridors 30 feet wide, which would be reclaimed as soon as practical after construction is completed. An additional area, estimated to be 10 feet wide, would be used to transport machinery, personnel, and equipment along the corridor to install flow lines and electrical lines, wherever the gathering system would not follow an access road. This corridor would be used to allow working room for the machinery, personnel, and equipment during the installation process. Gathering line segments in the project area would total about 5 miles, with 4 miles located on BLM-administered lands and 1 mile located on private land. An additional 12-inch HDPE water transfer line may be required and, if needed, would be installed adjacent to the existing road.

Up to four water transfer pumping stations may be used during production operations to transfer produced water from the gas wells to the water handling facilities. The transfer pumping stations would be needed in areas where differences in elevation would require supplemental pumping to transfer the produced water. If transfer pumping stations were required, they would be placed within existing footprints of project-related facilities, and no additional short-term surface disturbance would occur. Each pumping station would contain up to two 17,000-gallon water tanks, an inlet separation vessel, and a small centrifugal water pump. A small pump shed would be constructed to enclose the pump. Each pumping station would consist of a pad of approximately 125 feet x 125 feet that would disturb an estimated 0.4 acre, including cut and fill slopes. An approximate 3.5-foot berm would be constructed around the perimeter of the water tanks, excluding the pump shed, at each pumping station to contain any potential spills on the pad. The pump shed would be excluded from the berm area in order to minimize the potential for electrical or safety hazards that could occur if water entered the pump shed and caused electrical outages. The berm would be constructed to contain the water from the largest tank, plus 10%, and maintain a freeboard of 1 foot. A berm that is about 40 feet x 25 feet, with a water height of 2.5 feet could contain 2,500 cubic feet of water, equivalent to the 2,250 cubic feet of water contained in a 17,000-gallon tank, with additional capacity (10%). A typical water transfer facility is shown in Figure 2-7.

The CBNG interconnect pipeline would extend from T24N, R81W, S35 to the WIC block valve in T21N, R83W, S19 (Figure 2-1). Up to two 8- to 12-inch steel pipes would be buried a minimum of 42 inches deep. The construction ROW for the gas interconnect pipeline would be an estimated 100 feet wide, with the operational ROW totaling 50 feet. This corridor would allow working room for the machinery, personnel, and equipment during the construction and installation process. Figure 2-8 depicts a typical construction profile for the proposed CBNG interconnect pipeline construction. Roads associated with the interconnect pipeline, unless located entirely within the pipeline disturbance/ROW width of 90 feet, would need to be considered under additional NEPA analysis prior to authorization and construction.

The interconnect pipeline would be constructed using open-cut construction methods for upland areas and dry-ditch construction or boring methods for water body crossings. The disturbed area would be kept to a minimum. In order to minimize surface disturbance, the operator would use wheel trenchers (ditchers) or ditch witches, where possible, to construct pipeline trenches

associated with this project. Trenches that would be open for the installation of pipelines would have plugs placed no more than 1,000 feet apart to allow livestock and wildlife to cross or escape the trench, if warranted. Plug placement would be determined in consultation with BLM or the applicable landowners. ROWs located in the same corridor would overlap each other to the maximum extent possible, while maintaining sound construction and installation practices. Where ROW corridors are located along a road, working space for installation of facilities would be along the road. Pipeline corridors would be reclaimed as soon as practical after construction of the pipeline is complete.

2.1.5.4 Central Compressor Facility

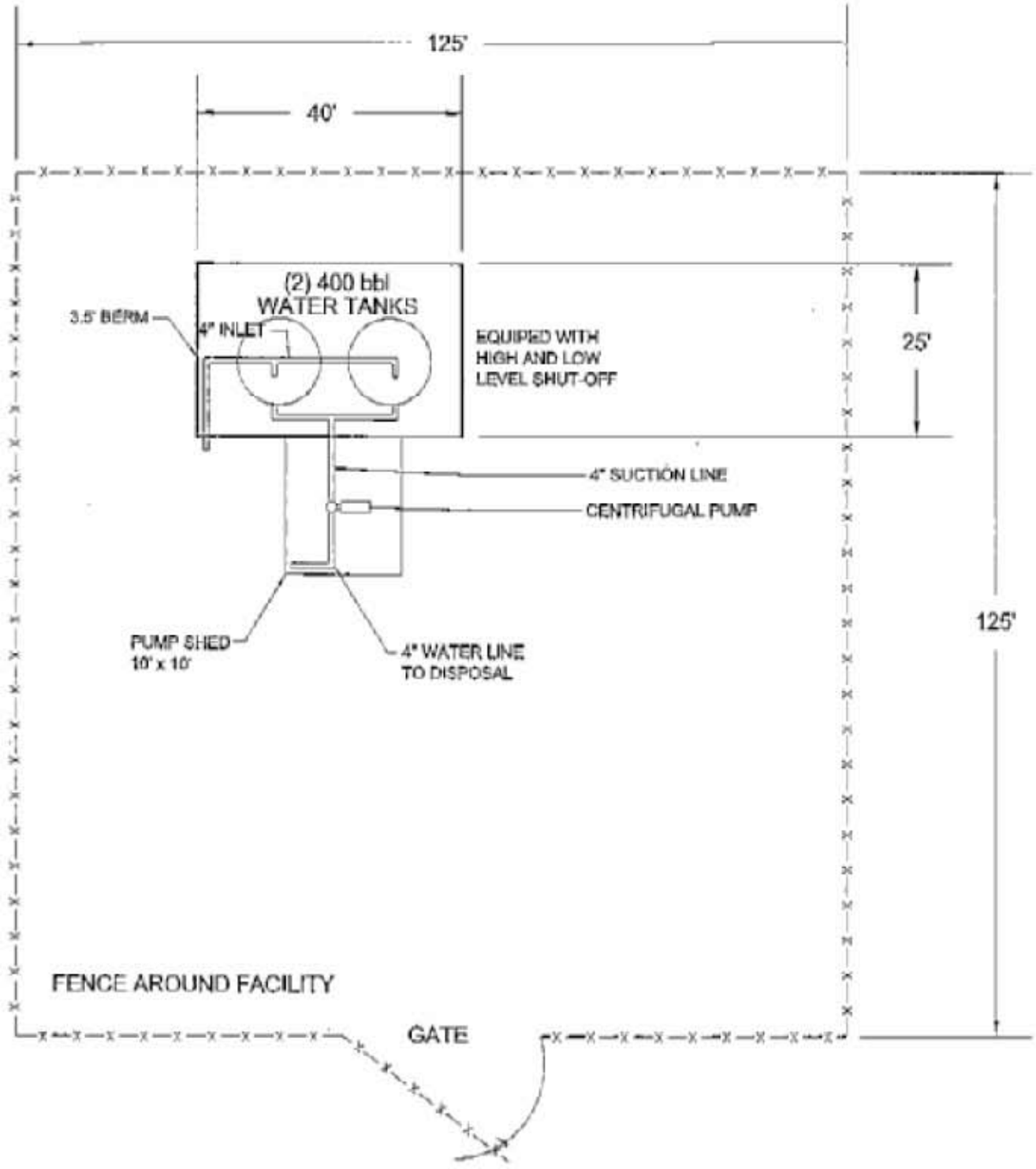
Produced natural gas under wellhead pressure would move through the low-pressure gas-gathering system to the CCF, located in T24N, R81W, S35 (Figure 2-2). Typical pressure in the lines for a gathering system of the type proposed for this project is less than 100 pounds per square inch (psi). Gas arriving at the CCF would be compressed from the pressure in the gathering line to facilitate delivery and introduction of the gas into a CBNG interconnect pipeline. Compression of the gas at a field CCF would increase the pressure to an estimated 800 to 1,500 psi.

The CCF would be sited to allow for the installation of two compressors for the proposed Hanna Draw Pilot Project. The compressors would be sized to handle 4.5 million cubic feet per day (MMCFD) from 15 to 25 psi suction pressure to 800 to 1,500 psi discharge pressure. The compressors would be driven by natural gas-fired IC engines designed to meet applicable requirements established by the Wyoming Department of Environmental Quality, Air Quality Division (WDEQ-AQD). Prior to construction and operation, a construction permit application package would be completed and an air quality permit obtained pursuant to requirements set out under Wyoming Air Quality Standards and Regulations (WAQSR), Chapter 6, Section 2. BACT would be applied for nitrogen oxides (NO_x), carbon monoxide (CO), and hazardous air pollutants (HAP), specifically formaldehyde. Additional equipment at each CCF would include a tri-ethylene glycol (TEG) dehydration system, which would dry the gas to meet all pipeline quality specifications of the market pipeline. The compressors would be contained in an enclosed building. Anticipated noise levels associated with each of these engines would be approximately 77 dBA at 50 feet. The CCF would require approximately 11 acres of disturbance and would be located as shown on Figure 2-2. All CCF engines would be housed within structures designed in accordance with applicable regulations. A typical CCF is shown in Figure 2-9.

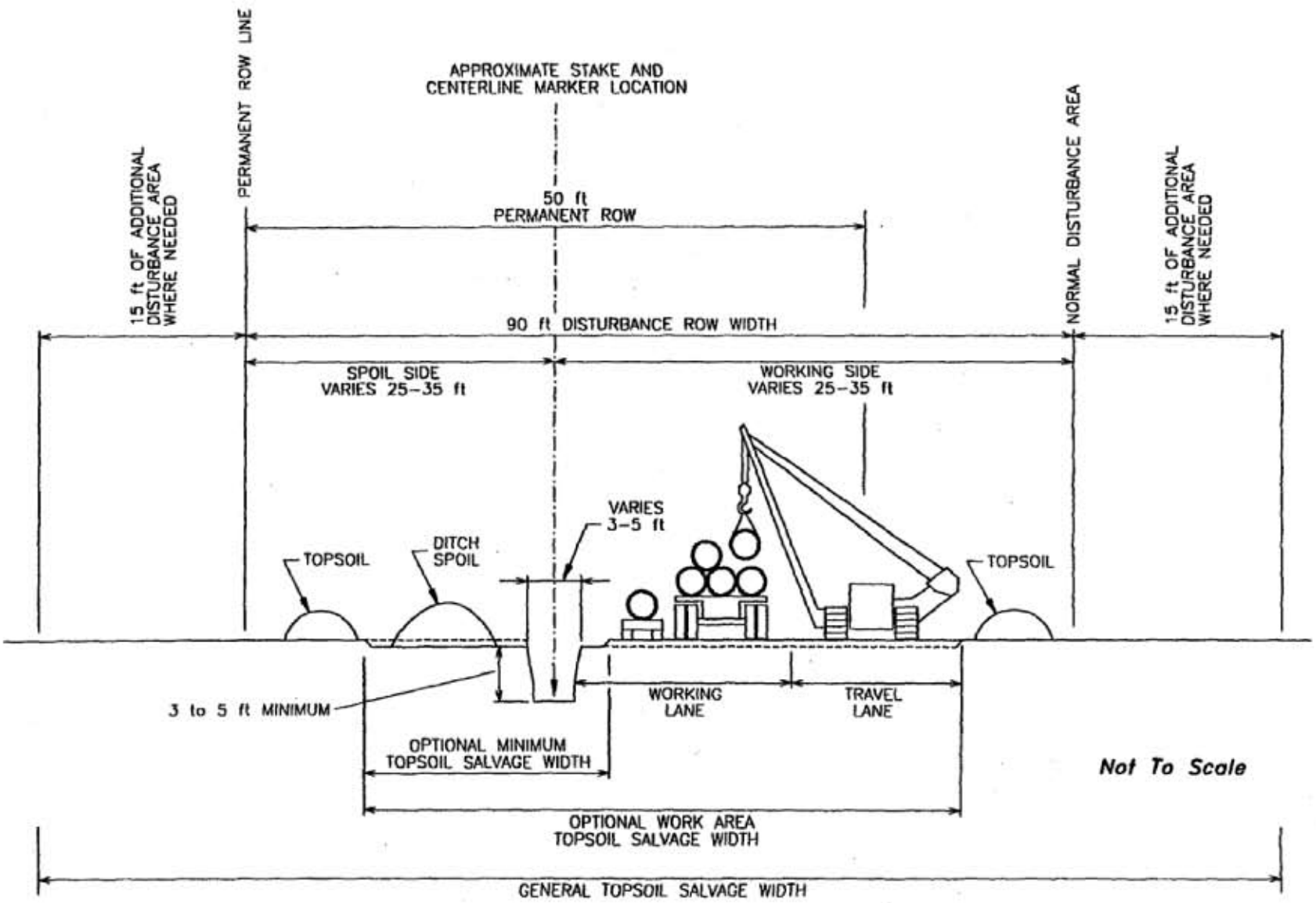
In the event that the wells prove to be economically viable, a CBNG interconnect pipeline would be required to move the gas to an existing system, as discussed in Section 2.1.5.3.

2.1.6 Workforce Requirements and Traffic Estimates

Estimated traffic requirements for drilling, completion, and well development are shown on Table 2-2. The "Trip Type" column lists the various service and supply vehicles that would travel to and from the well sites and ancillary facilities. The "Round-Trip Frequency" column lists the number of trips, both external (to and from the Hanna Draw Pilot Project area) and internal (within the Hanna Draw Pilot Project area). The figures provided on Table 2-2 should be



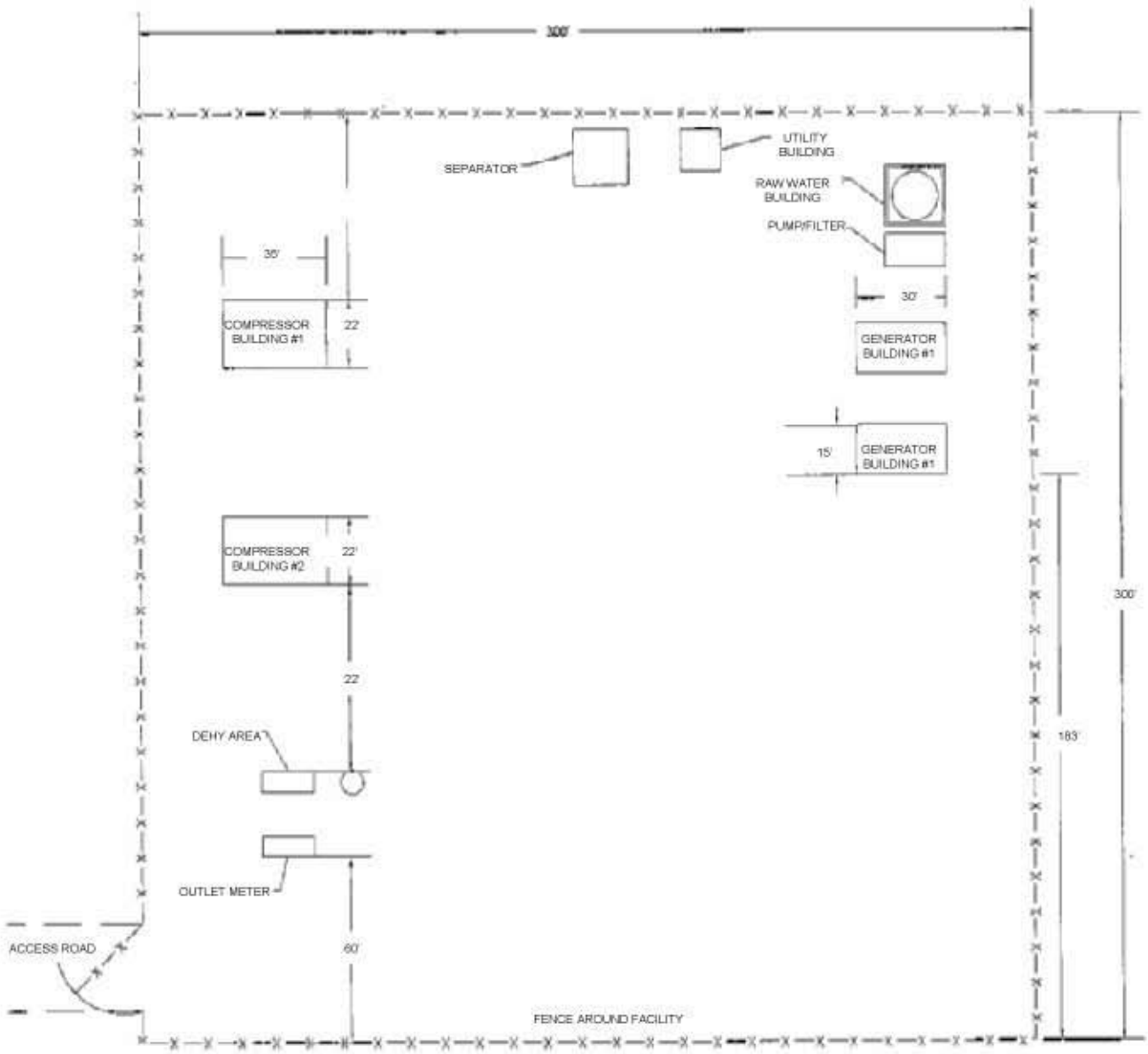
BUREAU OF LAND MANAGEMENT RAWLINS WYOMING FIELD OFFICE HANNA DRAW COALBED NATURAL GAS PILOT PROJECT	DIAGRAM OF TYPICAL WATER TRANSFER FACILITY
	FIGURE: 2-7



BUREAU OF LAND MANAGEMENT
RAWLINS WYOMING FIELD OFFICE
HANNA DRAW COALBED NATURAL GAS PILOT PROJECT

TYPICAL PIPELINE CONSTRUCTION

FIGURE: 2-8



BUREAU OF LAND MANAGEMENT RAWLINS WYOMING FIELD OFFICE HANNA DRAW COALBED NATURAL GAS PILOT PROJECT	DIAGRAM OF TYPICAL COMPRESSOR FACILITY
	FIGURE: 2-9

Table 2-2 Traffic Estimates

Trip Type	Round Trip Frequency	
Drilling (2 rigs, 2 crews/rig)	**External (to/from project area)**	**Internal (within project area)**
Rig supervisor	4/day	same
Rig crews	9 to 16/day	same
Engineers[1]	2/week	1/day/rig
Mechanics	4/week	same
Supply delivery	1/week	2-4/day
Water truck[2]	1/month	2 round trups/day
Fuel Trucks	2 round trips/well	same
Mud trucks	1/week	2/day
Rig move[3]	8 trucks/well	8 trucks/well
Drill bit/tool delivery	1 every 2 weeks	same
Completion		
Smeal rig/crew	1/day	same
Cement crew	2 trips/well	same
Consultant	1/day	same
Well loggers	3 trips/well	same
Gathering systems	8/day	same
Power systems	2/day	same
Compressor stations	2/day	same
Other field development	3/day	same
Testing and operations	2/day	same

[1] Engineers travel to the project area weekly and stay in a trailer in the project area during the week.

[2] Water trucks would deliver water to rigs from a location within the project area.

[3] It would require four trucks to move each rig to the project area. Upon completion of drilling in the project area, each rig would move to the next area.

considered general estimates, based on an active drilling program. The level of drilling and production activity may vary over time in response to weather and other factors.

2.1.7 Water Supply and Disposal

2.1.7.1 Water for Drilling

Water for use in well drilling would be obtained from existing gas wells completed in the coal seams of the Hanna Formation. Approximately 30,000 gallons of water would be needed to drill each well. The actual volume of water used in drilling operations would depend on the depth of the well and any losses that might occur during drilling. Associated drilling activities also would require almost 70,000 gallons of water per well for preparation of cement or stimulation of the well (55,440 gallons) and dust control (14,000 gallons). In all, nearly 100,000 gallons (about

0.3 acre-feet) of water per well would be used. Dust abatement measures would comply with all applicable Wyoming Oil and Gas Conservation Commission (WOGCC) requirements. Only water suitable for livestock use would be used for dust abatement.

2.1.7.2 Disposal of Produced Water

As part of the proposed Hanna Draw Pilot Project, up to 40,000 barrels (1,680,000 gallons) of produced water per day from the production operations would be discharged directly into the existing reservoir located in Section 13 (Figure 2-2). Approval for the discharge of produced water is under the jurisdiction of BLM from the point of origin to the point of discharge as described in Onshore Order No. 7, *Disposal of Produced Water*. Discharge of produced water downstream from the point of discharge is under the jurisdiction of the WDEQ, in accordance with permits issued through the WYPDES program. APC recently renewed the existing WYPDES permit (# WY0044164) for discharge to the reservoir, which was set to expire on November 27, 2006. The renewed permit became effective on November 28, 2006 and will expire November 30, 2011. APC would conduct monitoring activities to ensure that discharge quality meets the limits in the WYPDES permit issued by the WDEQ.

On May 2, 2006, APC submitted a WYPDES renewal application to the WDEQ for discharge of produced water to the existing reservoir in Section 13. The BLM provided public comment to the WDEQ in a letter dated November 20, 2006. The BLM's primary issues brought forward included concerns about reservoir containment of produced water (preventing seepage from the reservoir below the dam faces), dam engineering and safety, wildlife protection, groundwater protection, and sampling methodology. On November 28, 2006, the WYPDES permit was renewed. A copy of this permit is available from the WDEQ and was provided in the WMP by APC.

Produced water from the Pilot Project would be conveyed from the CCF to the existing reservoir via a pipeline located along the existing road ROW. The maximum storage in the reservoir (approximately 500 acre-feet at an elevation of 6,915 feet) would not be exceeded, in accordance with APC's State Engineer's Office (SEO) permit for use of this reservoir. Above and elevation of 6,915 feet the reservoir includes an additional 5 feet of freeboard (255 acre-feet of storage to accommodate precipitation and runoff from the 25-year storm event).

As noted in the WMP, APC would inspect two monitoring locations (downstream of each dam face) on a weekly basis during operations to ensure there is no reservoir seepage. Before utilizing the reservoir, APC would reinforce the dam faces with an erosion control device to help prevent any erosion due to wave action. In addition, APC would inspect the dams quarterly or after major storm events for the first year of operation. If the reservoir level needed to be lowered, water haul trucks could be utilized. Finally, APC would reclaim the reservoir when no longer used for disposal of produced water in accordance with specifications in the MSUP.

If needed, APC would construct a second water pipeline from the pilot drilling area to the reservoir. This additional line also would parallel the existing road to minimize impacts.

A portion of the produced water would infiltrate and evaporate. However, since the produced water would be added to the reservoir at a constant rate, it may be necessary for APC to reduce the discharge of produced water to the existing reservoir if storage capacity becomes a limiting factor.

2.1.8 Applicant-Committed Resource Protection Measures

APC is required to comply with a number of federal, state, county, and local regulations and standards for project development and operation. Additionally, APC has developed a list of measures to minimize impacts from project construction and operation, as detailed in the MSUP in Appendix A. A few additional resource-specific measures have been identified to help minimize potential impacts from the proposed Hanna Draw Pilot Project. APC has voluntarily committed to incorporate the following environmental protection measures into the Proposed Action. These measures and procedures are referred to as "Committed Protection Measures" throughout this document. The resource impact analyses completed for this EA have included these measures, which would prevent or minimize anticipated impacts, as discussed. Additional measures developed to "mitigate" potential impacts to specific resources from implementation of the Proposed Action, if warranted, are presented for the applicable resource discipline in Chapter 4.0 of this EA.

These protection measures and procedures would be applied to actions under the jurisdiction of the BLM. An exception to a protection measure or design feature may be approved on public land on a case-by-case basis when deemed appropriate by the BLM only after a thorough, site-specific analysis had concluded the resource or land use the measure was intended to protect is not present or would not be significantly affected in the absence of the protection measures. BLM also conducted on-site inspections of various elements of the Proposed Action (primarily drill pads and roads). During these inspections BLM reviewed surveyed locations of project elements and evaluated site-specific features such as sensitive plant species, wildlife habitat, erodible soils, steep slopes, drainages, riparian areas, floodplains, wetlands and other features that could be impacted by the Proposed Action. The BLM considered alternative locations to avoid or minimize the potential surface impacts of the Proposed Action. As a result of these inspections, changes were made to several project elements to avoid sensitive environmental resources.

Many of these protection measures align with the BLM's standard Conditions of Approval (COAs) that can be applied to coalbed natural gas projects. Additionally, many of these protection measures and other more detailed protection measures may be found in the MSUP in Appendix A, MDP in Appendix B, and WMP prepared for the project. A number of the resource-specific measures (e.g., soil erosion measures) would apply to other resource disciplines (e.g., water quality).

The following committed protection measures are outlined and summarized by project phase, project component, or resource type.

2.1.8.1 Paleontological Resources

1. If paleontological resources were uncovered during ground-disturbing activities, APC would suspend all operations that may further disturb such materials and immediately contact the BLM, who would arrange for a determination of significance and, if necessary, would recommend a recovery or avoidance plan. Mitigation of paleontological resources would be on a case-by-case basis, and APC would incur costs associated with BLM-required mitigations. Surface-disturbing activities would not resume until a Notice to Proceed is issued by the BLM.

2.1.8.2 Floodplains and Wetlands

1. Span the existing vegetated wetlands of the Mixed Grass-like/Grass Meadow Community along the proposed electric distribution line ROW. Avoid disturbance to other vegetated wetlands and open water features, where practicable.

2.1.8.3 Vegetation and Reclamation

1. One general seed mixture to be planted during reclamation may be insufficient to address the varying characteristics of the disturbed sites to be revegetated. In consultation with the BLM, APC would develop a limited array of seed mixtures to address varying site characteristics, such as soil chemical and physical parameters and existing vegetation community types.

2.1.8.4 Surface Reclamation Plans

1. On any disturbed sites where compaction could interfere with successful revegetation, disk, rip, or otherwise treat the affected areas to relieve the negative affects of this condition prior to initiating revegetation activities.

2. Fill and compact “rat and mouse holes” (i.e., subgrade excavations for the conduct of drilling operations) from the bottom to the top immediately upon release of the drilling rig from the location.

2.1.8.5 Terrestrial Wildlife

1. In the event that water quality is determined to be potentially detrimental to wildlife (e.g., oil deposition), identify applicable mitigation measures to minimize impacts in the short and long term. If netting is necessary over open reserve pits to eliminate any hazard to migratory birds or other wildlife, as outlined in the MSUP, APC and the BLM would develop an appropriate monitoring program for netted areas. Monitoring frequency would depend on 1) pit location, 2) evaluated water quality, 3) estimated water residence time, and 4) frequency of well maintenance schedule. APC would be responsible for monitoring activities as part of project implementation. APC also would be responsible for notifying the BLM if a wildlife injury or fatality were found at one of the reserve pits.

2. Tiering from the BLM’s Great Divide RMP (BLM 1988), prohibit construction, drilling, and other activities potentially disruptive to nesting raptors within 1 mile of active ferruginous hawk and golden eagle nests and within 0.75 mile of all other active raptor nests between February 1 and July 31. Controlled Surface Use restrictions would apply within 1,200 feet of an active ferruginous hawk, and an 825-foot buffer would be required for all other active raptor nests during project operation. An exception would be approved only after a thorough, site-specific analysis by the BLM or designated representative concluded that a negative impact would not occur.

3. If project development were to occur during breeding season (February 1 through July 31), complete a raptor survey prior to the initiation of construction to ensure that well sites are located a sufficient distance from potential conflict areas and ensure that active nest sites are not disturbed from development of applicable project components (e.g., access road, pipeline construction, and power line construction). These survey results

are applicable for that breeding season, and if project construction were delayed into the following season, additional surveys for the specific construction areas may be required.

4. Coordinate with PacifiCorp (i.e., Pacific Power) in the design and construction of the proposed three-phase 34.5-kV overhead electric distribution line to the Hanna Draw Pilot Project area. Electric lines would be constructed in accordance with the standards for raptor (i.e., bird of prey) protection in accordance with the Avian Power Line Interaction Committee's *Suggested Practices for Avian Protection of Power Lines: The State of the Art in 2006* (APLIC 2006). PacifiCorp also maintains an ongoing Avian Protection Plan and Bird Management Policy for electric distribution lines in rural areas. This measure would minimize the potential for bird electrocution risks.

2.1.8.6 Special Status Terrestrial Wildlife

1. If required, restrict construction, drilling, and other activities within a 2-mile radius of active greater sage-grouse leks during the breeding, egg-laying, and incubation period (March 1 through July 15). Exceptions may be granted if the activity would occur in unsuitable nesting habitat.

2. Prohibit construction, drilling and other potentially disruptive activities in mountain plover habitat from April 10 through July 10. An exception would be approved only after a thorough site-specific review concluded a negative impact would not occur.

2.1.8.7 Cultural Resources

1. APC 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 or historical objects or sites. If archaeological or historical materials are discovered, APC 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.

   Within 5 working days, the BLM Authorized Officer would evaluate the discovery of such materials, and APC would be informed of the mitigations and/or actions necessary to prevent the loss of significant cultural values.

   APC shall be responsible for the cost of any mitigation required by the BLM Authorized Officer. The BLM Authorized Officer provides technical and procedural guidelines for the conduct of mitigation. Upon verification from the BLM Authorized Officer that the required mitigation(s) have been completed, APC would be allowed to resume operations.

   Avoidance is the preferred method for mitigating effects to a property that is considered eligible for, or is already listed on, the National Register of Historic Places (NRHP). If avoidance is not possible, NRHP-eligible sites are to be afforded protection by the preparation and implementation of a cultural resources mitigation plan that would be developed through consultation with APC, BLM, and SHPO.

2.1.8.8 Socioeconomics

1. Implement hiring policies to encourage the use of local or regional workers who would not have to relocate to the area.

2.2 NO ACTION ALTERNATIVE

In accordance with NEPA Section 1502.14(d), an impact analysis must include the No Action Alternative. Under the No Action Alternative, the proposed Hanna Draw Pilot Project would not proceed, as described in Section 2.1. No exploratory drilling is proposed for private lands as part of the Hanna Draw Pilot Project; therefore, no additional CBNG drilling would occur under this alternative. Similarly, no construction or operation of ancillary facilities (e.g., gas and water gathering and transmission lines, power line, access roads) would occur.

2.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

Several alternatives to the Proposed Action were examined. The following section describes the alternatives previously considered but subsequently eliminated from detailed analysis and the rationale for their elimination.

2.3.1 Developing Existing Williams Wells

In 2002, Williams Production RMT Company (Williams) proposed to test the viability of the coalbed resources by drilling CBNG wells in T23N, R81W, S13 and T24N, R81W, S35 (Figure 2-1 of this EA). BLM analyzed the potential impacts from this proposal in the *Environmental Assessment for the Hanna Draw Coalbed Methane Exploration Project* (BLM 2002a). Although these wells were drilled, APC, which has acquired Williams' interests, has determined, based on its examination of the geology and reservoir data that the Williams eight-well Pilot Project in Section 13 (T23N R81W) was located in an area of poor reservoir quality (i.e., low gas content and saturation) and had insufficient well density. Data from other wells in the project area indicate that reservoir quality improves to the north, which is where APC has proposed its Pilot Project. In addition, it would be difficult to drill additional wells around the Williams' wells in Section 35 (T24N R81W) because of terrain features. Based on the data gathered to date, it would not be economical to develop the resources in this area; therefore, this alternative was eliminated from further analysis.

2.3.2 Underground Disposal of Production Water

APC also considered the potential for underground injection of produced water associated with the Hanna Draw Pilot Project. This alternative is not considered to be a viable project alternative for the Pilot Project. Subsurface injection of fluids must meet specific criteria, including water quality thresholds and potential changes to groundwater chemistry, suitable underground strata, sufficient space for anticipated fluid volume, and economic viability. Available subsurface data suggest that suitable porous and permeable strata of significant regional extent are not present at reasonable depths for water disposal in the project area. In addition, the volume of produced water would require a large number of injection wells, which would reduce the viability of the Pilot Project. For these reasons this alternative was eliminated from further analysis. If the Pilot Project were to prove that a full-field development may be practicable, the feasibility of underground injection would be examined further.

2.3.3 Use of Horizontal Production Wells

APC considered the use of horizontal drilling but it was excluded for the following reasons:

1. Horizontal drilling in coal seams at these depths is an unproven technology

2. Areas with multiple coal seams such as the Hanna coal, or areas where a coal seam has shale breaks imbedded in the coals would require multiple laterals to reach all reserves. Additionally, any barrier that represents limited vertical permeability would require an additional lateral to reach reserves.

3. Unknown risks associated with hole stability

4. Increased produced water volumes and potential subsequent treatment

5. Insufficient water handling capacities with the current infrastructure

6. Unknown kv/kh (ratio of horizontal to vertical permeability)

7. Increased risk of mechanical failure because of wellbore complexity

8. Significantly increased costs

2.3.4 Discharge of Produced Water to Medicine Bow River

Originally, APC's Proposed Action entailed the discharge of approximately 100,000 bbl/day of produced water to the Medicine Bow River, a tributary to the North Platte River. Hydrological evaluation of a U.S. Geological Survey (USGS) gaging station located immediately downstream of the Hanna Draw Pilot Project area on the Medicine Bow River indicated that the proposed discharge would, throughout much of the year, contribute a substantial amount of flow to the river (i.e., on 10 days, in an average year, the effluent would contribute at least 50% of instream flows).

The Medicine Bow River is classified as a 2AB watercourse (i.e., protected for drinking water and game fisheries). The BLM subsequently conducted fish population sampling in this portion of the river, in coordination with the Wyoming Game and Fish Department (WGFD). The sampling found no sensitive/protected fish taxa, but there are several species of warm- and cold-water fishes present, including brown trout.

The BLM requested that WET tests be conducted on waters representative of the produced water effluent from the target formations. These tests would assess the potential for toxicity to aquatic life as a result of discharging produced water.

In September 2004, APC selected the #14-35 well, a test well approximately 0.5 mile to the north of the project area and completed to a depth of 4,648 feet (the project target formations range from 4,050 feet to 5,850 feet) as the source for waters to conduct WET tests. Additionally, water quality analyses were conducted on the #14-35 well and six other wells located approximately 2 miles to the south of the project area (the completion depths of these six wells ranges from 3,600 feet to 4,100 feet, a mean depth of 3,884 feet; over 1,000 feet shallower than the midpoint of the project's target formations).

WET tests conducted on the #14-35 waters for *Daphnia magna* (an aquatic invertebrate) and *Pimephales promelas* (fathead minnow) resulted in 100% mortality at 100% effluent concentration. Both of these species are present in the Medicine Bow River. Tests at varying concentrations of effluent and laboratory standard (distilled water) indicated an expected lethal concentration for 50% of the population (LC_{50}) at approximately 62% effluent to 38% laboratory standard. The #14-35 water was moderately toxic to aquatic life. Subsequent modeling by a third-party consultant indicated that the primary toxicants of concern are ammonia (NH^{3+}) and salinity. Once the WET test results were received by the Rawlins FO, the FO requested the assistance of a BLM Toxicologist (NSTC-Denver).

As a result of additional BLM review of the issues and circumstances, the BLM determined there is concern regarding potential effects of the discharge. Hydrological analysis by the Rawlins FO Hydrologist using mean daily flows has shown that the LC_{50} concentration would be exceeded 5 days in an average year within this reach of the river, even when assuming complete mixing of the effluent in the receiving water.

A possibility exists that the #14-35 water used for the WET tests is unrepresentative of the target formations, but until the blended effluent from the project can be sampled (after drilling), this is difficult to determine.

APC subsequently revised the Proposed Action, eliminating effluent discharge to the Medicine Bow River for the Pilot Project.

CHAPTER 3

AFFECTED ENVIRONMENT

CHAPTER 3

Affected Environment

Chapter 3 of this EA presents the baseline environmental conditions within the area to be potentially affected by APC's proposed Pilot Project. The baseline conditions discussed in the chapter include air quality, geology, geologic hazards, paleontology, soils, water resources, floodplains and wetlands, vegetation, terrestrial wildlife, aquatic species, special status species, cultural resources, land use, noise, recreation, visual resources, socioeconomics, transportation/access, and health and safety.

3.1 AIR QUALITY

The Hanna Draw Pilot Project is located in a semiarid, steppe (dry and cold), midcontinental climate regime typified by dry windy conditions, limited rainfall, and long cold winters. The average annual temperature is approximately 42°F (Western Regional Climate Center [WRCC] 2000a, 2000b), and monthly mean temperatures range from a low of 11°F in January to a high of 83°F in July. The average annual precipitation is approximately 10 inches, with the majority falling from April to October; 30% occurs from thunderstorms during the summer months of June through August (Martner 1986). The average annual snowfall is approximately 39 inches, with January being the month of greatest accumulation (WRCC 2000a, 2000b). Snow accumulation patterns are determined by the effects of topography and vegetation on windblown snow and have a marked effect on vegetation, wildlife, hydrology, and human activities. Annual pan evaporation rate is an estimated 60 inches, while reservoir evaporation, representing anticipated conditions is approximately 42 inches.

The Hanna Draw Pilot Project is located in a region of Wyoming known as the wind corridor, where cold wind from the west and southwest is channeled eastward across the Continental Divide (Martner 1981). Annual wind speeds average 4.5 to 21.5 miles per hour (mph) and are greater during the afternoon and in the winter. The wind corridor has some of the strongest and most persistent winds in the U.S. (Martner 1986).

Air quality in the region is generally good (BLM 1995a, 1995b). Management for air quality includes the prevention of deterioration of air quality beyond applicable local, state, or federal standards; the enhancement of air resources of high quality where practicable; and the preservation of scenic values that may be impaired by the release of total suspended particulates (TSP) or other contaminants into the air that would affect visibility (BLM 1988).

The Hanna Draw Pilot Project is located in the Hanna Basin and is part of the Laramie Air Basin (BLM 1987), which includes much of south-central Wyoming. The basin is bordered by the Wyoming-Colorado state line to the south, the Laramie Mountains to the east, the Granite Mountains to the North, and the Great Divide Basin to the west. Air transport from the west and southwest dominates in level terrain areas, and dispersion results from unstable conditions induced by surface heating during the day. Stable conditions may be expected at night as the earth cools. In areas with significant terrain features such as the Medicine Bow, Shirley, and Green Mountains, transport is more complex. Typical mountain-valley coupling effects are evident in these areas, along with significant diurnal variations in local winds (BLM 1987).

The Hanna Draw Pilot Project is in an area designated a Prevention of Significant Deterioration (PSD) Class II area under the WDEQ/AQD Implementation Plan (BLM 1987). PSD Class II

areas are those that may be developed, and the release of limited concentrations of certain pollutants over Class II PSD increments is permitted so long as national ambient air quality standards (NAAQS) are maintained and emissions are within the PSD Class II increment (WDEQ 2002). The nearest PSD Class I area (an area where little air quality deterioration is allowed) is the Savage Run Wilderness, located approximately 50 miles south-southeast of the project area. Although the Savage Run Wilderness has not been designated Class I by Congress and thus legally does not have to be managed as a Class I area, it has the legal requirement to be managed as a Class I area under the Wyoming Air Quality Standards and Regulations Chapter 6, Section 4(c) (Dailey 2004). Other Class I areas in the region include the Bridger Wilderness in Wyoming and the Mount Zirkel Wilderness in Colorado.

The Clean Air Act mandates that NAAQS, established by the Environmental Protection Agency (EPA), must be maintained nationwide. NAAQS include standards for six "criteria" pollutants including: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter less than 10 microns in diameter (PM_{10}), sulfur dioxide (SO_2), and lead (Pb). Carbon County, Wyoming, is in an attainment area for all NAAQS "criteria" pollutants.

Visibility in the region is very good (generally greater than 70 miles), and particulates (i.e., fine particles carried by the wind from natural or manmade sources) are considered to be the main source of visibility degradation (BLM 1998). Climatic factors such as prevailing winds, atmospheric stability, and mixing heights affect air quality by influencing the ability of air to disperse or dilute particulates and other pollutants. Unstable conditions caused by vertical movement of air heated near the ground during the day combined with moderate to high wind speeds provide conditions conducive to dispersing and diluting particulates and other pollutants and maintaining air quality (BLM 1987). These conditions occur more than 70% of the time throughout most of the region in which the Hanna Draw Pilot Project would be located. A summary of some regional criteria pollutant background levels is presented in Table 3-1.

3.2 GEOLOGY AND GEOLOGICAL HAZARDS

3.2.1 Geology

The proposed Pilot Project is located within the Hanna Basin. Hanna Basin is a one of the deepest structural basins in Wyoming formed during the Laramide Orogeny, a period of intense folding, faulting, deformation, and deposition from the Late Cretaceous to early Tertiary Periods (Richter 1981). It is flanked to the north by the Shirley and Seminoe Mountains, east by the Carbon Basin, south by the Medicine Bow Uplift and Elk Mountain, and west by the Rawlins Uplift (Wilson et al. 2001).

Structural relief within the Hanna Basin exceeds 30,000 feet (Hansen 1986; Blackstone 1989). The basin is an asymmetrical synclinal feature with shallow dipping sedimentary rocks along the southern and western margins and steeper south-dipping rocks on the northern margin near the Shirley Mountain Thrust fault, which forms the northern boundary. The structural axis of the basin trends west-northwest to east-southeast along the northern portion of the basin. Figure 3-1 shows the bedrock geology of the proposed Pilot Project area, and Table 3-2 is a generalized stratigraphic section of the bedrock units. The overall sedimentary rock thickness within the basin exceeds 35,000 feet in the deeper portion of the basin (see Table 3-2).

Table 3-1 Regional Air Pollutant Background Concentrations and State and Federal Ambient Air Quality Standards

Pollutant/Averaging Time	Measured Background Concentration ($\mu g/m^3$)	State and National Ambient Air Quality Standards ($\mu g/m^3$)	PSD Class I Increment ($\mu g/m^3$)	PSD Class II Increment ($\mu g/m^3$)
Carbon Monoxide (CO) [1]				
1-hour	2,299	40,000	None	None
8-hour	1,148	10,000	None	None
Nitrogen Dioxide (NO_2) [2]				
Annual	3.4	100	2.5	25
Ozone (O_3)[3]				
1-hour	169	235	None	None
8-hour	147	157	None	None
Particulate Matter (PM_{10}) [4]				
24-hour	47	150	8	30
Annual	16	50	4	17
Particulate Matter ($PM_{2.5}$) [4]				
24-hour	15	65	None	None
Annual	5	15	None	None
Sulfur Dioxide (SO2) [5]				
3-hour	29	1,300	25	512
24-hour	18	260	5	91
Annual	5	80	2	20

Source: BLM 2004a

*Effective February 27, 2001 the U.S. Supreme Court upheld the EPA's position on the proposed national 8-hour ozone and PM2.5 standards. The WDEQ-AQD will not enforce the standards until EPA issues an implementation rule. Therefore no demonstration of compliance with these standards is required at this time. (WDEQ 2002).

[1]Colorado Department of Public Health and Environment-Air Pollution Control Division (CDPHE-APCD) 1996 in BLM 2004a: 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 in BLM 2004a: Data collected at the Craig Power Plant site and at Colorado oil shale areas from 1980 to 1984.

Table 3-2 Summary of Geologic Formations in the Pilot Project Area

Stratigraphic Units in the Hanna Basin					
Period/EPOCH		Stratigraphic Unit	Approximate Thickness (feet)	Crops out in Pilot Project Area	Probable Fossil Yield Classifications[1]
Tertiary (part)	EOCENE	Hanna Formation	19,000	Yes	4
	PALEOCENE	Ferris Formation			
Cretaceous	LATE	Medicine Bow Formation	6,000	Yes	4
		Fox Hills Sandstone	6,000	Yes	
		Lewis Shale	2,100	Yes	2
		Mesaverde Group	2,600	Yes	4
		Steele Shale	3,000	No	
		Niobrara Formation	1,200	No	
		Frontier Formation	800	No	
		Mowry Shale	200	No	
	EARLY	Muddy Sandstone	60	No	
		Thermopolis Shale	80	No	
		Cloverly Formation	20	No	
JURASSIC		Morrison Formation	375	No	
		Sundance Formation	300	No	
		Nugget Sandstone		No	
TRIASSIC		Jelm and Chugwater Fromations	700	No	
		Goose Egg Formation	400	No	
PERMIAN				No	
PENNSYLVANIAN		Casper Formation	400	No	
			300	No	
MISSISSIPPIAN		Madison Limestone	500	No	
CAMBRIAN		Flathead Standstone	65	No	
PRECAMBRIAN		granitic and metemorphic basement		No	

Modified from Willson et al. 2001

[1] See text for explanation

Sedimentary rocks exposed within the Proposed Action area of the Hanna Basin are shown in Figure 3-1 and range from Tertiary rocks of the Hanna Draw Formation (Tha) to Late Cretaceous (Medicine Bow Fm). The exposed bedrock units within the proposed interconnect pipeline corridor are shown on Figures 3-1 and Table 3-2 and are discussed below from youngest to oldest.

Hanna Draw Formation

The Hanna Draw Formation sediments are fluvial deltaic in origin consisting of interbedded, siltstone, claystone, and carbonaceous shale's with massive cross-bedded sandstones. This formation is synorgenic in nature, as the Hanna Basin was in-filled during rapid subsidence relative to adjacent Laramide orogenic uplifts (Wilson et al. 2001). The overall stratigraphic thickness of the formation is about 11,000 feet thick (Wilson et al. 2001). There are 32 known coalbeds of 5 feet or more within the Hanna Draw Fm. Coal thicknesses within the Tha are typically 5- to 10-feet thick but can be as thick as 60 feet and are the target of CBNG exploration within the basin (Glass and Roberts 1980). The formation contains moderate folds and minor faulting particularly along the southern portion of the basin (see Figure 3-1).

Ferris Fm

The Ferris Formation (TKf) also is comprised of synorogenic fluvial deltaic sedimentary rocks deposited across Cretaceous/Tertiary time boundary. It is similar in stratigraphic thickness and lithology to that of the overlaying Tha. The TKf consists of siltstone, shale, and claystone with massive cross-bedded fluvial coarse-grained to conglomeritic sandstone (Glass and Roberts 1980). The combined thickness of the Tha and TKf is on the order of 19,000 feet (see Table 3-2). The TKf contains 28 mineable coalbeds (Glass and Roberts 1980). Ferris Formation exposure occurs along the southern portion of the proposed Pilot Project area (see Table 3-2).

Medicine Bow Formation and Fox Hills Sandstone

The Late Cretaceous Medicine Bow Formation (Kmb) and Fox Hills Sandstone (Kfs) at its base have a combined thickness of approximately 6,000 feet. These units are exposed along the southern margin of the project area (see Table 3-2). The basal portion (Kfs) consists of massive to cross-bedded sandstones interbedded with coal seams. Above the Kfs, the Kmb consists of finer grained materials predominantly dark-colored shale and fine grained sandstones. The upper portion of the Kmb contains massive friable sandstone interbedded with dark colored shale (Glass and Roberts 1980).

Lewis Shale

The Lewis Shale (Kls) underlies the Kfs and consists of 2,100 feet of marine shale. It is interbedded with thin shaly sands and nearshore marine sandstones, including the 150-foot-thick Dad sandstone (HydroGeo 2004).

Mesa Verde Group

The oldest sedimentary rocks within the proposed Pilot Project area are the Cretaceous Mesa Verde Group (Kmv). This Kmv consists of four formations including white-colored sandstones of the Almond Formation; sandstone, shale, and coal of the Pine Ridge Formation; brown fluvial sandstones of the Allen Ridge Formation; and shale, bentonite, and sandstones of the Haystack

Mountain Formation. The combined stratigraphic thickness of the Kmv is about 2,600 feet (Wilson et al. 2001).

Surficial Geology

The Pilot Project surficial geology is shown on Figure 3-1. Within the proposed project area, quaternary alluvial and colluvial deposits (Qa) are located in the Medicine Bow River valley and the drainage west of the town of Hanna. Other colluvial deposits are present localized to drainages, but not at a reasonable scale for viewing. Gravel terrace and pediment deposits (Qt) are present northwest of the Pilot Project area.

3.2.2 Mineral/Oil and Energy Resources

The primary energy resource within the Hanna Basin is coal, with an estimated reserve of 23 billion tons of coal deposits. Both underground and surface mining of coal has been conducted within the basin since the 1860s, targeting subituminous to bituminous coals largely within the Tha and KTf formations (Glass and Roberts 1980). Underground mining of coal in Hanna Basin is no longer economically viable, and surface mining along the southern margin of the basin is currently under reclamation.

Numerous oil and gas exploration wells have been drilled across the Hanna Basin, some to depths of over 16,000 feet seeking natural gas potential. To date, no viable conventional oil or gas production has been discovered in the basin. However, because of the underlying coal, Hanna Basin contains potential for CBNG production.

There are no known economic mineral or base metal deposits within the Hanna Basin. Other industrial rock and minerals gravel deposits in the Qa and bentonite are unproven and likely sub-economic across the proposed Pilot Project area.

3.2.3 Geologic Hazards

Potential geologic hazards within the proposed project area include earthquakes, landslides, flash flooding, and subsidence from former mining activities.

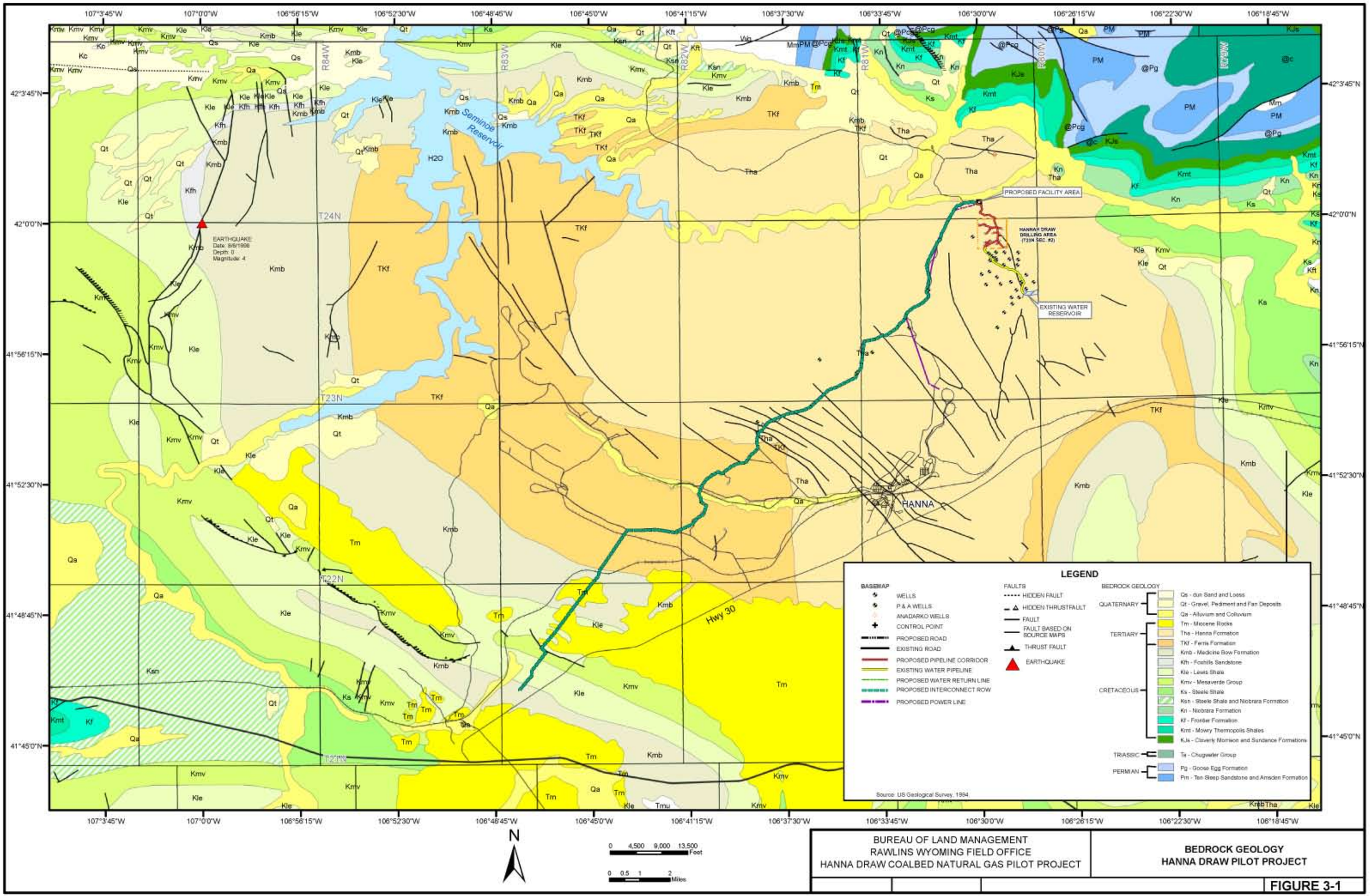
Seismicity

The most recent earthquake greater than a magnitude 3 on the Richter Scale occurred on the western margin of the Hanna Basin in August 1998, likely recurrent motion on an existing fault (see Figure 3-1). A magnitude 4 earthquake is minor with noticeable shaking if indoors, but barely perceptible when outdoors. The overall seismic risk within the Hanna Basin is very low.

Landslides and Flooding

Landslides are possible in the form of slumps and flows along hill slopes, particularly during or after periods of high precipitation along slopes with bentonitic soil and little vegetation. Small landslides and slumps are present to the west of the project area on steeper slopes closer to Hanna Draw.

Precipitation within the area is generally 12 inches per year or less and occurs largely from thunderstorm events. There is a potential for flooding along the dry washes and ephemeral and



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HANNA DRAW COALBED NATURAL GAS PILOT PROJECT

BEDROCK GEOLOGY
HANNA DRAW PILOT PROJECT

FIGURE 3-1

perennial streams in the project area. Flooding in ephemeral drainages is generally in response to high-intensity (large quantity of precipitation in a short time) localized storms. Such storms cause most of the floodwater damage, surface erosion, gulley formation, sediment deposition in arid and semi-arid environments (Branson et al. 1981). Curtis and Grimes (2004) indicates there are, on average, 35 to 40 days with thunderstorms in the area.

Subsidence

The proposed CBNG interconnect pipeline ROW avoids several historic coal mining areas, but does not cross reclaimed areas where subsidence risk may be greatest. Ground subsidence from the proposed withdrawal of produced water also has been examined, given its potential impact from CBNG development. However, there appears to be minimal risk for subsidence related to historic coal mining. Withdrawal of groundwater has been associated with subsidence in several areas including the San Joaquin Valley California, Las Vegas, New Orleans, Houston, and Mexico City. In these areas groundwater has been removed from unconsolidated sand and gravel aquifers, causing previously saturated zones to compress, resulting in ground subsidence of as much as 29 feet. The geologic strata underlying the Pilot Project is consolidated rock with porosities much lower than unconsolidated sand and gravel, and therefore, much less likely to be compressed following dewatering. In fact, estimates of ground subsidence associated with CBNG production for the Wyodak coal in the Powder River Basin, predict subsidence of less than 0.5 inch (Case et al. 2002). Furthermore, coal seams from which produced water would be withdrawn for the Pilot Project are much deeper than those in the Powder River Basin and any subsidence is expected to be attenuated because of the increased depth. Therefore, the potential for ground subsidence from the proposed project is not considered to be an issue and not carried forward in the analysis for the proposed Hanna Draw Pilot Project.

3.3 PALEONTOLOGICAL RESOURCES

BLM employs the Probable Fossil Yield Classification (PFYC) developed by the U.S. Forest Service (USFS) as the basis for describing the potential presence of paleontologic resources within surface geologic formations. This classification system is then used to determine the need for additional considerations for proposed surface disturbing activities. The classifications are described as follows:

> **Class 1.** Igneous and metamorphic geologic units (excluding tuffs) that are not likely to contain recognizable fossil remains.
>
> **Class 2.** Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils.
>
> **Class 3.** Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence.
>
> **Class 4.** Class 4 geologic units are Class 5 units that have lowered risk of human-caused impacts or lowered risk of natural degradation. Proposed ground-disturbing activities would require assessment to determine whether significant paleontological resources occur in the area of a Proposed Action and whether the action would impact the resources.

Class 5. Highly fossiliferous geologic units that regularly and predictably produce vertebrate fossils or scientifically significant nonvertebrate fossils and that are a high risk of natural degradation or human-caused impacts.

Six sedimentary formations are exposed at or near the ground surface in the Hanna Draw Pilot Project area, including the proposed interconnect pipeline ROW. These include, from youngest to oldest: 1) unnamed deposits of late Holocene age, including unconsolidated aeolian sands, stream gravels, alluvium, and colluvium; 2) Hanna Formation of Paleocene and possibly early Eocene age; 3) Ferris Formation of late Cretaceous and Paleocene age; 4) Medicine Bow Formation of Late Cretaceous age, 5) the Lewis Shale of Late Cretaceous age, and 6) Mesaverde Group of Cretaceous age. The Holocene deposits are widespread across the Pilot Project area, while the Hanna Formation, as shown on Figure 3-1 (USGS 1994) underlies Section 2 of the project area, the compressor station site in Section 35, and roughly the northeast half of the interconnect pipeline ROW. The remaining formations (i.e., Ferris, Medicine Bow, Lewis Shale, and Mesaverde Group) outcrop over varying lengths of the southeastern half of the interconnect pipeline ROW.

The Holocene deposits are derived from local erosional sources and are too young to contain significant fossil resources. However, the Hanna, Ferris, and Medicine Bow Formations and Mesaverde Group are known to produce vertebrate fossils of scientific significance in areas adjacent to the Pilot Project as summarized in the following paragraphs. The Lewis Shale is known to contain invertebrate fossils and occasionally vertebrate fossils but underlies a small portion of the pipeline corridor.

High deposition rates in the Hanna Basin led to the deposition of thick sequences of sediments that form the Hanna Formation, which yields abundant vertebrate and invertebrate fossils and plants of Paleocene age (Higgins 2003; Gill et al. 1970; Ryan 1977; Lillegraven 1995; Eberle and Lillegraven 1998a). Plants from the formation include microfossil (pollen) and megafossil (leaf and stem imprints and petrified and carbonized wood) remains. More recently, field parties have documented fossil vertebrates including a wide variety of mammals, reptiles, and fish of Paleocene age. In addition, a specimen of early horse, Hyracotherium, was discovered from near the top of the unit that suggests the top of the Hanna Formation is earliest Eocene in age (Eberle and Lillegraven 1998a, 1998b).

The Ferris Formation has produced scientifically significant fossils ranging in age from Late Cretaceous to Early Paleocene age, including the remains of 59 species of early Paleocene mammals (Eberle and Lillegraven 1998a, 1998b; Eberle 1996). The vertebrate fauna of the Ferris Formation is of particular importance because it spans the Cretaceous-Tertiary boundary and provides critical information on the diversification of mammals at the beginning of the Cenozoic Era. In addition, the formation preserves fossil leaves and shells of freshwater invertebrates and trace fossils.

The Medicine Bow Formation yields fossils of terrestrial vertebrates and plants and marine and freshwater invertebrates. Plants known from this formation also include microfossil (pollen) and megafossil (leaf and stem imprints, and petrified and carbonized wood) remains. Well-preserved fossil leaf floras have been described from the formation by Dorf (1942). Invertebrate fossils include marine foraminifera and brackish water gastropods and bivalves, represented by at least 21 species (Gill et al. 1970; Fox 1971). Dinosaur bone fragments have long been known from the lower part of the formation (Bowen 1918; Lull 1933; Breithaupt 1985, 1994), and the formation has also produced the remains of a small number of mammals of Late Cretaceous age (Lillegraven 1993, 1995; Secord 1998).

Due to the presence of significant fossil resources within the Hanna, Ferris, Medicine Bow, and Mesaverde Group formations in areas near or adjacent to the Pilot Project, these formations meet the criteria for PFYC Class 4 (see Table 3-2). Class 4 may require further assessment of existing data prior to authorizing land use actions involving surface disturbance.

3.4 SOILS

Unpublished soil maps, map unit descriptions, pedon descriptions, and soil interpretations for the project area were provided by the Natural Resources Conservation Service (NRCS) (Cox 2004) to aid in developing this section. In addition, an interpretations table was developed depicting ratings for the majority of the map units occurring within the project area with respect to runoff potentials, water and wind erosion hazards, and the presence of elevated salt and sodium levels.

The following information was developed based on the maps and data collected from these sources pertaining to the dominant soil map units found across the proposed project area. Soil chemical and physical characteristics related to impact assessment, mitigation planning, and potential revegetation success are emphasized. Table 3-3 provides an overview of the specific soil baseline characteristics of the dominant soil map units for the project area.

3.4.1 General Soil Characteristics

The soils of this project area are somewhat variable in terms of both physical and chemical characteristics, as a function of parent material, topography, and differential rates of mineral weathering. Soils range from shallow to very deep with shallow soils common to dissected uplifts, cuestas, and various upland topographic positions. Deeper soils are most common on alluvial fans and fan skirts, floodplains, drainages, pediment surfaces, and rolling uplands. Surficial textures are loamy with coarse fragments in the form of channers included in steeper and dissected upland soil profiles. Heavy clay textures are not common. The soils are typically alkaline with pH values ranging from 6.6 to 9.0. Saline and/or sodic profiles are comparatively rare across the project area as a whole, but are locally common as noted below. Available water capacities range from very low to high depending upon soil depth and texture, with effective rooting depths following a similar pattern. Water erosion hazards range from slight to severe with moderate to severe ratings most common. Wind erosion hazards are typically moderate or moderate to severe.

3.4.2 Soil Characteristics by Landform

The following discussion presents a more detailed discussion of the dominant soil map units overlying the landforms that characterize this project area. Moderately steep to steep cuestas, dissected uplifts, and rolling uplands are common landforms across the proposed drilling area in Section 2 and along the interconnect pipeline and power line ROWs, with slopes ranging from 6 to 50%. Parent materials include local alluvium and residuum derived from sandstone and shale materials. These soils are typically shallow, although moderately deep soils also may occur. Available water capacities range from very low to low. Effective rooting depths range from 5 to 20 inches over weathered and unweathered bedrock. These soils are characterized by slight to severe and moderate to severe water and wind erosion hazards, respectively. Seeding efforts would be constrained by shallow soil depths and soil alkalinity. Map unit range sites include the Very Shallow, Shallow, Shallow Loamy, Loamy, and Shale types.

Table 3-3 Selected Soil Baseline Characteristics of Dominant Soil Map Units

Map Unit #	Topographic Position	Slope (%)	Depth (pH)	Surficial Texture(s)[1]	Runoff Potential	Water Erosion Hazard	Wind Erosion Hazard	Available Water Capacity	Project Facility Occurrence[2]
235	dissected uplifts	6-40	shallow (7.5-9.0)	l, cl	rapid	severe	moderate	very low	DA, ROW
252	moderately steep to steep cuestas	10-50	shallow (6.6-9.0)	l, cl, chsl	rapid	severe	moderate	very low	DA, PL, ROW
253	rolling uplands, cuesta slopes	6-40	shallow to moderately deep (6.6-9.0)	l, sl, cl, scl	medium to slow	slight to moderate	moderate to severe	very low to low	DA, ROW
254	nearly level to gently sloping uplands	0-6	shallow to moderately deep (6.6-9.0)	sl, l, cl	slow to medium	slight to moderate	moderate to severe	low	DA
257	floodplains, major drainages	0-3	very deep (7.9-9.0)	l, sl, cl, sil	slow	moderate	moderate to severe	High	PL, ROW
258	alluvial flats and fans skirts	0-12	very deep to moderately deep (6.6-9.0)	sl, scl	slow	slight	Severe	low to high	PL, ROW
263	alluvial fans	3-15	very deep to moderately deep (6.6-8.4)	sl	slow to medium	slight to moderate	Severe	very low to moderate	ROW
401	steep to very steep sandstone exposures and thin soils				rapid	severe	not rated	not rated	FA, PL, ROW
1252	steep dissected uplands	10-50	shallow (6.6-9.0)	chsl vchsl, l, cl	medium to rapid	moderate to severe	slight to moderate	very low to moderate	ROW

Table 3-3 Selected Soil Baseline Characteristics of Dominant Soil Map Units

Map Unit #	Topographic Position	Slope (%)	Depth (pH)	Surficial Texture(s)[1]	Runoff Potential	Water Erosion Hazard	Wind Erosion Hazard	Available Water Capacity	Project Facility Occurrence[2]
1255	sloping to steep uplands	10-40	Shallow (6.6-9.0)	sl, chsl, xchl	slow to rapid	moderate to severe	moderate to severe	very low to low	ROW
1256	alluvial fans, pediments, dissected relict surfaces	2-15	very deep (8.0-9.0)	sl - scl	slow to medium	slight to moderate	severe	moderate to high	ROW
1260	rolling uplands	2-20	deep (7.4-8.6)	sl	moderate to high	slight to severe	moderate	moderate to high	ROW
2530	sloping uplands	2-10	shallow to moderately deep (6.6-9.0)	l, cl, sl, scl	slow to medium	slight to moderate	slight to moderate	low to high	ROW

[1]l = loam; sl = sandy loam; cl = clay loam; sil = silt loam; scl = sandy clay loam; chsl = channery sandy loam; vchsl = very channery sandy loam; xchl = extremely channery loam.

[2]Project Facility Occurrence: DA = Drilling Area (Section 2), PL = Power Line, FA = Sec. 35 Compressor Facility, ROW = Pipeline Right-of-way

Sloping to steeply dissected uplands also support shallow soil profiles forming in shallow alluvium and residuum derived from interbedded sandstone and shale as well as from tilted sandstone beds. Slopes range from 10 to 50%. Available water capacities are very low to moderate. The effective rooting depth ranges from 5 to 20 inches over weathered bedrock. Water erosion hazards range from moderate to severe and wind erosion hazards range from slight to severe. Overlying the "breaks" along the Medicine Bow River and certain southern portions of the proposed interconnect pipeline ROW, these soil map units are included in the Very Shallow, Shallow Sandy, and Shale range sites. Seeding efforts would be constrained by shallow soil depths and alkalinity.

Shallow to moderately deep soils developing in shale residuum and alluvium over residuum derived from interbedded sandstone and shale overlie nearly level to sloping (0 to 10%) uplands. These soils occur in association with the proposed drilling area and the southern terminus of the interconnect pipeline ROW. Saline profiles are common to the exploration site. Available water capacities range from low to high. Effective rooting depths typically range from 10 to 20 inches, constrained by unweathered bedrock, but may extend to 40 inches or more with the deepest soils. A slight to moderate water erosion hazard and a slight to severe wind erosion hazard characterize these soils. Seeding efforts would be constrained, on a soil series-specific basis, by depth to bedrock, alkalinity, and soil salinity. Range sites to which these soils have been assigned include the Impervious Clay and Loamy types.

Sloping to steeply dissected uplands also support shallow soil profiles forming in shallow alluvium and residuum derived from interbedded sandstone and shale as well as from tilted sandstone beds. Slopes range from 10 to 50%. Available water capacities are very low to moderate. The effective rooting depth ranges from 5 to 20 inches over weathered bedrock. Water erosion hazards range from moderate to severe and wind erosion hazards range from slight to severe. Overlying the "breaks" along the Medicine Bow River and certain southern portions of the pipeline ROW, these soil map units are included in the Very Shallow, Shallow Sandy, and Shale range sites. Seeding efforts would be constrained by shallow soil depths and alkalinity. Shallow to moderately deep soils developing in shale residuum and alluvium over residuum derived from interbedded sandstone and shale overlie nearly level to sloping (0 to 10%) uplands. These soils occur in association with the proposed drilling area and the southern terminus of the interconnect pipeline ROW. Saline profiles are common to the exploration site. Available water capacities range from low to high. Effective rooting depths typically range from 10 to 20 inches, constrained by unweathered bedrock, but may extend to 40 inches or more with the deepest soils. A slight to moderate water erosion hazard and a slight to severe wind erosion hazard characterize these soils. Seeding efforts would be constrained, on a soil series-specific basis, by depth to bedrock, alkalinity, and soil salinity. Range sites to which these soils have been assigned include the Impervious Clay and Loamy types.

Floodplains, drainages, alluvial flats and skirts, and relict surfaces have given rise to moderately deep to very deep soils on slopes typically ranging from 0 to 15% with lesser slopes predominating. These soil units occur in and along Hanna Draw and in the larger drainages crossing the interconnect pipeline ROW. Parent materials consist of sandstone alluvium and alluvium from interbedded sandstones, siltstones, and shales. The available water capacity ranges from low to high with higher values the norm. Effective rooting depth is typically 60 inches or more, although lesser depths do occur. The water and wind erosion hazards for these soils are slight to moderate and moderate to severe, respectively. Seeding activities may be somewhat constrained on portions of this unit due to soil pH. Range sites that these soils

have been assigned to include the Saline Lowland, Loamy, Shallow Sandy, and Sandy classifications.

Steep to very steep sandstone exposures with thin soil inclusions occur in association with the "breaks" topography bordering Hanna Draw and the Medicine Bow River. This unit also occurs in isolated areas along the southern portion of the interconnect pipeline ROW. This unit is typically about 70% sandstone ledges and associated barren shales with about 30% very shallow to shallow soil inclusions. Runoff is rapid and the erosion hazard is severe where soils occur. No other descriptive or interpretive information was available for this soil unit.

3.4.3 Prime Farmlands

No prime farmland soil units, or soils, occur in Carbon County, Wyoming (Cox 2004).

3.5 WATER RESOURCES

3.5.1 Surface Water

The project area is located within the drainage of the Medicine Bow River, in the North Platte River Basin (Figure 3-2). The Medicine Bow River is a prominent perennial drainage flowing in a westerly direction north of the project area, eventually discharging into Seminoe Reservoir. Runoff from the project area ultimately reaches this river via ephemeral and intermittent drainages, including Hanna Draw. Since the proposed Hanna Draw Pilot Project would not affect the Medicine Bow River or points downstream, these surface water resources are not discussed in detail as part of this baseline summary.

3.5.1.1 Hydrology

Surface Water Resources

The project area is located south of the Medicine Bow River. No perennial water sources occur in the immediate project area. Hanna Draw is an intermittent creek entering the Medicine Bow west of the project area. Hanna Draw was evaluated by the USGS from 1975 to 1981 at Station 06634990. During this period, the creek typically was dry from October through January, with a maximum monthly average in March at 2.7 cfs. Peak flows of 79 and 80 cfs occurred in 1979 and 1980, respectively, in response to spring rain or snow events. Hanna Draw is the receiving water for any runoff than may flow in a westerly direction from the project area.

Missouri John Spring is located near the project area, in T23, R80, S30. This spring is intermittent and only flows in wetter years. The spring is located on the south side of the ridge draining towards the town of Hanna and does not flow towards or from the project area. Barrel Springs is located south of the project area in T23, R80, S27. This spring is located downstream of a reclaimed coal mine area and drains to the northwest into Hanna Draw. Both springs are located between 3 and 4 miles from Section 2 where the proposed project wells would be located.

Two playas with surface ponds exist in the project area. Runoff from the eastern portion of the project area may reach these playas. One playa is located in T23, R81, S12 and has an excavated depression in the bottom used seasonally by local ranchers for livestock watering. A

farm pond is located in a small playa (T23, R81, S12) downgradient of the existing reservoir located in Section 13.

The proposed CBNG interconnect pipeline also would cross several drainages that are hydrologically distinct from the Medicine Bow River. The initial 7 miles of the pipeline would run along Hanna Draw, which is a tributary to the Medicine Bow River. Farther south, the proposed pipeline ROW crosses the Big Ditch drainage and Saint Mary's Creek. Both of these streams are intermittent tributaries (Class 4A and Class 3B, respectively) of the North Platte River (WDEQ 2001). The Big Ditch is maintained for drainage from area coal mines with a Class 4A classification indicating that aquatic life is not a designated use for this stream.

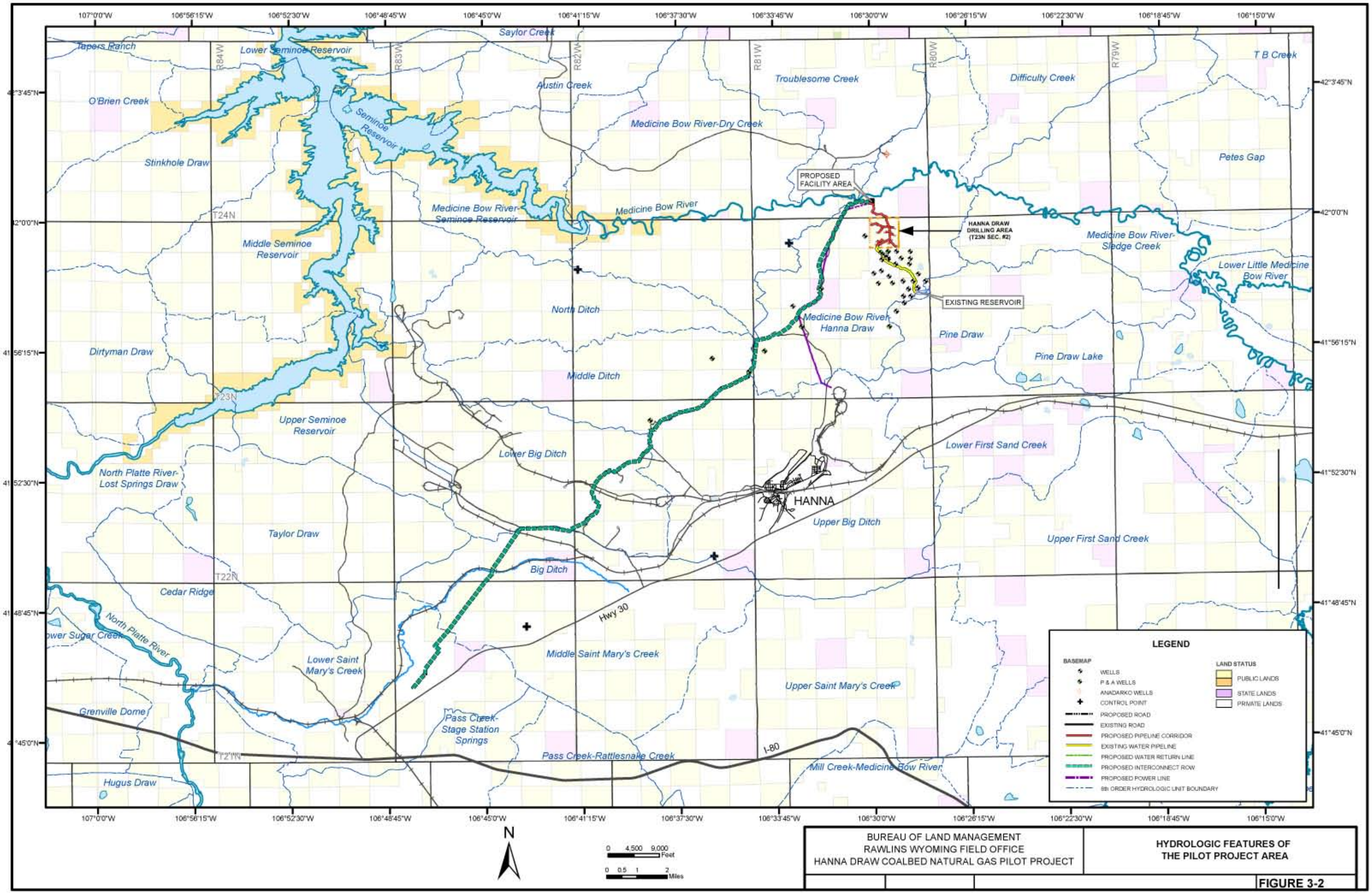
Existing Reservoir

The permitted reservoir located in T23N, R81W, E½ S13 (see Figure 3-2) is dry and has, to date, only contained small amounts of produced water and surface water accumulated from runoff. It has been constructed at the hydrologic divide between Hanna Draw to the west and Pine Draw to the east, and it has a storage capacity of 500 acre-feet. The reservoir is permitted by WDEQ as a closed basin, playa, or reservoir with no flow into any waters of the state. The reservoir is permitted per SEO Permit #11084, assigned to APC as of April 13, 2004. The reservoir is expected to accommodate water storage needs for the produced water management program. APC is currently projecting that the initial, maximum daily flow into the reservoir would be approximately 40,000 BBL/day, or 2.6 cfs. At this rate of water production, the reservoir would take approximately 97 days to fill (excluding evaporation and infiltration). The reservoir would be an on-channel reservoir within a class 3 receiving stream, which is eventually tributary to a class 2AB perennial water of the state. Authorized uses include aquatic life other than fish, recreation, agriculture (livestock watering), wildlife, industry, and scenic value. WYPDES permit No. WY0044164 was issued to operator Barrett Resources for this reservoir on August 23, 2001. This permit was renewed by WDEQ effective November 28, 2006 and valid through November 30, 2011. With exception of discharge due to natural overtopping during a 50-year/24-hour storm event or greater, the permit does not authorize discharge of water from the reservoir.

The reservoir is designed for 500 acre-feet of storage with 5 feet of freeboard. Reservoir storage including the 5 feet of freeboard is 755 acre-feet, which is more than sufficient to contain the annual precipitation expected for the area (approximately 36 acre-feet) and the estimated runoff from the 25-year storm event (13.2 acre-feet) (BLM 2002a). APC would manage delivery of produced water to the reservoir to ensure that the design storage of 500 acre-feet is not exceeded.

3.5.1.2 Existing Water Quality

In 2003 and 2004, APC collected water quality data from Hanna Draw and three additional tributaries to the Medicine Bow River upstream of the project area (i.e., Little Medicine Bow River, Difficulty Creek, Troublesome Creek). In addition, limited USGS water quality data are available for Hanna Draw. Table 3-4 shows the water quality data available for intermittent flow in Hanna Draw. The load of dissolved solids is considerably higher than in the Medicine Bow River, a pattern commonly recorded for smaller regional streams. These data were likely collected during coal mine discharges from the upstream Rosebud Coal Mine.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42°3'45"N
42°0'0"N
41°56'15"N
41°52'30"N
41°48'45"N
41°45'0"N
R84W
R83W
R82W
R81W
R80W
R79W
T24N
T23N
T22N
T21N
Tapers Ranch
Lower Seminoe Reservoir
Saylor Creek
Austin Creek
Troublesome Creek
Difficulty Creek
T B Creek
O'Brien Creek
Seminoe Reservoir
Medicine Bow River-Dry Creek
Stinkhole Draw
Petes Gap
PROPOSED FACILITY AREA
Medicine Bow River
Medicine Bow River-Seminoe Reservoir
HANNA DRAW DRILLING AREA (T23N SEC. #2)
Middle Seminoe Reservoir
Medicine Bow River-Sledge Creek
Lower Little Medicine Bow River
North Ditch
EXISTING RESERVOIR
Medicine Bow River-Hanna Draw
Pine Draw
Dirtyman Draw
Pine Draw Lake
Middle Ditch
Upper Seminoe Reservoir
Lower First Sand Creek
Lower Big Ditch
North Platte River-Lost Springs Draw
HANNA
Upper Big Ditch
Upper First Sand Creek
Taylor Draw
Big Ditch
Cedar Ridge
Hwy 30
North Platte River
Lower Sugar Creek
Lower Saint Mary's Creek
Middle Saint Mary's Creek
Upper Saint Mary's Creek
Grenville Dome
Pass Creek-Stage Station Springs
Pass Creek-Rattlesnake Creek
I-80
Mill Creek-Medicine Bow River
Hugus Draw
LEGEND
BASEMAP
WELLS
P & A WELLS
ANADARKO WELLS
CONTROL POINT
PROPOSED ROAD
EXISTING ROAD
PROPOSED PIPELINE CORRIDOR
EXISTING WATER PIPELINE
PROPOSED WATER RETURN LINE
PROPOSED INTERCONNECT ROW
PROPOSED POWER LINE
8th ORDER HYDROLOGIC UNIT BOUNDARY
LAND STATUS
PUBLIC LANDS
STATE LANDS
PRIVATE LANDS
N
0 4,500 9,000 Feet
0 0.5 1 2 Miles
BUREAU OF LAND MANAGEMENT
RAWLINS WYOMING FIELD OFFICE
HANNA DRAW COALBED NATURAL GAS PILOT PROJECT
HYDROLOGIC FEATURES OF THE PILOT PROJECT AREA
FIGURE 3-2

Associated water quality in regional playa lakes has not been evaluated, but may be expected to be elevated in salinity and ionic components relative to surface water streams, as these components would be expected to concentrate as a result of ongoing water evaporation.

Table 3-4 Hanna Draw Baseline Water Quality

	Conductivity µS/cm[1]	Calcium mg/L[2]	Magnesium mg/L	Sodium mg/L	Chloride mg/L	TDS[3] mg/L
USGS Monitoring Station 06634990						
Period of Record	1975 - 1981					
No. Observations	33	32	32	32	32	32
Average	2239	207	140	175	21	1840
Minimum	615	60	24	27	4	415
Maximum	3800	310	240	300	160	3050
Anadarko Station HDC (Hanna Draw at culvert near mouth)						
Period of Record	November 2003 - July 2004 (dry in July 2004)					
No. Observations	8	8	8	8	8	8
Average	2382	195	105	143	37	1749
Minimum	464	50	15	23	5	309
Maximum	4530	293	205	320	121	3500

[1] µS/cm = micro siemens per centimeter
[2] mg/L = milligram/liter
[3] TDS = total dissolved solids

Coal Mine and Operation

Upstream of the project area in Hanna Draw is an area of extensive coal mining belonging to the Rosebud Coal Sales Company (RCSC). This mining operation has been operational since 1964, and most locations have since been reclaimed. The mine is currently in the reclamation phase, and covers 4,000 acres, once containing 11 pits. The mine employed a technique of area strip mining with overburden removal using draglines and scrapers. There is evidence that soil health may be affected in some areas of reclamation (Stahl et al. 2003). Discharges occurred to Hanna Draw under a WDEQ NPDES permit, principally during the early 1980s.

Hanna Draw Coalbed Natural Gas Project

Williams Production RMT Company undertook a CBNG project located south of the current project area where 25 wells were authorized, of which 8 wells were installed. The existing road infrastructure was built to access these sites, and the permitted reservoir in Section 13 was constructed to store the anticipated produced waters. Reclamation of these sites has not been finalized.

Metals with Potential for Bioaccumulation

The wildlife section discusses those constituents known to bioaccumulate in the terrestrial food chain, including mercury, boron, selenium, cadmium and chromium. None of the values

measured in existing wells (Table 3-5) indicate these constituents may be of issue, but not all of these constituents were measured in the existing monitoring wells. Water quality in the Williams

Table 3-5 Metals in Produced Water Samples

Well ID	2-2	14-35	HD-14 (2001)	HD-14 (2004)	HD-1	HD-18	Chronic NRWQC[2]
Arsenic	ND(1) [1]	7.7	ND(.1)	7.7	1.1	ND(1)	150
Boron	---	---	370	---	110	170	---
Cadmium	---	2.3	ND(.1)	---		---	6.2 [3]
Chromium	---	ND(1)	ND(1)	---	8	---	230 [3]
Mercury	---	ND(.06)	ND(.1)	---	ND(.1)	---	0.77
Selenium	ND(5)	ND(5)	ND(5)	ND(?)	7	---	5

Units = µg/l

[1] ND( ) = non detect (detection limit)

[2] NRWQC = National Recommended Water Quality Criteria

[3] NRWQC at a hardness of 400

wells may not be representative of water quality in the producing wells, although the water is expected to be similar as it originates in the same formation.

3.5.2 Groundwater

Groundwater within the project area is present under unconfined conditions in alluvium-filled drainages, primarily in the Medicine Bow River valley north of the proposed pilot project area. Alluvium within the Medicine Bow alluvium may approach 100 feet thick and contain significant water storage. This perennial drainage likely functions as a groundwater recharge and discharge boundary. Other shallow groundwater systems generally discharge to local drainages and ultimately the Medicine Bow River (Richter 1981). Deeper groundwater is present in the Hanna and Ferris Formations within the basin (Lowry et al. 1983; Richter 1981). The deeper groundwater exists under semi-confined and confined conditions with potentiometric surfaces from aboveground surface to several hundred feet below ground level across the basin (Daddow 1986). The range of potentiometric surfaces is largely due to complex interbedded nature and structural orientation of the bedrock units. Groundwater is present within fluvial sandstones, conglomerates, and fractured coalbeds, which are interbedded with low-permeablity shales and claystones. Because of the interbedded nature of these formations, little vertical migration of groundwater is thought to occur.

Groundwater recharge occurs along the margins of the basin in the form of infiltration of rain and snowmelt into more permeable horizons, the outer edges of the basin, and/or where drainages cross aquiferous rocks (Richter 1981). Infiltrated water flows in the direction of the bedrock dip or toward the center of the basin. Locally, groundwater flow is likely affected by faulting and joint sets, which increase permeability through an increase in fracture density (Freeze and Cherry 1979).

Aquifer characteristics are poorly known across the basin. Aquifer permeability and potential water yield tend to be related to rock characteristics and degree of fracturing (Richter 1981). A

table of permitted wells in close proximity is provided in Appendix C. The majority of these wells are related to exploration, monitoring, or dewatering of CBNG or reclamation and monitoring of coal mines. Wells with available groundwater information show a range of static water levels from artesian (above ground surface) to over 700 feet below ground surface. Most static water levels fall between 100 and 300 feet below ground surface. Water yield information for the permitted wells is limited, but yields generally range from 2 to 650 gallons per minute (gpm) within the proposed Pilot Project area.

Two water samples (from test Well 14-35 and from Hanna Draw Well 18) have been dated using deuterium, tritium (H_3), and oxygen 18/16 isotope ratios (tests conducted for APC in 2004 by the Illinois State Geological Survey laboratories). The results of the analyses are presented in Table 3-6. The lack of tritium in groundwater samples from the Pilot Project area is indicative of water that has not been in contact with the atmosphere since at least the early 1950s when large amounts of tritium were released during atmospheric testing of nuclear devices. The isotopic ratios for deuterium and oxygen-18 suggest that the groundwater in the area was isolated from the atmosphere during a time of lower mean atmospheric temperatures (approximately 10 degrees cooler than present). Temperatures this much lower than present are associated with the Pleistocene Epoch, suggesting that the groundwater in the coal seams has an age on the order of thousands of years. This age indicates that the groundwater system in the target formation moves slowly and is not likely connected closely to surface waters.

Table 3-6 Isotopic Analysis of Hanna Formation Coal Seam Groundwater

Well	Tritium Content (TU)	δ^{18} O VSMOW (0/00)	δ^{18} D VSMOW (0/00)
Hanna Draw 18	<0.50	-19.52	-15.3
Hanna Draw 14-35	<0.50	-18.66	-14.49

Notes:

TU - Tritium Unit. One TU is defined as one tritium atom per 1,018 hydrogen atoms.
VSMOW = Vienna Standard Mean Ocean Water, an international standard used for oxygen and hydrogen isotopic analysis.

(0.00) is per mil or per thousand.

3.6 FLOODPLAINS

Low-lying areas adjacent to perennial streams, dry washes, and ephemeral streams in the vicinity of the Pilot Project may be subject to periodic flooding. Flood Insurance Rate Maps or Flood Hazard Boundary Maps have been developed for portions of the proposed Pilot Project area by FEMA. The areas where floodplain mapping has been published by FEMA are along the southern portions of the proposed interconnect pipeline ROW where two stream crossings (Big Ditch and Saint Mary's Creek) have been mapped as Zone A (approximate extent of the 100-year floodplain where flood elevations and flood hazard factors have not been determined). Floodplain mapping is not available for the northern portion of the project area, which includes Hanna Draw and the Medicine Bow River. Therefore, flood-prone areas adjacent to these streams are classified as Zone D (areas of undetermined, but possible, flood hazard).

The Medicine Bow River is located to the north of the Pilot Project and is the only perennial stream in the project area. The river flows to the west in a narrow topographic valley where flooding is restricted to low-lying areas immediately adjacent to the river channel. Hanna Draw is an intermittent tributary to the Medicine Bow River, which flows to the north parallel to a portion of the interconnect pipeline. Smaller floodplains occur along Hanna Draw and other creeks and washes throughout the Pilot Project area. Flooding in ephemeral drainages is generally in response to high-intensity, localized storms. Such storms cause most of the floodwater damage, surface erosion, arroyo formation, and sediment deposition in arid and semi-arid environments (Branson et al. 1981). Martner (1986) indicated an average of 40 thunderstorms per year in the vicinity.

The constructed ditch in the St. Mary's Creek drainage consists of a narrow, incised channel (R4SBJ) with vegetated wetlands (PEM1J) occurring on the low benches to either side. The wetlands are dominated by seaside buttercup, Baltic rush, silverweed, and creeping bentgrass.

Open water features of the project area include small, intermittent drainages, Hanna Draw, and its tributaries. The small, intermittent drainages consist of narrow drainages, typically 1- to 6-foot-high, incised banks. Bed widths generally range from 1 to 3 feet. The beds and banks of these drainages range from barely discernable under low flow conditions to strongly developed in areas draining larger watersheds. These drainages are subject to intermittent (R4SBJ) or seasonal (R4SBC) flooding. Typically, these drainages do not support a fringe of vegetated wetlands but transition directly into upland vegetation communities.

Hanna Draw is the major drainage (to the Medicine Bow River) of the northern project area. This drainage is typically incised with extensive terraces and benches located along the channel proper. Channel banks typically range from 1 to 4 feet high (discounting terrace and bench formations), while bed widths are in the 1- to 3-foot range. Beds and bank features are strongly developed, overall. The channel is subject to intermittent flooding (R4SBJ). As noted above, vegetated wetlands associated with this drainage and its tributaries are highly variable.

The Mixed Grass-like/Grass Meadow Community is a wetland community delineated as a defined vegetation type. Therefore, it is described below and included as one of the vegetation types associated with the proposed project.

3.6.1 Functioning Conditions/PFC Evaluation of Hanna Draw, St. Mary's Creek, and the Medicine Bow River

Riparian conditions on public lands along Hanna Draw, St. Mary's Creek, and the Medicine Bow River have been evaluated by the BLM using the following Proper Functioning Condition Assessment Process.

Evaluation Method:

The primary method used in evaluating this standard is through a qualitative assessment procedure called Proper Functioning Condition (PFC). This process evaluates physical functioning of riparian/wetland areas through consideration of hydrology, vegetation, and soil/landform attributes. A properly functioning riparian/wetland area will provide the following elements:

- Dissipate stream energy associated with high-water flows, thereby reducing erosion and improving water quality.

- Filter sediment, capture bedload, and aid floodplain development.
- Improve floodwater retention and groundwater recharge.
- Develop root masses that stabilize streambanks against cutting action (Technical Reference 1737-15 1998).

Overall, most locations along Hanna Draw and St. Mary's Creek were rated by the respective PFC multidisciplinary teams to be "Functioning at Risk" with either a static or downward trend. Hanna Draw does rate Proper Functioning Condition at the upper end, where there are less impacts from the past mineral exploration. Further downstream, inadequate previous reclamation changed the hydrologic nature of the channel causing accelerated vertical and lateral adjustments to the channel (approaching the non-functional rating). In addition, permit long grazing duration also has contributed to the instability of the system by wet season trampling effects. Permit long grazing duration on Hanna Draw, St. Mary's Creek, and other riparian areas also has resulted in reduced vegetation vigor, changes in species composition, and changes in overall plant density in some locations. In some cases, these riparian areas are drying and losing their riparian vegetative component. The Medicine Bow River near the mouth of Hanna Draw was rated "Functioning at Risk" primarily due to vegetation composition and associated effects (i.e., weeds). No lentic systems within the Hanna Draw area on public lands have been rated.

When riparian areas are not PFC, the BLM has to make changes to improve riparian condition. Livestock grazing duration is addressed through pasture rotation, fencing, and water developments. Stream stabilization generally improves as vegetation improves; however, past impacts from mineral development also may need to be addressed.

3.7 VEGETATION

Project maps based on aerial photos were used to develop a preliminary list of dominant vegetation types potentially present across the project area. Following map analysis, the vegetation reconnaissance survey was completed from July 12 through July 15, 2004. The project area was traversed by two biologists in a vehicle along the roads identified during the project map review. Pedestrian surveys also were completed where the proposed project area deviated from established roads. Aerial photo interpretation was used in 2005 for portions of Section 35. Vegetation was mapped within the entire Section 2 proposed drilling area, the proposed compressor facility area, and to a distance of 600 feet on either side of the utility ROW centerlines. As the reconnaissance survey proceeded, notes were taken on the project maps concerning the dominant vegetation present, vegetation continuums, topography, physiography, erosion, and significant features such as rock outcrops, drainages, wetlands, and open water bodies. In addition, plant cover values were estimated at representative sample sites to further characterize the vegetation types encountered and to gain information on vegetation community productivity. The acreage inaccessible by road was viewed through binoculars and the vegetation types present estimated based on a comparison of surficial characteristics with the areas traversed elsewhere on the project area. Preliminary map unit boundaries were then drawn on the field maps.

Areas of weed invasions, wetlands, and open water features were noted, and GPS coordinates were taken. Similarly, areas qualifying as potential habitat for threatened, endangered, and sensitive plant species were identified and GPS coordinates noted for future identification. Weed infestation and sensitive plant habitat identification surveys were conducted to a distance

of 100 feet on either site of the center points/lines of proposed well sites, access roads, utility corridor ROWs, and within the proposed CCF disturbance area in Section 35.

The data collected in the field were compiled, the dominant vegetation communities were identified, and the final vegetation community boundaries were mapped. Vegetation communities too small to delineate at final map scale were treated as community inclusions in the following discussion. Figure 3-3 depicts the vegetation communities identified and described onsite as well as weed concentrations and the locations of potential threatened, endangered, and sensitive plant species habitat.

3.7.1 Dominant Vegetation Communities and Land Types

3.7.1.1 Wyoming Sagebrush/Mixed Grass Community

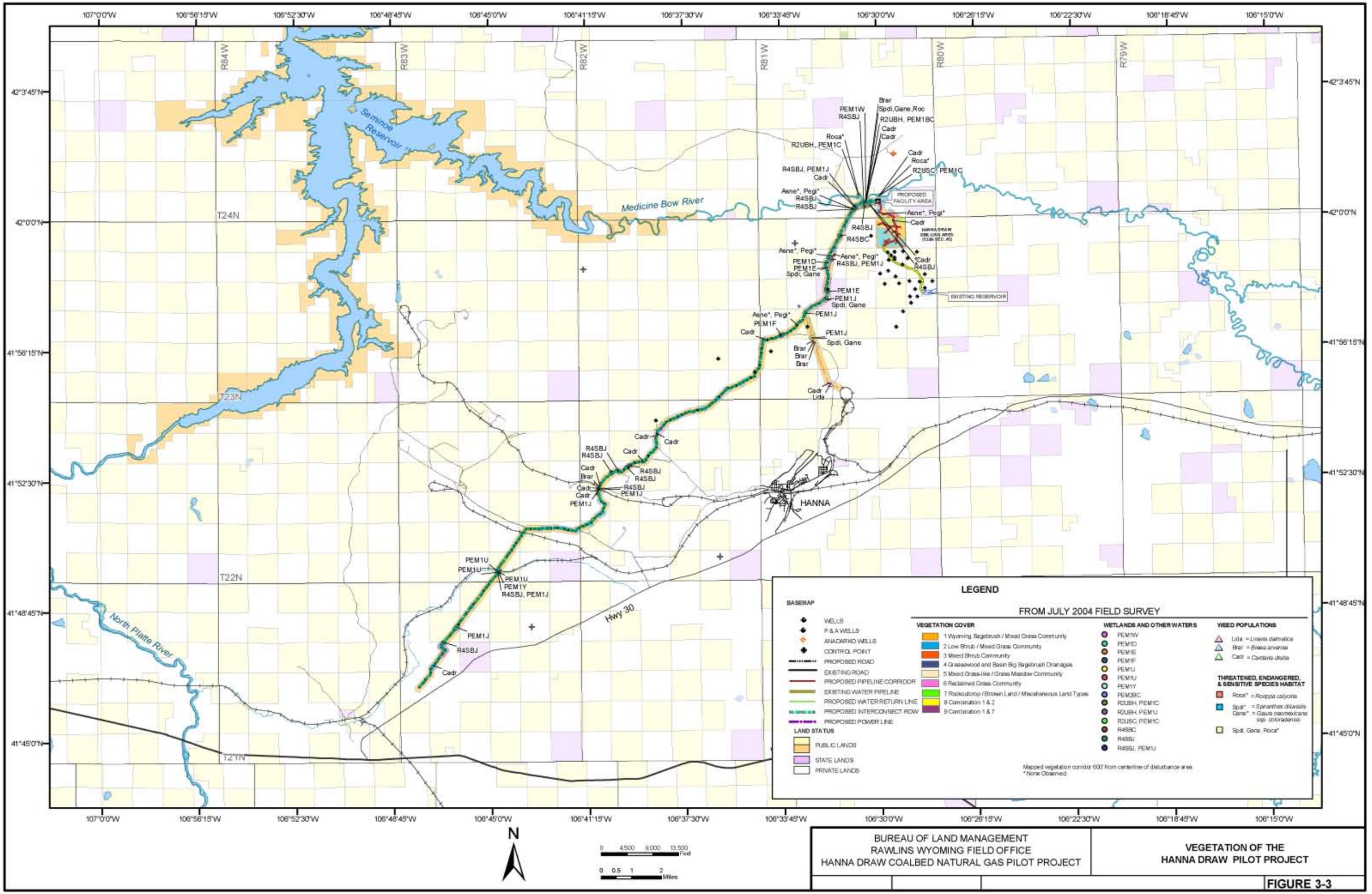
This vegetation community occurs across all project components and is the dominant community along the majority of the proposed CBNG interconnect pipeline ROW. Slopes typically range from nearly level to moderately sloping, although steeper slopes occur. Concave-convex landforms are common and all aspects are represented. The soils supporting this community appear to be of a higher productivity than the soils common to the Low Shrub/Mixed Grass Community discussed below.

Wyoming sagebrush (*Artemisia tridentata* var*. wyomingensis*) dominates this community with an understory composed of a variety of grass species including Sandberg bluegrass (*Poa secunda*), threadleaved sedge (*Carex filifolia*), green needlegrass (*Stipa viridula*), Indian ricegrass (*Achnatherum hymenoides*), and western wheatgrass (*Pascopyrum smithii*). Hood's phlox (*Phlox hoodii*) is a commonly occurring forb. Douglas rabbitbrush (*Chrysothamnus viscidiflorus*) also is present as a community inclusion in site-specific areas. Sandberg bluegrass is the most common grass species though other species dominate on a site-specific basis. Needle-and-thread (*Stipa comata*) tend to dominate on more sandy soils to the general exclusion of most other grass species. Plant cover typically ranges from 30 to >60% with higher values the norm.

Pedestalling and sheetwash were commonly observed across this unit. Vegetation community transition zones are narrow to moderately broad with the broadest observed where soil characteristics permit a transition to the Low Shrub/Mixed Grass Community. Included in this delineation are small, localized areas of the Low Shrub/Mixed Grass Community, as well as disturbed areas adjacent to and paralleling County Road 291. Transitioning with both the Wyoming Sagebrush/Mixed Grass and Greasewood/Basin Big Sagebrush units, the disturbed areas consist primarily of a native and introduced grass/forb community dominated by such species as western wheatgrass (*Pascopyrum smithii*), Sandberg bluegrass, and kochia (*Bassia sieversiana*). Isolated rock outcrops also were observed.

3.7.1.2 Low Shrub/Mixed Grass Community

A dominant community in the area of Section 2, this unit also occurs sporadically along the proposed interconnect pipeline and distribution line ROWs on upland ridge tops and hillocks, dissected side-slopes and similar upland sites. It is not associated with the higher elevations and landforms normally occupied by the Mixed Shrub Community. Slopes typically range from nearly level to moderately sloping, although more gentle slopes are most common. All aspects are represented and the physiography is dominated by convex landforms, although concave and concave-convex landforms also occur. Some soils may be saline. This community is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41°56'15"N
41°52'30"N
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R84W
R83W
R82W
R81W
R80W
R79W
T24N
T23N
T22N
T21N
Seminoe Reservoir
Medicine Bow River
North Platte River
Hwy 30
HANNA
PROPOSED FACILITY AREA
HANNA DRAW DRILLING AREA (T23N, SEC. 6)
EXISTING RESERVOIR
PEM1W R4SBJ
Brar Spdi,Gene,Roc
R2UBH, PEM1BC
Cadr
Roca* R2UBH, PEM1C
R4SBJ, PEM1J
Aene*, Pegi* R4SBJ
R2USC, PEM1C
R4SBC
PEM1D PEM1E Spdi, Gane
PEM1E PEM1J Spdi, Gane
PEM1J Spdi, Gane
PEM1F
Brar
Lida
PEM1U PEM1Y R4SBJ, PEM1J
PEM1J R4SBJ
R4SBJ PEM1U
LEGEND
BASEMAP
WELLS
P & A WELLS
ANADARKO WELLS
CONTROL POINT
PROPOSED ROAD
EXISTING ROAD
PROPOSED PIPELINE CORRIDOR
EXISTING WATER PIPELINE
PROPOSED WATER RETURN LINE
PROPOSED INTERCONNECT ROW
PROPOSED POWER LINE
LAND STATUS
PUBLIC LANDS
STATE LANDS
PRIVATE LANDS
FROM JULY 2004 FIELD SURVEY
VEGETATION COVER
1 Wyoming Sagebrush / Mixed Grass Community
2 Low Shrub / Mixed Grass Community
3 Mixed Shrub Community
4 Greasewood and Basin Big Sagebrush Drainages
5 Mixed Grass-like / Grass Meadow Community
6 Reclaimed Grass Community
7 Rockoutcrop / Broken Land / Miscellaneous Land Types
8 Combination 1 & 2
9 Combination 1 & 7
WETLANDS AND OTHER WATERS
PEM1W
PEM1D
PEM1E
PEM1F
PEM1J
PEM1U
PEM1Y
PEM3C
R2UBH, PEM1C
R2UBH, PEM1U
R2USC, PEM1C
R4SBC
R4SBJ
R4SBJ, PEM1U
WEED POPULATIONS
Lida = Linaria dalmatica
Brar = Bromus arvensis
Cadr = Cardaria draba
THREATENED, ENDANGERED, & SENSITIVE SPECIES HABITAT
Roca* = Rosa woodsii ssp. ultramontana
Spdi* = Sphaeralcea coccinea
Gane* = Gaura neomexicana ssp. coloradensis
Spdi, Gane, Roca*
Mapped vegetation corridor 600' from centerline of disturbance area.
* None Observed.
N
0 4,500 9,000 13,500 Feet
0 0.5 1 2 Miles
BUREAU OF LAND MANAGEMENT
RAWLINS WYOMING FIELD OFFICE
HANNA DRAW COALBED NATURAL GAS PILOT PROJECT
VEGETATION OF THE
HANNA DRAW PILOT PROJECT
FIGURE 3-3

dominated by Gardner saltbush (*Atriplex gardneri*) and birdfsfoot sagebrush (*Artemisia pedatifida*) with shadscale (spiny) saltbush (*Atripex confertifolia*) occasionally occurring as a sub- or co-dominant. Winterfat (*Krascheninnikovia lanata*) also was noted as a common community inclusion. Dominant understory species include Sandberg bluegrass and threadleaved sedge. Plant cover is somewhat low compared to the Wyoming Sagebrush/Mixed Grass Community ranging from 20 to 40% with values around 35% most common.

Soil pedestalling was commonly found in this unit and sheet wash leading, in part, to a gravel pavement also was noted. Transition zones associated with this unit are comparatively narrow, although they broaden in some instances, as noted above, where bordering the Wyoming Sagebrush/Mixed Grass Community.

Included in this unit are minor drainages supporting greasewood and/or basin big sagebrush, as well as isolated meadows dominated by native or introduced grass species. Wyoming sagebrush also occurs as an inclusion on isolated rocky slopes and knolls.

3.7.1.3 Mixed Shrub Community

This vegetatively diverse unit occurs locally near the proposed CCF and on the smooth slopes and broken topography associated with Dana Ridge. Slopes are nearly level to moderately sloping at the CCF site and moderately steep to steep along Dana Ridge. The topography is typically concave-convex and all aspects are represented.

Dominant species near the proposed CCF include Wyoming big sagebrush, rubber rabbitbrush (*Chrysothamnus nauseosis*), Gardner saltbush, and Douglas rabbitbrush. Antelope bitterbrush (*Purshia tridentata*), white squaw currant (*Ribes cereum*), and mountain mahogany (*Cercocarpus montanus*) dominate this community along Dana Ridge. Herbaceous understory species vary. Plant cover is highly variable ranging from 20 to >50%.

Transition zones to adjacent communities are narrow to moderately broad. Both pedestalling and sheet wash were noted leading to the formation of a gravel pavement, particularly on more steeply sloping sites.

Isolated rock outcrops at higher elevations and a few deeply incised greasewood/basin big sagebrush drainages at lower elevations are included in this unit.

3.7.1.4 Greasewood and Basin Big Sagebrush Drainages

This mapping unit has become established along the major and many of the minor drainages of the project area. It crosses and, in some cases, parallels the interconnect pipeline, road, and power line ROWs. Slopes are nearly level to very gently sloping across concave topographies. All aspects are represented. Soil alkalinity and/or salinity levels are presumed to be higher than those of the surrounding vegetation communities dominated by Wyoming sagebrush.

Vegetation characteristics associated with this unit vary. Both greasewood and basin big sagebrush dominate this delineation along Hanna Draw. Conversely, the smaller drainages located in the project area exhibit vegetation communities dominated by either greasewood or basin big sagebrush with varying levels of the sub-dominant species present. Greasewood flats also are included in this unit where basin big sagebrush contributes only a minor cover percentage. Plant cover values are typically high as is normal for this type unit given soil moisture regime considerations and range from 60 to >90%. Understory plant cover is limited,

with Sandberg bluegrass occurring at some sample sites. Crested wheatgrass also was noted in one drainage.

Sheet wash was observed in some drainages, but severe pedestalling was typically lacking. Transition zones to other vegetation communities characteristically range from abrupt to moderately broad, depending upon side-slope angles, though wider zones do occur in association with greasewood flats.

Included in this unit, on a site-specific basis, are minor drainage channels and their associated narrow grass/forb terraces along with limited wetland fringe communities.

3.7.1.5 Mixed Grass-like/Grass Meadow Community

Sufficiently large to depict on the vegetation community map, this wetland community (PEMC) is discussed in this section as a defined vegetation type. This community is located in the southern portion of Hanna Draw within the project area along the proposed interconnect pipeline and power line ROWs (see Figure 3-3). Slopes are primarily nearly level across a concave topography. A northerly aspect predominates.

Herbaceous species dominate this diverse community, with Nebraska sedge (*Carex nebrascensis*), Baltic rush (*Juncus balticus*), meadow barley (*Hordeum brachyantherum*), and silverweed (*Potentilla anserin*a) commonly occurring. A variety of other species, including common plantain (*Plantago major*), spikerush (*Eleocharis* sp.) and creeping bentgrass (*Agrostis stolonifera*) also are present. Plant cover values are high, typically ranging from 95 to 98%.

The soil surface was observed to be stable. Transition zones to adjacent communities are typically abrupt to very narrow given the hydrologic constraints associated with this type of vegetation community.

A narrow to moderately wide band of the Greasewood/Basin Big Sagebrush community exists as a border between this community and adjacent communities.

3.7.1.6 Reclaimed Grass Community

This vegetation unit includes disturbances associated with past mining activities where reclamation techniques have been employed and is limited in extent across the project area. Slopes are nearly level to very gently sloping with a concave-convex topography.

Crested wheatgrass (*Agropyron cristatum* var. *desertorum*) along with western wheatgrass dominate this community. Indian ricegrass and Lewis flax (*Linum lewisii*) are notable community inclusions in some areas. Plant cover typically ranges from 25 to 40%, with values approximating 30% most common.

Minor pedestalling was noted on an otherwise stable soil surface. Transition zones to adjacent communities were abrupt to narrow.

3.7.1.7 Rockoutcrop/Broken Land/Miscellaneous Land Types

Occurring intermittently across the project area, this unit is characterized by sandstone rock outcrops, surface rock exposures, and weathered geologic formations typified by little to no soil, high surficial coarse fragments, and comparatively sparse vegetation. Slopes are moderately

steep to very steep on all aspects. The Wyoming Sagebrush/Mixed Grass Community may occur as an inclusion in this land type.

3.7.2 Upland Vegetation Health Evaluation

The upland vegetation southwest of the Pilot Project was determined to not meet Rangeland Health Standard 3 on public lands. Reclamation with introduced species and a predominance of herbaceous rather than a mix of shrub/herbaceous components was identified by the assessment team. In addition, Basin big sagebrush and Wyoming big sagebrush communities in the area are comprised of mature to decadent dense stands of sagebrush with little to no diversity in types. This holds true for the entire area from the Pilot Project as well as along the proposed interconnect pipeline and power line routes. Loss of sheep grazing in the area, and permit long grazing has favored shrub dominance. As grazing distribution and duration is addressed, herbaceous communities will improve. In addition, many of these areas have been identified for vegetative diversification to improve age and cover class variability thereby improving habitat for wildlife species dependent on sagebrush communities.

3.7.3 Non-native Invasive (Weed) Species

Of the 25 noxious weeds listed in Table 3-7, 24 plant species are either designated or prohibited noxious weeds in the State of Wyoming. Any large populations (infestations) of these weeds observed during the July 2004 vegetation surveys were noted and GPS coordinates taken. The locations of these weed populations identified during the field review are depicted on Figure 3-3. Lesser noxious weed levels also were noted. Halogeton (*Halogeton glomeratus*) is declared a noxious weed in Carbon County with larger populations of this weed also noted in the field for inclusion in this document.

Weed infestations were limited within the project area, confined primarily to roadside disturbances and along wetter drainages such as Hanna Draw. Weed populations also were noted along the borders of some disturbed areas that were previously revegetated. Weed populations were not typically found within healthy, undisturbed, upland native vegetation communities upslope from drainages. Weed populations established along roadsides and drainages commonly took a linear form following disturbance configurations and runoff/natural drainage flow patterns.

State-declared noxious weed species found as larger populations in the field included whitetop (*Cardaria draba*), Canada thistle (*Cirsium/Breea arvense*), and Dalmation toadflax (*Linarea dalmatica*). Whitetop was the most common weed species encountered during the field surveys. This species was found along roadsides in Section 2 and County Road 291, as well as similar disturbed areas, in drainages, and across drainage terraces and benches. Whitetop also was found, although to a limited degree, along the banks of the Medicine Bow River. It is one of the few weed species that appears to be successful in invading established, native shrub communities, although this seems to occur only in association with enhanced soil moisture regimes such as along drainages. Whitetop was not commonly observed in drier upland sites. Whitetop populations along roadsides, as may be expected, assumed a narrow, linear form and may reach 300 feet in length, although lesser lengths are generally the norm. Populations

Table 3-7 Designated or Prohibited Noxious Weeds Occurring or Potentially Occurring In the Project Area

Common Name	Scientific Name	Common Name	Scientific Name
Field bindweed	*Convolvulus arvensis*	Common burdock	*Actium minus*
Saltcedar	*Tamarix* sp.	Dyers woad	*Isatis tinctoria*
Leafy spurge	*Euphorbia esula*	Houndstongue	*Cynoglossum officinale*
Perennial sowthistle	*Sonchus arvensis*	Purple loosestrife	*Lythrum salicaria*
Quackgrass	*Agropyron repens*	Skeletonleaf bursage	*Franseria discolor*
Hoary cress or whitetop	*Cardaria draba* and *C. pubescens*	Common tansy	*Tanacetum vulgare*
Perennial pepperweed or giant whitetop	*Lepidium latifolium*	Spotted knapweed	*Centaurea maculosa*
Russian knapweed	*Acroptilon repens*	Plumeless thistle	*Carduus acanthoides*
Diffuse knapweed	*Centaurea diffusa*	Canada thistle	*Cirsium/Breea arvense*
Yelowtoadflax	*Linaria vulgaris*	Scotch thistle	*Onopordum acanthium*
Dalmation toadflax	*Linaria dalmatica*	Musk thistle	*Carduus nutans*
Common St Johnswort	*Hypericum perforatum*	Halogeton	*Halogeton glomeratus*
Ox-eye daisy	*Leucanthemum vulgare*		

present on drainage terraces and banks, as well as drier drainages, may range from small isolated patches to infestations up to 200 feet long. This species can serve as a notable community component in some isolated areas.

Canada thistle populations were found at one site in Hanna Draw along County Road 291 and where the proposed CBNG interconnect pipeline crosses Big Ditch. These populations occurred under more mesic soil moisture regime conditions. Dalmation toadflax was observed at one site along the proposed transmission corridor near County Road 291.

Populations of two additional noxious weed species are currently known to exist within or adjacent to the project area but were not observed within the survey area at the time of the July 2004 fieldwork. Leafy spurge (*Euphorbia esula*) has been observed along the banks of the Medicine Bow River and upslope to within 200 yards of the southern riverbank in Sections 34 and 35 to the north of the proposed project access road. Similarly, Russian knapweed (*Acroptilon repens*) has been noted along the proposed access road to Section 2 and also along the Medicine Bow River to the north of the proposed disturbances located in Sections 34 and 35.

Halogeton occurs along numerous roadside disturbances, notably in Section 2. Populations of this Carbon County–designated noxious weed species were typically limited to road shoulders

and adjacent disturbed soils. This species was not observed to have escaped to any degree into adjacent, mature, native vegetation community types.

With respect to invasive weed species not listed as noxious, Russian thistle (*Salsola iberica*) also was observed to inhabit roadside disturbances. However, this species was less common than halogeton in this respect. Cheatgrass (*Bromus tectorum*) is present in the project area and is found sporadically on disturbed areas in upland situations. It may occasionally occur in the understory of more mature shrub communities but is not typically a dominant species. This species is not usually supported by soils exhibiting wetter moisture regimes or found associated with wetland conditions. Curley-cup gumweed (*Grindelia squarrosa*) also is present in upland range communities and along roadside disturbances forming a notable community component in some areas. Drought resistant, this species increases under droughty conditions. Babysbreath (*Gypsophila paniculata*) is known to occur onsite along county road disturbances in or adjacent to the project area.

3.7.4 Wetlands and Riparian Areas

Vegetated wetlands occur across the project area primarily in connection with intermittent drainages (including Hanna Draw). Two vegetated wetlands also were found associated with constructed stock ponds, while several small wetlands have developed adjacent to and within a constructed diversion ditch in the St. Mary's Creek drainage.

Vegetated wetlands that have formed in intermittent drainages (PEM1C, PEM1D, PEM1E, PEM1J) occur in the drainage bottoms or across the adjacent benches and terraces where such have formed. Typical vegetated wetlands associated with Hanna Draw are dominated by a variety of species including Nebraska sedge (*Carex nebrascensis*), Baltic rush (*Juncus balticus*), meadow barley (*Hordeum brachyantherum*), and silverweed (*Potentilla anserina*) as noted previously for the Mixed Grass-like/Grass Meadow Community. Other species occurring with regularity include common plantain (*Plantago major*), spikerush (*Eleocharis* sp.), and creeping bentgrass (*Argostis stolonifera*) in soils with more variable soil moisture regimes. Where soils trend toward higher alkalinities and/or salinities, small-flowered sumpweed (*Iva axillaris*) has become established.

One stock pond, fed by a small drainage, is characterized by a central flooded zone (PEM1F) supporting a near mono-typic stand of cattails (*Typha latifolia*). This zone transitions to a variety of soil moisture regimes supporting a border dominated by spikerush, Nebraska sedge, creeping bentgrass, foxtail barley, meadow barley, and Baltic rush, depending upon soil moisture regime. A second stock pond-associated wetland was found upslope from the stock pond proper within the associated drainage. Exhibiting a somewhat drier soil moisture regime, this vegetated wetland occurs in a mosaic with upland plant communities. Dominant species include creeping bentgrass, foxtail barley, Baltic rush, inland saltgrass, alkali muhly (*Muhlenbergia asperfolia*), and sedge (*Carex*) species. The soils of this wetland appear to be saline.

A number of vegetated wetlands have developed along and adjacent to the crossing at St. Mary's Creek. Vegetated wetlands established in old creek oxbows (PEM1U) appear to be remnant communities and are drying. Species inhabiting these oxbows include Baltic rush and small-flowered sumpweed. The soils appear to be saline in nature. Wetlands of the adjacent channels (PEM1J, PEM1Y) vary according to soil moisture regime characteristics, but are wetter than the oxbows located upslope. These wetlands support wetland plant communities somewhat similar to those of the oxbows but at notably higher cover rates, or a more salt-tolerant grouping where saturated, saline soils predominate. In the latter case, red saltwort

(*Salicornia rubra*), small-flowered sumpweed, foxtail barley, alkali muhly, and Baltic rush dominate.

3.8 TERRESTRIAL WILDLIFE

3.8.1 Habitat

The terrestrial wildlife resources commonly associated with the Hanna Draw Pilot Project area encompass a variety species commensurate with the native and reclaimed habitats, relative carrying capacities of these habitats, and the degree of existing disturbance from past coal mining and petroleum exploration and development. It should be noted that many reclaimed habitats may not return to their original state due to weed invasion, erosion, etc. Reclaimed habitats that are degraded from original conditions are often not suitable for wildlife use due to the change in species/forage composition.

Section 3.7 summarizes the dominant vegetation recorded within the project area, including general terrain, physiography, erosion, significant topographic features such as rock outcrops and drainages, and noxious weeds. Pertaining to wildlife, the dominant plant community in the immediate project area of Section 2 is the Wyoming Sagebrush/Mixed Grass Community. This habitat type supports a variety of terrestrial wildlife species, including common species such as mule deer, pronghorn, bobcat, coyote, prairie dogs, raptors, upland game birds, and greater sage-grouse. Sagebrush is a critical year-round food and habitat component for sage-grouse, as well as high-value winter forage for mule deer and pronghorn antelope. Other special status terrestrial wildlife species are discussed in Section 3.10.2.

The localized areas of the Low Shrub/Mixed Grass Community, Greasewood/Basin Big Sagebrush Community, and small grassland meadows provide greater habitat diversity and a mosaic of upland habitats for area wildlife. Increased species' diversity would be particularly apparent along the narrow drainages containing basin wildrye, basin big sagebrush, and greasewood with isolated rock outcrops, transitioning into the upland sagebrush benches and ridges.

Section 3.6 summarizes the vegetated wetlands and open water features occurring within the Hanna Draw Pilot Project area. Wet meadows, wetland areas, and the mesic interface with the upland communities provide a greater habitat diversity for terrestrial vertebrate and invertebrate species than the surrounding upland habitats. Available water is one of the most valuable habitat features for regional wildlife species. In the arid west, these riparian areas consist of a relatively small proportion of the landscape, but are used by wildlife at some portion of their life history to a much greater degree than other, more predominate habitats. In addition to food, water and shelter, these habitats are often utilized as travel corridors (dispersal and migration) within the landscape. As discussed in Sections 3.5, 3.6, and 3.7, these features within the project area include small, intermittent drainages, such as Hanna Draw and its tributaries, and the perennial Medicine Bow River. Typically, the intermittent or ephemeral drainages do not support a fringe of vegetated wetlands but transition directly into upland vegetation communities, whereas, the Medicine Bow River's adjacent shoreline supports vegetated wetlands that are seasonally flooded.

The predominant plant community along the proposed CBNG interconnect pipeline corridor and electric distribution line ROW is the Wyoming Sagebrush/Mixed Grass Community interspersed with areas of the Low Shrub/Mixed Grass Community along upland ridges and side-slopes. The Greasewood and Basin Big Sagebrush Drainages also intersect and parallel these proposed

alignments, as shown on Figure 3-3. Small, isolated wetlands associated with the Mixed Grass-like/Grass Meadow Community occur along these ROWs (see Sections 3.6 and 3.7.1.5). The reclaimed grasslands in the previously mined areas along the proposed pipeline corridor would provide a lower habitat diversity to area wildlife than the upland shrub/grass communities; however, it appears that these reclaimed areas are recovering well, albeit they are more homogenous.

The following information is a summary of terrestrial wildlife resources either documented or anticipated to occur in and near the proposed project. This area encompasses the proposed drilling sites, CCF, access roads, gas gathering lines, water disposal lines, the interconnect pipeline, and ancillary electric distribution line corridor.

3.8.2 Big Game Species

Big game species documented to occur in the Hanna Draw Pilot Project region primarily include pronghorn and mule deer, although isolated occurrences of white-tailed deer and moose have been reported along the Medicine Bow River and other regional riparian corridors and tributaries. Elk are not known to occur in the immediate project area, but do occupy suitable habitats north and south of the project region. Specific big game seasonal ranges are integral to these animals' survival and movement patterns. The primary seasonal range addressed in this analysis is crucial winter range for both pronghorn and mule deer, although other seasonal range information also has been provided, when available.

Figure 3-4 depicts seasonal ranges for pronghorn in and near the project region; Figure 3-5 provides a detailed overview of pronghorn seasonal ranges relative to the proposed drilling area in Section 2 and the immediate surrounding area. Although pronghorn typically occupy a large extent of the upland grasslands and sagebrush steppe, designated crucial winter/yearlong range for pronghorn encompasses a portion of Section 2 in the proposed drilling area, the farthest northern portion (approximately 2 miles) of the proposed interconnect pipeline and electric distribution line ROWs, and the southern terminus (about 1 mile) of the interconnect pipeline.

The majority of the proposed CBNG interconnect pipeline would cross pronghorn winter/yearlong range (WNDDB 2004). Pronghorn in this area belong to the Medicine Bow Herd, Herd Unit #525.

Figure 3-6 shows the seasonal ranges for mule deer and white-tailed deer and isolated occurrences of white-tailed deer outside of its winter range for the project region, including the proposed interconnect pipeline. Figure 3-5 provides more detailed information for mule deer seasonal ranges for the immediate project area. As shown, a portion of the proposed drilling area in Section 2 intersects with mule deer winter/yearlong range, in addition to the proposed CCF located to the north in Section 35, a majority of the electric distribution line and approximately 8 miles of the proposed interconnect pipeline ROW on its northern end. Mule deer crucial winter/yearlong range extends immediately north of the Medicine Bow River. The only project component that intersects with mule deer crucial winter/yearlong range is 3 miles of the pipeline route near its southern terminus. Mule deer occur in much of the upland habitats and along the riparian corridor along the Medicine Bow River. Browse for foraging and thermal protection in the winter are key to mule deer use and survival. East of Hanna Draw, mule deer are part of the Shirley Mountain Herd, Herd Unit #540; west of Hanna Draw, it is the Platte River Herd, Herd Unit #541.

Crucial range can describe any particular seasonal range or habitat component often the determining factor in a population's ability to maintain itself at a certain level over the long term (Wyoming Chapter of the Wildlife Society 1990). Crucial winter/yearlong range is defined as suitable habitat that has is used by a population or portion of a population of animals on a year-round basis, but during the winter months (commonly between December 1 and April 30), there is a "significant influx" of additional animals into the area from other seasonal ranges (Wyoming Chapter of the Wildlife Society 1990; WGFD 2004a). Crucial winter range (in this instance for big game species), is commonly referred to as a "limiting factor" for big game populations, in that their populations can be limited by the amount, quality, and lack of disturbance factors on these critical areas.

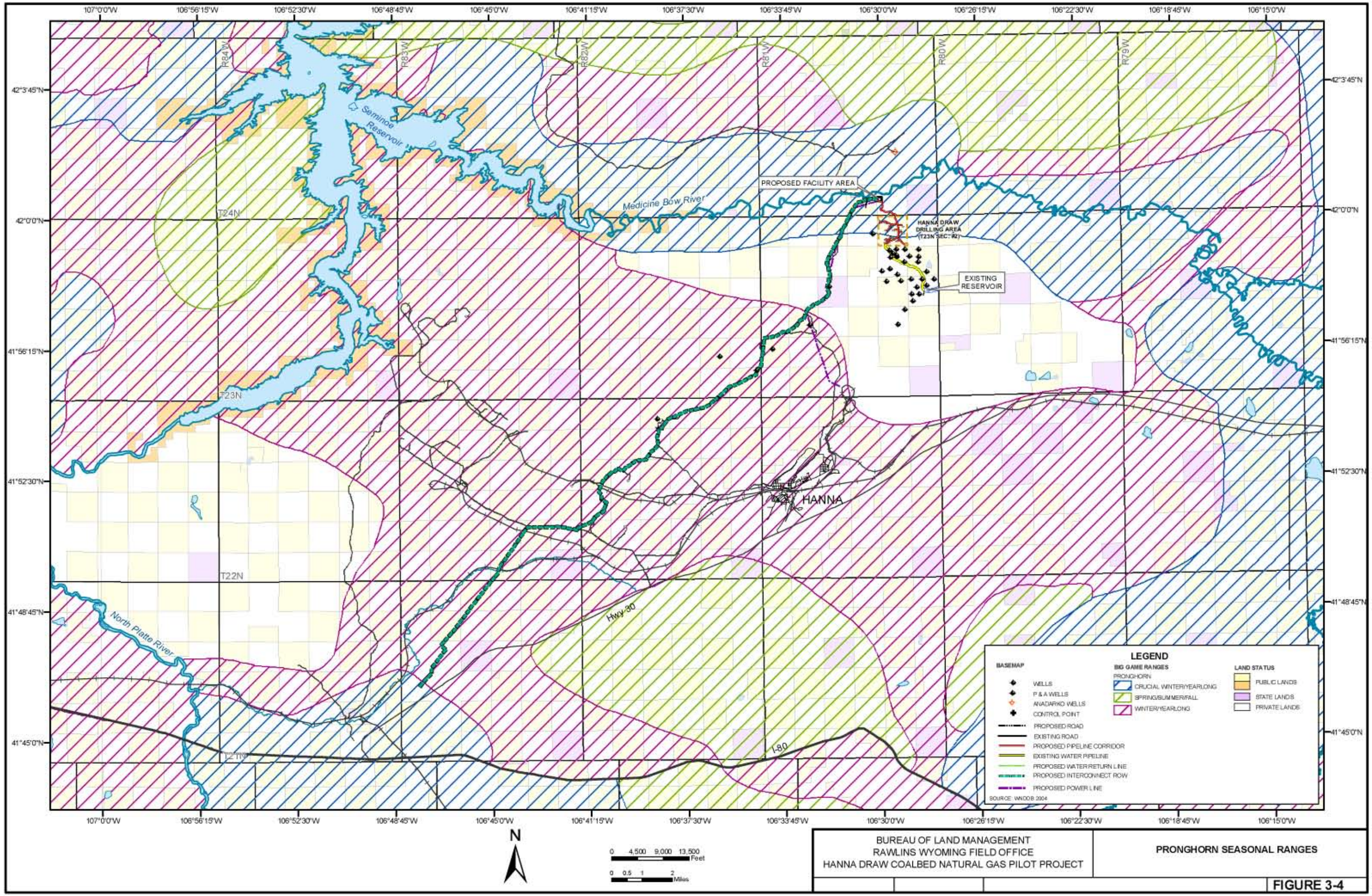
Overall, the herd health for both pronghorn and mule deer is considered to be good, and populations are stable or increasing in specific areas. However, vegetative conditions in certain portions of these two big game species' winter ranges are not optimal because of extended drought and older decadent shrub conditions (Lanka 2005). Animal densities vary throughout these ranges.

Two other big game species have are known to occur near the project region, as shown in Figure 3-7. Elk occur north and south of the project area, and designated elk winter/yearlong range extends from near the southern terminus of the proposed interconnect pipeline east. No project components intersect with this elk range; however, the Shirley Mountain Herd Unit #16 occurs north of Highway 30. Winter range for moose also occurs south of the project region, but individuals are not expected to occur in the immediate project area, based on this species' habitat associations with dense riparian willow corridors and mature wetlands.

3.8.3 Upland Game Birds, Waterfowl, and Other Waterbirds

The project area occurs in the Small and Upland Management Area #22. The predominant upland game bird species in the project area is the greater sage-grouse. Sage-grouse are classified as a BLM sensitive species and are discussed in Section 3.10.2. Chukar partridge and gray (Hungarian) partridge may occur in low numbers; however, both chukar and gray partridge populations fluctuate depending on climatic and vegetative conditions. As range conditions improve with increased precipitation, their populations expand. In comparison, the effects from the continuing drought in the western U.S. continue to shrink these game bird distributions (Rothwell 2004). Therefore, if present, it is assumed that population numbers are low.

Waterfowl and other waterbirds would primarily be associated with the Medicine Bow River corridor, adjacent wetlands, Seminoe Reservoir, isolated playas, and livestock ponds (BLM 2001a, 2002a). Figure 3-8 depicts the general areas where waterfowl have been recorded in and near the Proposed Action. Other water birds (e.g., wading birds and shorebirds), also have been documented, but these occurrences are sporadic throughout the region. Common waterfowl species would include the mallard, Canada goose, American coot, green-winged teal, blue-winged teal, northern pintail, northern shoveler, American wigeon, ring-necked duck, and gadwall (BLM 2002a; WNDDB 2004). WGFD conducts aerial surveys for nesting Canada geese in the project area. These breeding surveys are the only waterfowl surveys flown along this reach of the Medicine Bow River and occur in April; however, they are not conducted every year for the project area (Roberts 2004).



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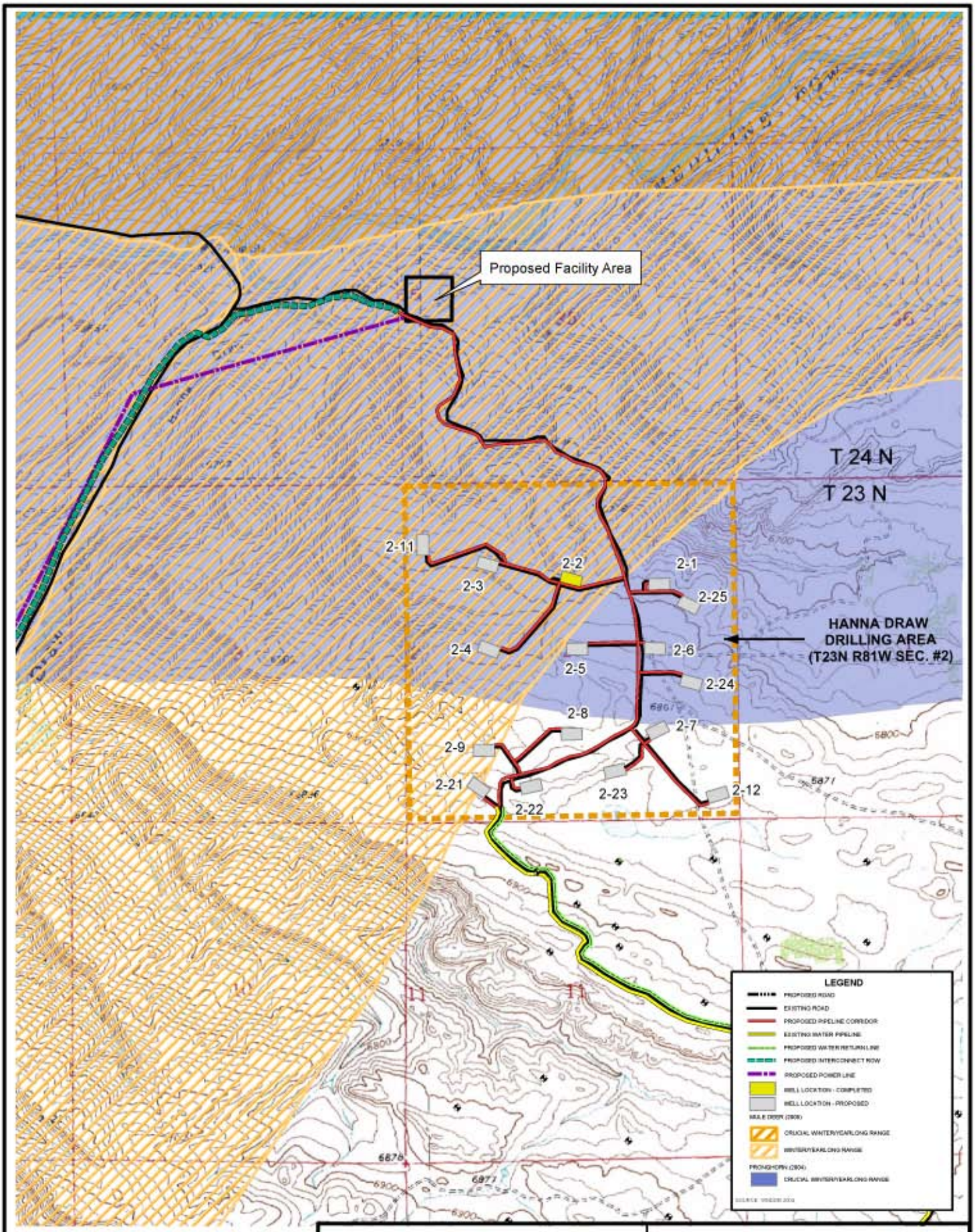
HANNA DRAW COALBED NATURAL GAS PILOT PROJECT

PRONGHORN SEASONAL RANGES

FIGURE 3-4



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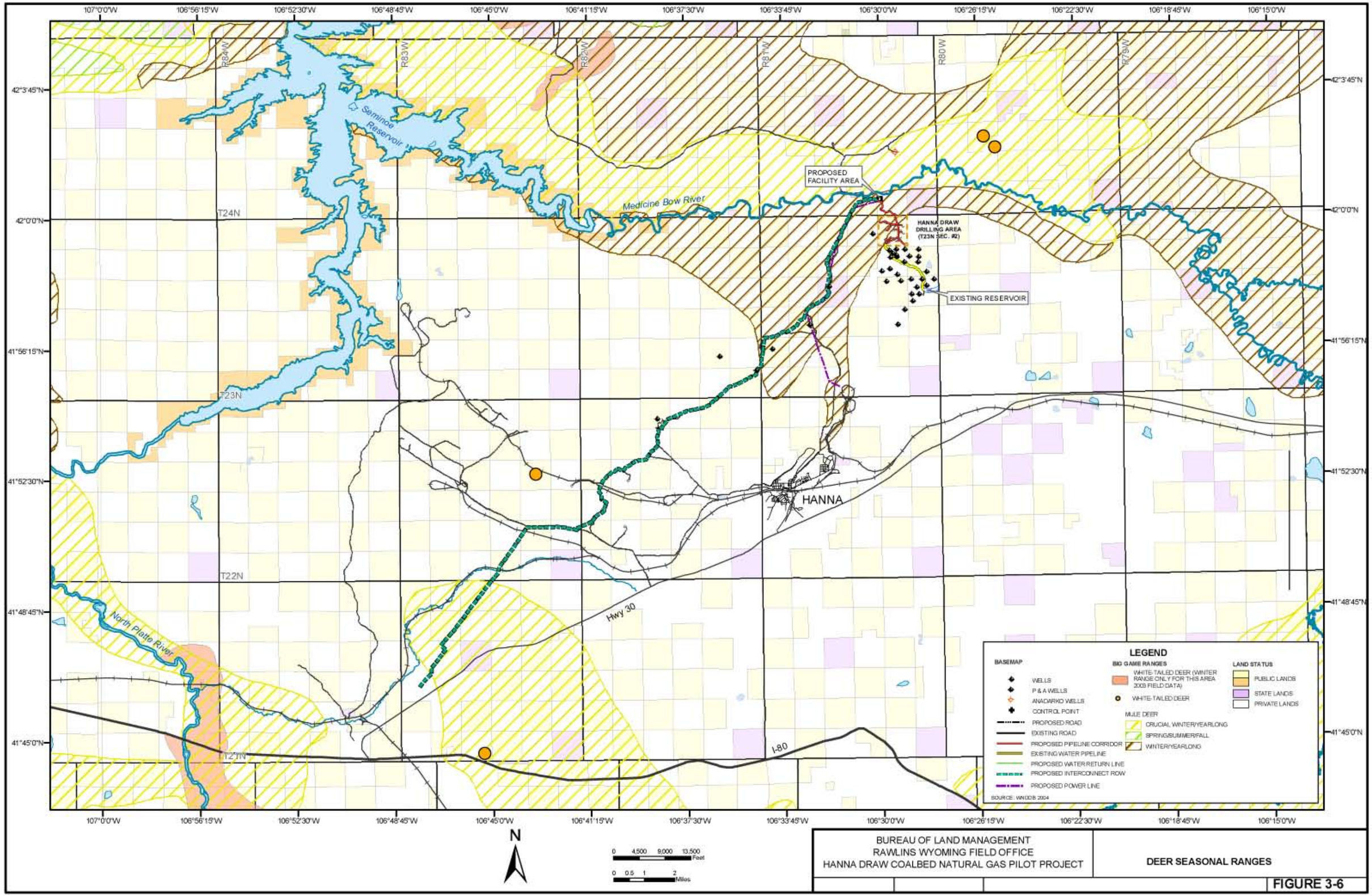
PRONGHORN AND MULE DEER
SEASONAL RANGES IN
PROPOSED DRILLING AREA

FIGURE 3-5



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DEER SEASONAL RANGES

FIGURE 3-6

107°0'0"W 106°56'15"W 106°52'30"W 106°48'45"W 106°45'0"W 106°41'15"W 106°37'30"W 106°33'45"W 106°30'0"W 106°26'15"W 106°22'30"W 106°18'45"W 106°15'0"W

42°3'45"N 42°0'0"N 41°56'15"N 41°52'30"N 41°48'45"N 41°45'0"N

R84W R83W R82W R81W R80W R79W

T24N T23N T22N T21N

Seminoe Reservoir

Medicine Bow River

North Platte River

PROPOSED FACILITY AREA

HANNA DRAW DRILLING AREA (T23N SEC. #2)

EXISTING RESERVOIR

HANNA

Hwy 30

I-80

LEGEND

BASEMAP
- WELLS
- P & A WELLS
- ANADARKO WELLS
- CONTROL POINT
- PROPOSED ROAD
- EXISTING ROAD
- PROPOSED PIPELINE CORRIDOR
- EXISTING WATER PIPELINE
- PROPOSED WATER RETURN LINE
- PROPOSED INTERCONNECT ROW
- PROPOSED POWER LINE

BIG GAME RANGES

ELK
- CRUCIAL WINTER/YEARLONG
- SPRING/SUMMER/FALL
- WINTER/YEARLONG
- ELK

MOOSE
- MOOSE

LAND STATUS
- PUBLIC LANDS
- STATE LANDS
- PRIVATE LANDS

SOURCE: WNDDB 2004

N

0 4,500 9,000 13,500 Feet

0 0.5 1 2 Miles

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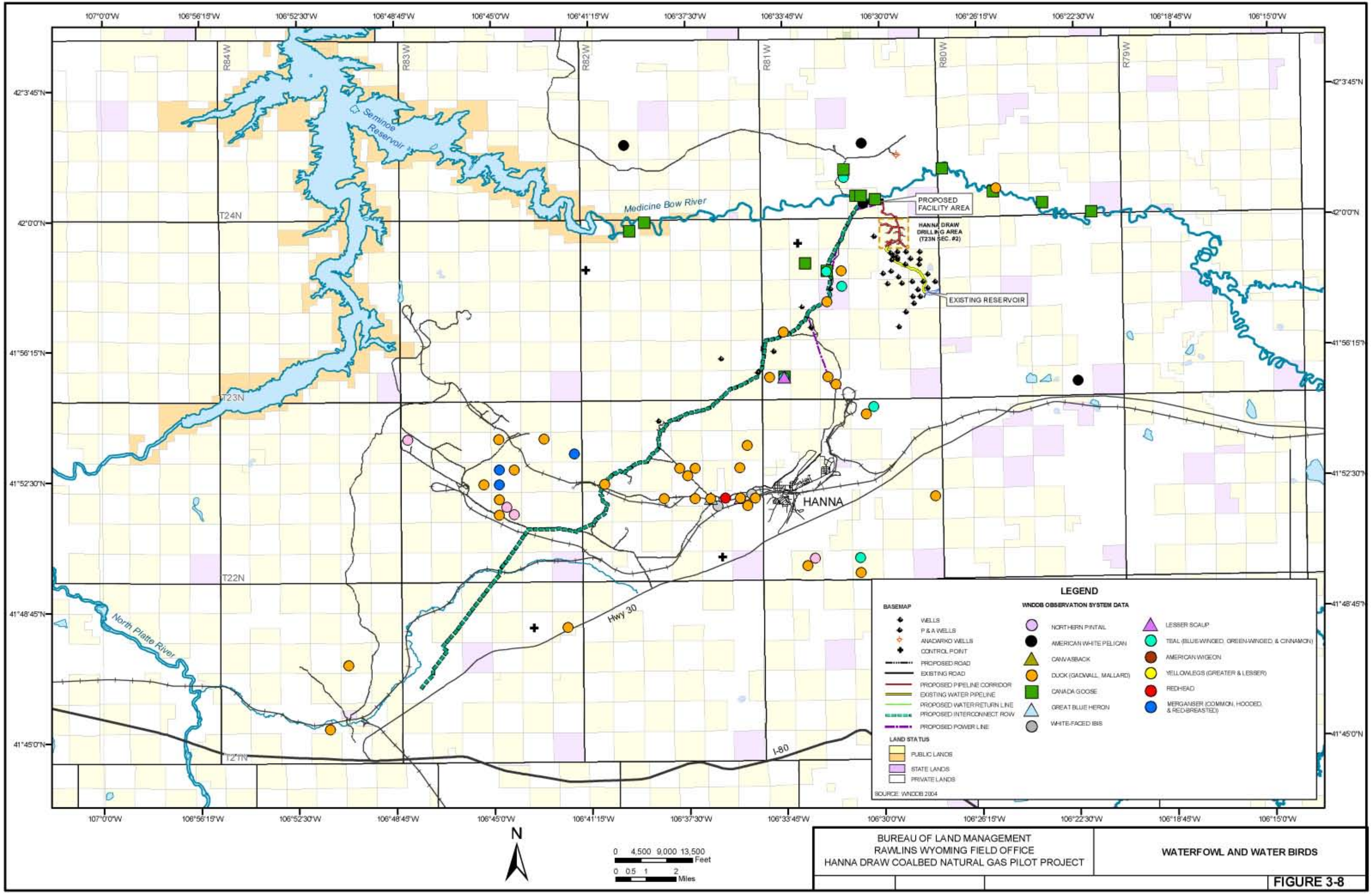
ELK AND MOOSE DISTRIBUTION

FIGURE 3-7



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WATERFOWL AND WATER BIRDS

FIGURE 3-8

Representative waterbirds (also associated with available water resources), would include the Clark's grebe, great blue heron, snowy egret, black-crowned night heron, American white pelican, killdeer, American avocet, white faced ibis (a BLM sensitive species), and spotted sandpiper (BLM 2002a; WNDDB 2004). As shown in Figure 3-8, reported bird occurrences of water-dependent species are scattered throughout the region. Lentic waters (i.e., nonflowing wetlands, ponds, reservoirs, playas) are more important to migratory birds, as compared to lotic waters (i.e., flowing streams, Medicine Bow River) (Roberts 2004). However, it is assumed that waterfowl and water birds would capitalize on any available surface water in the region.

3.8.4 Raptors

A number of raptor (i.e., birds of prey) species breed and winter in the project region, as depicted on Figure 3-9, which provides data on known raptor nest sites. Numerous nest sites for golden eagles, ferruginous hawks, and prairie falcons occur throughout the area (Oakleaf 2004). Wintering and migrating bald eagles may forage along the Medicine Bow River and adjacent uplands downstream to Seminoe Reservoir. Bald eagles are discussed further in Section 3.10.2. Breeding buteos (i.e., hawk species) include the ferruginous hawk, (a BLM sensitive species), red-tailed hawk, and Swainson's hawk. Falcons known to breed in the area include the prairie falcon and American kestrel (WNDDB 2004). Accipters (forest-dwelling hawks) are not as common in the open sagebrush-dominated habitats of the project area, although foraging or migrating individuals may move through the region, including the sharp-shinned hawk, Cooper's hawk, and an occasional goshawk. Owl species that would occur in the project area include the great horned owl, burrowing owl, (a BLM sensitive species), barn owl, long-eared owl, and short-eared owl along the wet meadows and adjacent wetlands in the region. Other raptors include breeding northern harriers and turkey vultures and wintering rough-legged hawks (WNDDB 2004; BLM 2001a, 2002a).

Breeding raptors may nest on or in a variety of substrates, including cliff faces, rock outcrops, both deciduous and conifer trees, ground burrows, and manmade structures (e.g., windmills, artificial nest structures). The relative open nature of the project region increases the habitat value of vertical structures (both natural and manmade) that provide nest sites, roosts, and foraging perches. Breeding raptors typically defend specific home territories, which vary in size, depending on the bird species. Within this territory, a breeding pair may occupy or tend one or more nest sites. Many raptor species alternate among nest sites within their breeding territories from year to year. The species-specific information shown in Figure 3-9 may represent alternate nest sites within an individual territory, and nests that may be unoccupied or inactive one year may become active in subsequent years.

All raptors are protected under the Migratory Bird Treaty Act (MBTA), both eagle species are protected under the Bald and Golden Eagle Protection Act (BGEPA), and the bald eagle is protected under the Endangered Species Act (ESA), which is discussed in detail in Section 3.10.2. In accordance with these Acts, any "take" of active nest sites (containing eggs or young), injury or death to individual birds, or harassment of breeding birds resulting in nest abandonment (BGEPA and ESA only) would be a federal violation.

3.8.5 Other Birds, Mammals, Amphibians, and Reptiles

The habitat diversity found among the upland sagebrush steppe, mixed shrublands, reclaimed grasslands, rocky outcrops and cliffs, wetlands, and area streams corridor supports a wide variety of other terrestrial wildlife species. These nongame terrestrial wildlife species reflect the mosaic of habitats and habitat interfaces.

Other representative mammal species that occur in the project region include the coyote, mountain lion, bobcat, badger, long-tailed weasel, striped skunk, raccoon, black-tailed jackrabbit, desert cottontail, white-tailed prairie dog, and a variety of small mammals including the thirteen-lined ground squirrel, northern pocket gopher, least chipmunk, deer mouse, and bushy-tailed woodrat (BLM 2002a). Although these representative predator and prey species characterize mammalian presence in the region, certain species, such as the white-tailed prairie dog and ground squirrel species are considered to be a key prey species for a wide variety of predators. Prairie dog colonies generally concentrate use by predators (e.g., ferruginous hawk, red-tailed hawk, bald eagle, golden eagle, coyote, black-footed ferret, potentially the swift fox (a BLM sensitive species), and other associated species (burrowing obligates), such as mountain plover, burrowing owl, and rattlesnake species. Prairie dogs are discussed further in Section 3.10.2 for special status species.

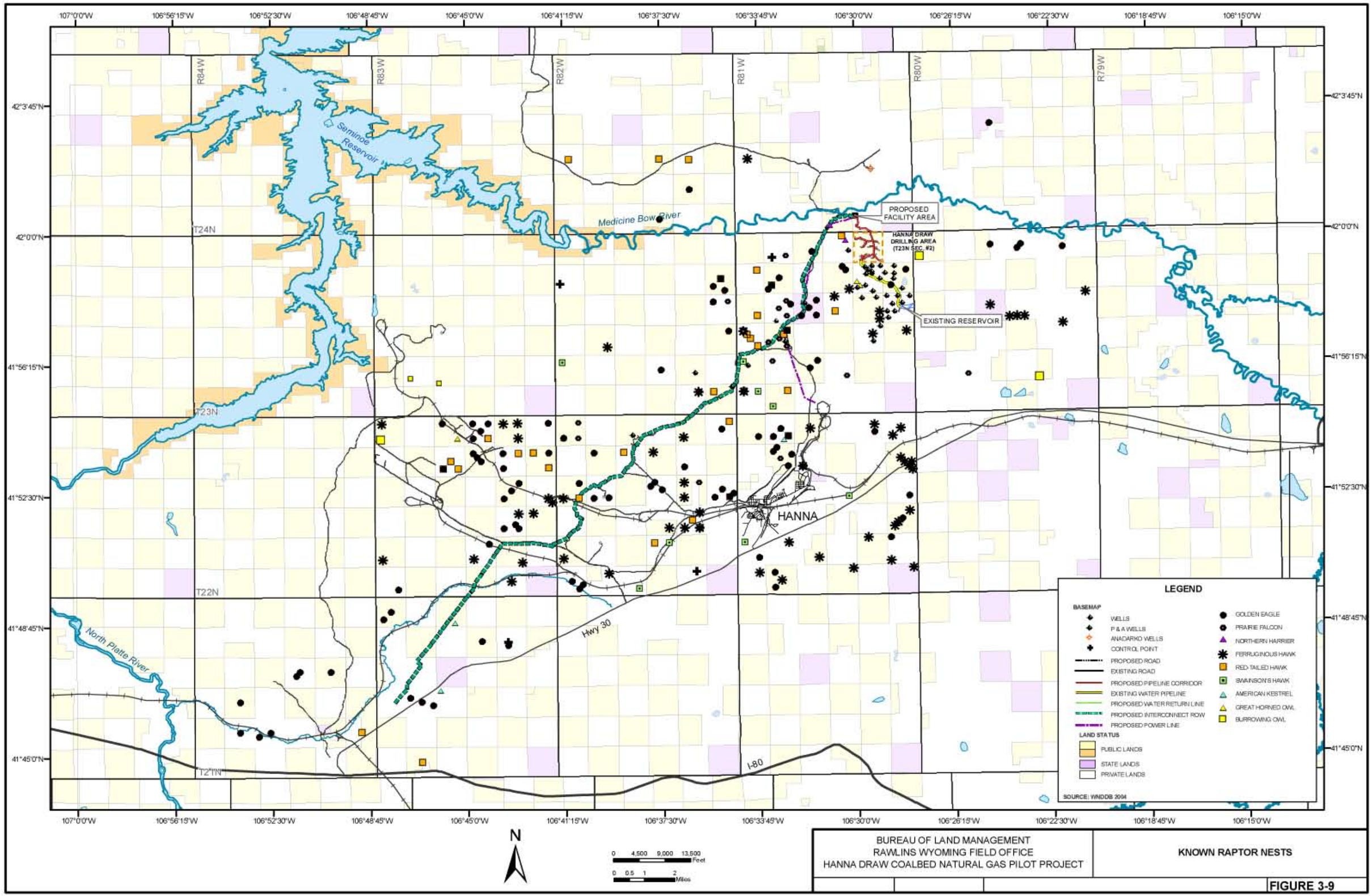
Representative bird species not already mentioned for the project region include the Say's phoebe, western kingbird, horned lark, black-billed magpie, common raven, vesper sparrow, mountain bluebird, lark bunting, red-winged blackbird, common grackle, and Brewer's blackbird (BLM 2002a; WNDDB 2004).

Area amphibian and reptile species would be range among the different habitat types. Amphibians are limited to aquatic habitats, but primarily along the Medicine Bow River and its tributaries that support perennial or more regular intermittent sources. Representative amphibians include the tiger salamander, northern leopard frog, and chorus frog. Reptiles would include eastern short-horned lizard and northern sagebrush lizard, and rattlesnakes and bull snakes tend to be wide ranging and may be found throughout the upland and riparian habitats. Garter snakes tend to be more prevalent in the riparian areas (BLM 2001a, 2002a).

3.9 AQUATIC BIOLOGY

The aquatic habitats within and downstream of the project area are detailed in Section 3.5.1. The existing constructed reservoir located in Section 13 (see Figure 3-2) is currently dry and, therefore, does not support aquatic resources.

Although the existing reservoir is generally dry, during wet periods (primarily during the spring season), standing water from snowmelt and rains may result in an ephemeral aquatic community present. This community consists of species adapted to opportunistic exploitation of ephemeral aquatic resources, including planktonic species, aquatic insects, and frogs. The ephemeral water supply serves as a resource permitting development of larval and juvenile stages of many of these species. The existing reservoir would not contain any resident or permanent aquatic community.



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KNOWN RAPTOR NESTS

FIGURE 3-9

3.10 SPECIAL STATUS SPECIES

3.10.1 Plants

Three threatened and one endangered plant species are known to occur in the general project region, while seven species classified as BLM "sensitive," also occur (BLM no date). In addition, two species of special concern in the State of Wyoming have been previously identified for the project region (Handley 2004). Table 3-8 presents selected information, including habitat characteristics, for each of these special status plant species. The locations of habitats marginally suitable or suitable for supporting species potentially present on site are depicted on Figure 3-3.

3.10.1.1 Threatened and Endangered Species

The three threatened plant species include the Ute ladies'-tresses orchid (*Spiranthes diluvialis*), Colorado butterfly plant (*Guara neomexicana* ssp*. coloradensis*), and the desert yellowhead (*Yermo xanthocephalus*). The Ute ladies'-tresses orchid and the Colorado butterfly plant both occur in association with wetlands at comparatively lower elevations. Desert yellowhead is considered endemic to Fremont County and occurs on barren outcrops of white silty clays of the Split Rock Geologic Formation at a known elevation of 6,700 feet. The designated Critical Habitat for this species occurs only in Fremont County. The endangered blowout (Hayden's) penstemon (*Penstemon haydenii*) grows on actively shifting sand dunes and blowouts created by wind action out of sandy substrates. This species is associated with the Ferris/Seminoe Mountain region in Wyoming.

Marginally suitable habitat was found for the Ute ladies'-tresses orchid and the Colorado butterfly plant within Hanna Draw in the Mixed Grass-like/Grass Meadow Community. However, the potential presence is questionable, given the lack of a typical sub-irrigated meadow landform surrounded by a mixed grass prairie community with which this species is typically associated. The remaining wetlands observed during the field survey failed to qualify as habitat due to a drier soil moisture regime or a propensity to flood, high soil salinity, and/or dense vegetation. No habitat suitable for supporting blowout penstemon or desert yellowhead was observed during the vegetation field surveys completed for this project.

3.10.1.2 Sensitive Plant Species

Seven plant species occurring within the region of the Hanna Draw Pilot Project area are considered "sensitive" by the BLM. These species occur in a wide variety of habitat types from wetlands, to sparsely vegetated shale or sandy-clay slopes, to granite boulders, cliffs, and limestone ridges. These species occur across a wide range of elevations from 4,300 to 9,600 feet. The majority of these species, however, occur within a range of from 5,000 to 7,500 feet. Two species, Laramie columbine (*Aquilegia laramiensis*) and Cedar rim thistle (*Cirsium aridum*), are considered endemic to counties other than Carbon County.

Habitat considered marginally suitable or suitable for supporting one BLM sensitive plant species, persistent sepal yellowcress (*Rorippa calycina*), was observed within the project area during the field surveys completed. Suitable habitat for this species consists of riverbanks and lake shorelines exhibiting muddy or sandy soils. Historically, it has been found to exist on both the North Platte and Medicine Bow River arms of Seminoe Reservoir (Dutcher 2004). This

Table 3-8 Special Status Plant Species

Species Name	Organization Listing [1]	Status [2]	Elevation Range (feet)	Habitat Characteristics/Comments	Habitat Observed in Project Area
Colorado butterfly plant *Guara neomexicana* ssp. *coloradensis*	USFWS	T	5,700 - 6,400	Subirrigated alluvial soils of drainage bottoms surrounded by mixed prairie	Yes (marginal)
Blowout penstemon *Penstemon haydenii*	USFWS	E	NI	Actively shifting sand dunes, blowout depressions; known from Ferris/Seminoe Mountains region	No
Ute ladies'-tresses orchid *Spiranthes diluvialis*	USFWS	T	5,100 - 5,200	Moist streambanks, wet meadows, and abandoned stream channels	Yes (marginal)
Desert yellowhead *Yermo xanthocephalus*	USFWS	T	6,700	Barren outcrops of white silty clay of Split Rock Formation; endemic to Fremont Co.	No
Laramie columbine *Aquilegia laramiensis*	BLM	S	6,400 - 8000	Crevices of granite boulders and cliffs; endemic to Albany and Converse counties	No
Nelsons milkvetch *Astragalus nelsonianus*	BLM	S	5,200 – 7,600	Alkaline clay flats, shale bluffs and gullies, pebbly slopes, volcanic cinders in sparse vegetation	No
Cedar rim thistle *Cirsium aridum*	BLM	S	6,700 - 7,200	Barren, chalky hills, gravelly slopes and fine-textured, sandy/shaley draws; endemic to Fremont and Sublette Counties	No
Webber's scarlet-gilia *Ipomopsis aggregata* ssp. *weberi*	BLM	S	8,500 - 9,600	Openings in coniferous forests and scrub oak woodlands	No
Gibbons beardtongue *Penstemon gibbensii* *Yellowcress*	BLM	S	5,500 - 7,700	Sparsely vegetated shale or sandy-clay slopes	No
Persistent sepal yellowcress *Rorippa calycina*	BLM	S	4,300 – 6,800	Riverbanks and shorelines, usually on sandy soils near high waterline; more common near Seminoe Reservoir	Yes
Laramie false sagebrush *Sphaeromeria simplex*	BLM	S	7,500 – 8,600	Cushion plant communities on rocky limestone ridges and gentle slopes	No
Bedstraw milkweed *Asclepias subverticillata*	WNDDB	SC	~ 6,800	Roadsides and other disturbed sites; last observed in Wyoming in 1947	Yes
Ward's goldenweed *Oonopsis wardii*	WNDDB	SC	5,460 – 7,200	Selenium – rich, shale – clay slopes, barren plains and disturbed roadsides; areas of low vegetation cover	No

[1]USFWS = U.S. Fish and Wildlife Service; BLM = Bureau of Land Management; WNDDB = Wyoming Natural Diversity Database

[2]T = Threatened plant species; E = Endangered plant species; S = Sensitive plant species; SC = Wyoming Species of Concern

[3]NI = No information **Sources:** BLM (no date); Fertig 1994; Handley 2004; WNDDB 2004

species was not observed during the surveys completed in 2004. This species is not present within the boundaries of the project area. Other project area wetlands failed to qualify as habitat for this species due to the lack of shoreline landforms exhibiting a muddy or sandy substratum near the high water line.

The breaks located south of the Medicine Bow River include exposed clay-shale slopes and associated toeslope positions paralleling County Road 291 in Hanna Draw. This habitat was initially considered as potentially marginally suitable for the Nelson's milkvetch (*Astragalus nelsonianus*) and Gibbon's beardtongue (*Penstemon gibbensii*). Selected habitats areas were searched for the presence of plants of the Astragalus and Penstemon genera. None was found and it was concluded that are not present in the areas searched. Additionally, a review of the habitat features was conducted by the BLM. The agency concluded that these species would not likely occur in this area.

No habitat was observed to be present for the remaining two species. Webber's scarlet gilia (*Ipomopsis aggregata* ssp*. weberi*) occurs in association with coniferous forests and scrub oak woodlands at elevations ranging from 8,500 to 9,600 feet; well above the elevations associated with this project. Similarly, Laramie false sagebrush (*Sphaeromeria simplex*) grows in conjunction with cushion plant communities on limestone ridges and slopes at 7,500 to 8,600 feet; conditions not observed across the areas proposed to be disturbed.

3.10.1.3 Plant Species of Special Concern

Two species of special concern to the State of Wyoming have been recorded previously within the project region and could potentially occur within project boundaries if suitable habitat were present. These species include bedstraw milkweed (*Asclepias subverticillata*) and Ward's goldenweed (*Oonopsis wardii*). Suitable bedstraw milkweed habitat consists of roadsides and other disturbed sites at an elevation of about 6,800 feet. Found previously in the Hanna Draw area, the last recorded siting of this species in Wyoming was in 1947 (Dutcher 2004). Given that suitable habitat consists of disturbed roadsides and it has not been recorded in such accessible sites for 57 years, it is assumed that this species does not exist in the project area. It may also be noted that this species was not observed in any disturbed area during the vegetation field survey completed for this project.

Ward's goldenweed typically inhabits selenium-rich shale-clay slopes, barren plains, and disturbed roadsides in areas of low vegetation cover at elevations ranging from 5,460 to 7,200 feet. It has been previously recorded near the project area to the north of the Medicine Bow River (Dutcher 2004). Soils known to be selenium rich occur to the north of the Medicine Bow River in Carbon County. Selenium-rich soils are not present to the south of the river within the project area and it is therefore assumed that habitat suitable for Ward's goldenweed is not present within the acreage proposed to be disturbed.

3.10.2 Terrestrial Animals

The BLM identified 21 special status animal species for the Hanna Draw Pilot Project, including 2 federally listed and 19 BLM sensitive species. These animal species potentially present in or near the project area are reflected in Table 3-9, which summarizes the species, their associated status, habitats, potential to occur in the project area, and which species are analyzed in greater detail. Figure 3-10 depicts occurrences for some of these species, as discussed below for each special status animal.

Table 3-9 Special Status Animal Species Examined for the Hanna Draw Pilot Project

Common Name	Scientific Name	Status[1]	Habitat Association and Distribution	Potential to Occur in Project Area
Bald eagle	*Haliaeetus leucocephalus*	FT[2]	Typically breeds along reservoirs, lakes, and rivers, often using upland habitats for foraging. Winters near open water and in semideserts and grasslands, often associated with prairie dog colonies.	Moderate. No documented nests or communal winter roosts in or near project area. Occasional individuals may move forage or roost along Medicine Bow River, in active prairie dog colonies, and in upland areas, but occurrence would be rare and sporadic.
Black-footed ferret	*Mustela nigripes*	FE	A prairie dog obligate, tied directly to prairie dog colonies. Minimum size of white-tailed prairie dog colony for suitable habitat to support ferrets is 200 acres (complex w/in 4.3 miles).	Low. Project area in USFWS' black-footed ferret block clearance; no presence/absence surveys would be required. If present or reintroduced, the black-footed ferret would be part of experimental/nonessential population.
American peregrine falcon	*Falco peregrinus*	BLM	Typically breeds along high ridges and cliffs in foothills and mountainous areas. Eyries often located 400 feet or greater on cliff faces, overlooking rivers, lakes, wetlands, and wet meadows.	Low. No peregrine falcon nest sites have been documented. Habitat in project area and along Medicine Bow River is moderate for this species' foraging. Cliffs in vicinity of project and river corridor are limited for potential nesting.
Ferruginous hawk	*Buteo regalis*	BLM	Occurs in open, semi-arid basin-prairies, foothills, badlands, and grasslands. Nest sites include trees, ledges, rock outcrops, and the ground on knolls or hills. Tree nests often occur on the pinyon-juniper woodland interface with sagebrush basins.	High. Habitat is suitable for this species for nesting and foraging. A number of known and active nest sites occur in surrounding region.
Northern goshawk	*Accipiter gentilis*	BLM	Generally found in woodlands and forests, although individuals will forage in open, dry uplands. Migrants often observed in uplands.	Low. Habitat in the immediate project area is not suitable for nesting birds, although individuals may forage in the upland areas.

Table 3-9 Special Status Animal Species Examined for the Hanna Draw Pilot Project

Common Name	Scientific Name	Status[1]	Habitat Association and Distribution	Potential to Occur in Project Area
Burrowing owl	*Athene cunicularia*	BLM	Typically nests in open, grasslands, shrublands, and some woodland communities. Often occupies burrows of prairie dogs, ground squirrels, foxes, and badgers.	Moderate. Pairs may breed in portions of the project area, particularly in prairie dog colonies. Individual birds also may forage in and near the Proposed Action.
Long-billed curlew	*Numenius americanus*	BLM	During migration found along coasts, islands, prairies, rivers, ponds, wet meadows, and marshes. Nests in moist meadows or dry prairies; upland feeder on nesting and wintering grounds.	Moderate. Known to occur in project vicinity; individual birds may occur along Medicine Bow River and adjacent uplands.
White-faced ibis	*Plegadis chihi*	BLM	Marshes, wet meadows.	Low. Breeding areas may exist on the Medicine Bow River; some migration stopover areas may exist in small wetland/stock pond areas.
Greater sage-grouse	*Centrocercus urophasianus*	BLM	A sagebrush obligate with lek sites typically located along ridges, open areas, and plateaus. Nesting habitat includes sagebrush with adequate canopy cover and shrub density. Brooding habitat includes wet meadows and mesic areas adjacent to riparian streams. Winter range requires adequate sagebrush cover and linkage corridors.	Documented. Greater sage-grouse breed in the project vicinity, and documented lek sites occur throughout the project area. However, no leks are known to occur in the immediate drilling area or are intersected by the project's linear ROWs. Grouse nesting would occur in the project area.
Sage thrasher	*Oreoscoptes montanus*	BLM	Breeds in sagebrush shrublands and occasionally in other shrublands or cholla grasslands. During migration and winter, occupies open agricultural areas, pastures, grasslands, shrublands, open riparian areas, and pinyon-juniper woodlands.	High. Likely occurs in or near the project area, based on habitat associations for breeding and foraging.

Table 3-9 Special Status Animal Species Examined for the Hanna Draw Pilot Project

Common Name	Scientific Name	Status[1]	Habitat Association and Distribution	Potential to Occur in Project Area
Brewer's sparrow	*Spizella breweri*	BLM	Breeds and forages primarily in sagebrush communities, but occasionally in other shrubland types. During migration, occupies woody, brushy, and weedy riparian, agricultural, and urban areas.	
Sage sparrow	*Amphispiza belli*	BLM	Breeds in sagebrush shrublands; also occupies grasslands and other shrubland communities during migration.	High. Likely occurs in or near the project area, based on habitat associations for breeding and foraging.
Baird's sparrrow	*Ammodramus bairdii*	BLM	Breeds in grasslands and dry prairie. Forages and nests on the ground.	Low. May occur in or near the project area, based on habitat associations for breeding and foraging. Distribution infers species not common in immediate project area.
Loggerhead shrike	*Lanius ludovicianus*	BLM	Typically inhabits grasslands, semi-desert shrublands, agricultural areas, and riparian zones. Nests usually in isolated trees or large shrubs.	Moderate. This species could breed within suitable shrubland and riparian habitats in the project area.
Mountain plover	*Charadrius montanus*	BLM	Inhabits flat, shortgrass prairie often with surface disturbance, livestock grazing, and prairie dog colonies.	Moderate. Potentially suitable habitat occurs in and near the project area.
White-tailed prairie dog	*Cynomys ludovicianus*	BLM	Forms colonies of varying size in shortgrass or mixed-grass prairie, digging complex burrow systems.	Documented. Colonies occur in and near the project area.
Wyoming pocket gopher	*Thomomys clusius*	BLM	Meadows with loose soil.	Low. Generally, wet meadow areas of any size not present in project area.
Pygmy rabbit	*Brachylagus idahoensis*	BLM	Basin-prairie and riparian shrub.	Low-Moderate. Areas of sagebrush with deep soils sufficient to support burrows may exist within the project area; however, no surveys have been attempted within the project boundaries.

Table 3-9 Special Status Animal Species Examined for the Hanna Draw Pilot Project

Common Name	Scientific Name	Status[1]	Habitat Association and Distribution	Potential to Occur in Project Area
Swift fox	*Vulpes velox*	BLM	Typically occupies short-, mid-, and mixed-grass prairies with flat to gently rolling topography. Den sites provide good visual coverage of surrounding area and may coincide with prairie dog colonies.	Low. Although habitats are potentially suitable for this mammal species and documented occurrences have been recorded for the area, records are rare and incidence would likely be low.
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM	Inhabits dry, coniferous forests, juniper woodlands, deciduous forests, basins, desert shrublands, and grasslands. Roosts are critical to this species, typically requiring underground caverns (e.g., caves and abandoned mines) with stable temperatures and air supply. Roosting in rock outcrops and buildings would be individually dispersed.	Low. This bat species requires very specific underground features and temperature regimes, particularly for hibernacula and maternity colonies. No communal roosts or potential habitat in underground features have been documented in the project area. Occurrences would be expected to be low or sporadic. Project area lacks breeding habitat; however, foraging habitat potentially exists.
Spotted bat	*Euderma maculatum*	BLM	Cliffs over perennial water, basin prairie shrub.	Low. Generally large cliffs lacking within the project area; however, foraging habitat potentially exists within the project area.

Sources: Fitzgerald et al. 1994; WGFD 2004b; WyGISC 2002; WNDDB 2004; Oakleaf 2004; Terres 1991; Andrews and Righter 1992; BLM 2001a, 2002a.

[1]Status:

FE = Federally listed as endangered
FT = Federally listed as threatened
BLM = BLM Sensitive Species

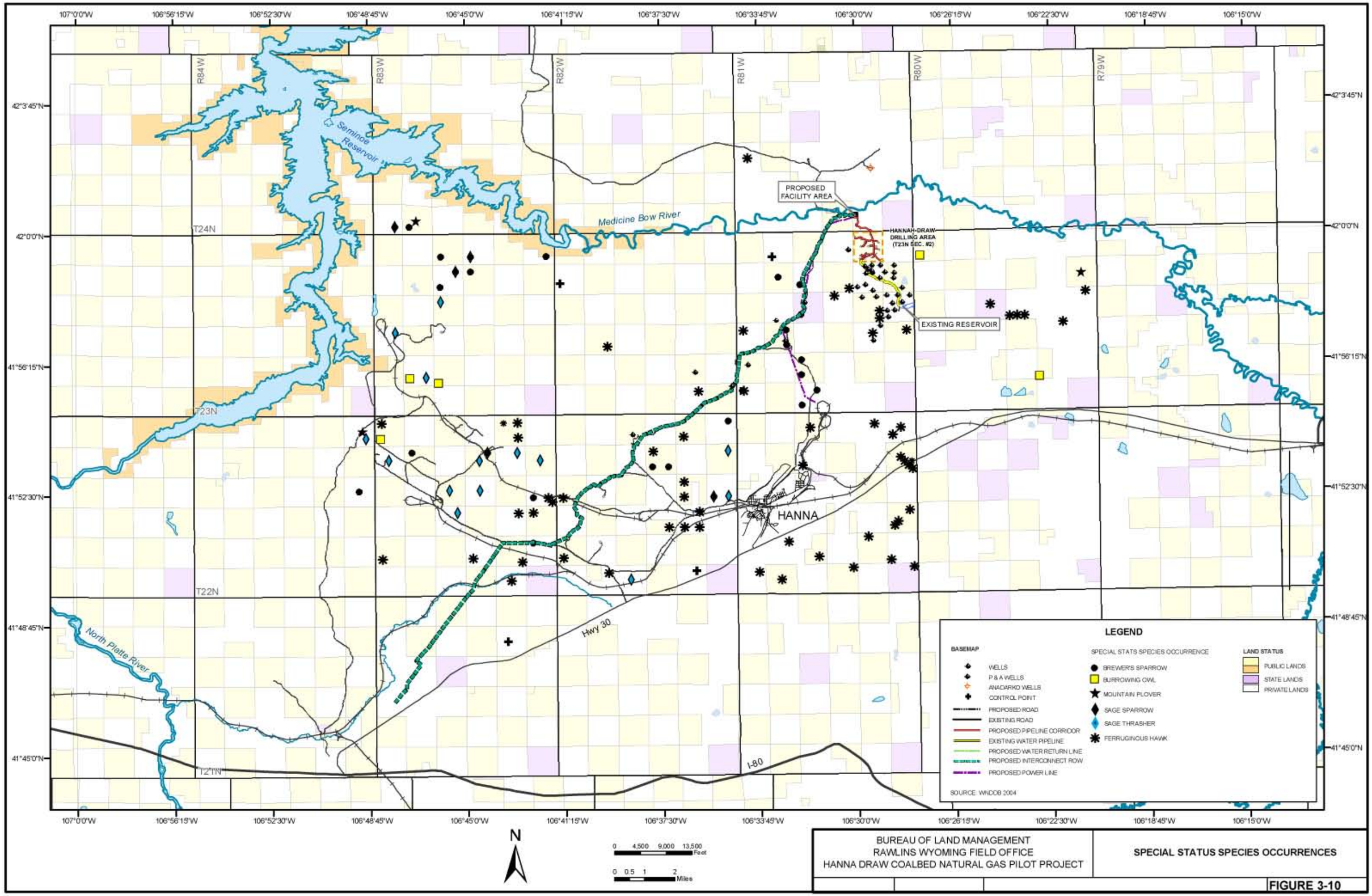
[2]The bald eagle is proposed for delisting; the final decision is pending.

The bald eagle sporadically occurs in the Hanna Draw Pilot Project area. Bald eagles actively nest and roost along the North Platte River over 30 miles north and south (or upstream) of the project area (BLM 2002a). Optimum nesting habitat includes proximity to open water that provides an adequate food source, large nest trees with sturdy branches at sufficient height, and stand heterogeneity. Bald eagles often use the same nest each year (Grubb 1976; Anderson and Bruce 1980). Wintering bald eagles may gather in large aggregations and share communal roosts, diurnal perches, and feeding areas. The major habitat components on wintering grounds include a food source and suitable trees for diurnal perching and night roosting, with eagles commonly using riparian drainages, open water areas, and conifers or riparian woodlands for foraging, roosting, and thermal protection. Thermal cover is a crucial component of bald eagle winter night roosts and relates to energy conservation during extreme low temperatures. Food availability is likely the single most important factor influencing winter eagle distribution and abundance (Steenhof 1976). Perches are an essential element in bald eagles' selection of foraging areas (Stalmaster and Newman 1979). Perch sites must be in open view of potential food sources and are generally within 160 feet of water (Vian 1971). The bald eagle commonly forages on fish, waterfowl, and carrion; however, bald eagles also will forage in upland habitats for terrestrial prey species. Scavenging along reservoir shorelines and rivers corridors for stranded fish or crippled waterfowl is a main food source during the winter (Winternitz 1998). No known nest sites or communal winter roosts are known to occur in the vicinity of the project, specifically along this reach of the Medicine Bow River (BLM 2002a; WNDDB 2004); however, migrating, foraging, and wintering eagles may occur in the region, particularly near Seminoe Reservoir, approximately 10 to 20 miles west of the project area.

Historically, the black-footed ferret was documented in Hanna Basin in 1968 and 1979 (Figure 3-11). One of those sitings (i.e., ferret skull) was documented in the immediate area of proposed drilling in Section 2 (WNDDB 2004). More recently, two observations of released ferrets (i.e., part of the experimental population) were recorded 13 miles north and 20 miles northeast of the project area (BLM 2002a). Presently, no ferrets are known to occur in or near the project area. The black-footed ferret is closely associated with active prairie dog colonies, their primary prey species. Although white-tailed prairie dogs occur the project area, as discussed below, the project area is included in the U.S. Fish and Wildlife Service's (USFWS') black-footed ferret block clearance where no documentation of ferret presence or absence is currently required. A portion of the area also is included in the black-footed ferret "experimentalreintroduction area." It is not likely that reintroduced ferrets occur in the area, since a sylvatic plague epizootic in the mid-1990s severely impacted the prairie dog colonies extending from

Hanna Draw to the Shirley Basin/Medicine Bow reintroduction area (Oakleaf 2004). However, it is likely these prairie dog populations continue to recover and provide a suitable prey base for area predators. Therefore, the project area may be considered suitable for future ferret reintroductions. If present in the future, the black-footed ferret would be considered to be part of the USFWS' "experimental/nonessential population."

The American peregrine falcon and northern goshawk are not known to nest in the vicinity of the project area. Individual falcons may periodically forage along the Medicine Bow River and any associated riparian habitats, and goshawks may forage in the upland habitats in and near the project (BLM 2001a, 2002a). Individual migrants also may occur in the region, but occurrences would be expected to be low.



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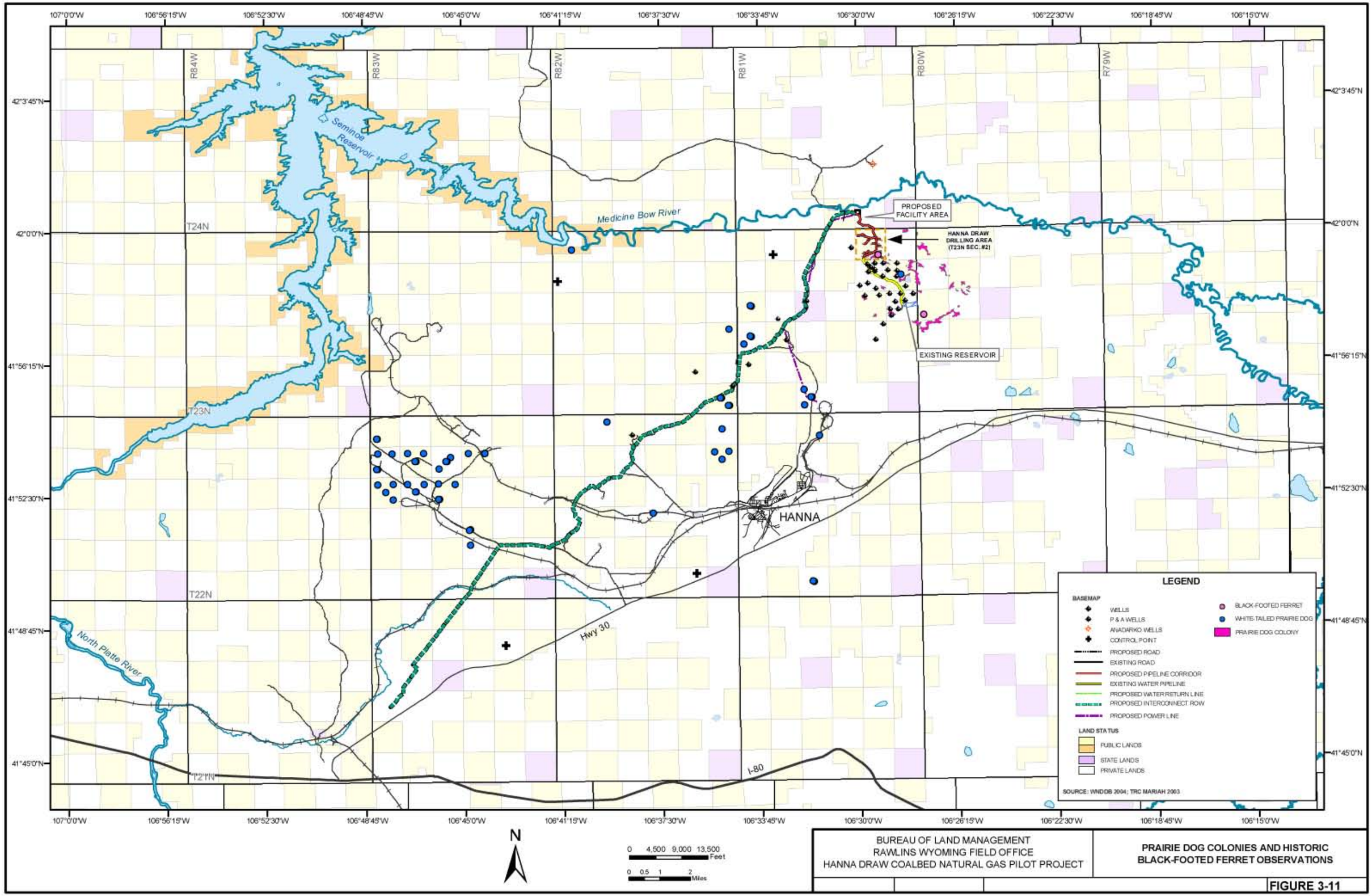
SPECIAL STATUS SPECIES OCCURRENCES

FIGURE 3-10



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PRAIRIE DOG COLONIES AND HISTORIC BLACK-FOOTED FERRET OBSERVATIONS

FIGURE 3-11

The ferruginous hawk nests throughout the project area (see Figure 3-9) (WNDDB 2004; BLM 2004b). Many habitats are optimal to support these breeding and foraging birds, as inferred by the number of known nest sites for this region. Many of those nests clustered in close proximity are likely alternative nest sites for the same breeding pair, as some species of birds often alternate nest sites year to year.

Few burrowing owl nests are shown on Figure 3-9; however, a number of records exist for the project area (Oakleaf 2004; WNDDB 2004). Also, habitat for this raptor that nests in underground burrows is suitable for both nesting and foraging. Nesting pairs may occur in and near the project area, especially in active or inactive prairie dog colonies.

The long-billed curlew is known to occur in the project vicinity (BLM 2002a; TRC Mariah 2003). This species is more closely associated with wet meadows and riparian corridors; therefore, individual birds may forage and nest along the Medicine Bow River and the adjacent upland grasslands.

The white-faced ibis may use stock ponds or isolated areas where water ponds in the spring as migration stopover areas. Breeding habitat may exist on the adjacent Medicine Bow River. The potential habitat in the project area is very limited, and occurrences of this species is expected be sporadic or non-existent.

Sage-grouse across the western U.S. are receiving a greater scrutiny from federal, state, and local regulatory and management agencies. This increased interest is based on the continued decline of sage-grouse populations in the western U.S. and Canada, caused by a number of factors, predominantly habitat loss and fragmentation. Because this species is a sagebrush obligate, the greater sage-grouse requires large expanses of sagebrush-dominated lands. Regulatory and management agencies also recognize sage-grouse as “indicator species” of the overall health of not only the range but also the other commonly associated wildlife and plant species.

Greater sage-grouse are documented in and near the project area. Lek sites (i.e., breeding areas) are typically situated on broad ridgetops, grassy swales, disturbed sites (e.g., burns), and dry lake beds. The leks commonly occur in openings of sagebrush rangelands, containing less herbaceous and shrub cover than the surrounding area (Schroeder et al. 1999). Lek sites are generally used from year to year, although some lek locations may shift slightly to adjacent areas. Figure 3-12 depicts documented lek sites recorded for the area in and near the Proposed Action (WNDDB 2004; BLM 2004b; Guenzel 2004). No known leks intersect directly with the proposed project components, although leks and satellite leks can change with changing habitat conditions, degree of human-related disturbances, and precipitation levels. A 2-mile buffer surrounding each lek also is shown relative to specific project component locations.

Nesting habitat generally occurs in relatively thick vegetative cover, usually dominated by big sagebrush, with both vertical and horizontal strata. Nests are placed on the ground under a shrub, typically but not always sagebrush, and most nest sites are located within 3.9 miles of the lek. However, research on the greater sage-grouse showed that females moved from 0.2 mile up to 12.4 miles from a lek to nest, with the mean being 2.5 miles. In Colorado, up to 80% of greater sage-grouse hens were documented nesting within this 2.5-mile average (Apa 2003).

Holloran's (2005) recent studies from the Wyoming Pinedale Anticline show that female grouse will move even greater distances in areas near disturbance (e.g., surface, noise, human presence). Hens nest in the project area, although specific nest sites have not been mapped. Brooding habitats typically occur in and near wet meadows and riparian areas; therefore, sage-grouse broods likely occur along the Medicine Bow River corridor and adjacent tributaries that provide wet and mesic habitats. No designated sage-grouse wintering habitat occurs in the vicinity of the drilling area (BLM 2002a), although some wintering areas likely occur along the proposed interconnect pipeline ROW. The Rawlins FO has not yet mapped sage-grouse wintering areas; however, these habitat types generally occur in areas of taller, denser sagebrush stands (e.g., basin big sage)

Five BLM sensitive passerines or songbirds were identified for the proposed project, including the sage thrasher, Brewer's sparrow, sage sparrow, Baird's sparrow, and loggerhead shrike. The sage thrasher, Brewer's sparrow, and sage sparrow are closely associated with sagebrush communities, particularly during the breeding season. Figure 3-10 depicts some occurrence information for these species. The Baird's sparrow is found in grasslands, commonly nesting on the ground (Terres 1991). All four of these bird species have been documented in the project region (BLM 2002a) and may occur within suitable habitats in and near the area of the Proposed Action. The loggerhead shrike typically occurs in more open grasslands and sagebrush steppe with scattered shrubs and small trees. It likely occurs in the region, particularly the greasewood and grassland communities.

The mountain plover is closely associated with shortgrass prairie, disturbed areas, and prairie dog colonies. This bird species returns to Wyoming to breed between March and August. Potentially suitable habitat occurs in and near the project area, particularly in active prairie dog colonies. Potentially suitable plover habitat and two breeding plovers were documented in the project area in 2001 and 2003 (TRC Mariah 2003). Other observations also have been recorded (WNDDB 2004).

The white-tailed prairie dog occurs in the project region. They provide a prey base for a wide diversity of predators, including a number of special status species (e.g., bald eagle, ferruginous hawk, swift fox). However, local prairie dog populations were severely impacted by sylvatic plague in the mid-1990s, extending between Hanna Draw and the Shirley Basin/Medicine Bow black-footed reintroduction area, as discussed for the ferret above (Oakleaf 2004). White-tailed prairie dog colonies are typically dispersed within open, grasslands and desert grass communities. Figure 3-11 depicts historic prairie dog locations recorded by the WGFD through 2004 (WGFD 2004b). Additional active colonies may be present beyond those previously mapped, particularly as this species recovers from the plague.

The five remaining mammal species that are classified as BLM sensitive, the swift fox, pygmy rabbit, Wyoming pocket gopher, spotted bat, and Townsend's big-eared bat were identified for the proposed project area. Habitat for the pygmy rabbit may exist on the project area. The pygmy rabbit selects sagebrush stands with soils deep enough to support its burrows (it is the only rabbit species, not including hares, that digs a burrow complex). Limited surveys have been undertaken by the Rawlins FO, and the project area has not yet been surveyed. Thus, the possibility exists that pygmy rabbit habitat could be located within the project area. The Wyoming pocket gopher requires wet meadow areas with correspondingly loose soils for its burrows. These areas are quite limited within the project area, and thus probability of its occurrence is considered low. Habitats in and near the project area would be considered to be suitable to support swift fox. Records of this mammal species do exist for the area (Oakleaf 2004). The swift fox often will utilize prairie dog burrows for its den sites. The Townsend's big

107°0'0"W 106°56'15"W 106°52'30"W 106°48'45"W 106°45'0"W 106°41'15"W 106°37'30"W 106°33'45"W 106°30'0"W 106°26'15"W 106°22'30"W 106°18'45"W 106°15'0"W

42°3'45"N
42°0'0"N
41°56'15"N
41°52'30"N
41°48'45"N
41°45'0"N

R84W R83W R82W R81W R80W R79W

T24N T23N T22N T21N

Saminoe Reservoir
Medicine Bow River
North Platte River
Hwy 30
I-80

PROPOSED FACILITY AREA
HANNA DRAW DRILLING AREA (T23N SEC. #2)
EXISTING RESERVOIR
HANNA

LEGEND

BASEMAP
- WELLS
- P & A WELLS
- ANADARKO WELLS
- CONTROL POINT
- PROPOSED ROAD
- EXISTING ROAD
- PROPOSED PIPELINE CORRIDOR
- EXISTING WATER PIPELINE
- PROPOSED WATER RETURN LINE
- PROPOSED INTERCONNECT ROW
- PROPOSED POWER LINE

WNDDB OBSERVATION SYSTEM DATA*
- SAGE-GROUSE
- 0.25-MILE BUFFER
- 2- MILE BUFFER

*Source: WNDDG 2004a; BLM 2004

LAND STATUS
- PUBLIC LANDS
- STATE LANDS
- PRIVATE LANDS

N

0 4,500 9,000 13,500 Feet

0 0.5 1 2 Miles

BUREAU OF LAND MANAGEMENT
RAWLINS WYOMING FIELD OFFICE
HANNA DRAW COALBED NATURAL GAS PILOT PROJECT

GREATER SAGE-GROUSE LEK SITES

FIGURE 3-12

eared bat requires underground features (e.g., mines, caves) for its maternity colonies and stable temperature regimes, which are critical for this bat species' survival. No known winter hibernacula, maternity colonies, or bachelor roosts have been documented in or near the project area, and the potential for a feature of this nature would be low. Individual bats may day-roost under appropriate vegetative cover, in rocky crevices, and in buildings, but roosting would be anticipated to be sporadic and dispersed through the area. Foraging habitat within the basin-prairie shrub ecosystem is present on the project area. The spotted bat utilizes rock crevices on cliff faces for its maternity roosts, and the habitat within the project area lacks this feature. Foraging habitat within the basin-prairie shrub ecosystem is present on the project area.

3.10.3 Aquatic Resources

3.10.3.1 Amphibians

Three amphibian species are listed as BLM sensitive, including the northern leopard frog (*Rana pipiens*), Great Basin spadefoot (*Spea intermontana*), and boreal toad (*Bufo boreas boreas*). The boreal toad is a species characteristic of elevation exceeding 7,000 feet with conifer vegetation. No suitable habitat for this species is present in the project area. The Great Basin spadefoot is primarily a terrestrial species, associated with water only during spring reproduction. This species reproduces in temporary or permanent pools, ponds, stock tanks, and irrigation ditches. Few such aquatic features are present in the project area and this species is not expected to reproduce in aquatic features in the project area such as the constructed reservoir as it seldom contains any water. The northern leopard frog inhabits backwaters with emergent vegetation, and suitable habitat is therefore limited along the Medicine Bow River.

3.11 CULTURAL RESOURCES

3.11.1 Overview of Prehistory and History

This brief overview is taken from the work of Mulloy (1958); Frison (1991); and BLM (2002a). The earliest known peoples to have occupied the Northwestern Plains appear to have entered the region over 11,000 years ago. These Paleoindian period cultures were expert big game hunters who focused on now-extinct species such as the mammoth, bison, and camel. Paleoindian sites are rare in the study due primarily to poor preservation conditions and thus are usually limited to isolated lithic artifacts. As a result of significant climatic changes as well as other environmental factors the megafauna eventually died out, which forced a behavioral shift to more diverse subsistence strategies that focused on smaller game species and increased reliance on a variety of plant resources. This period is known as the Plains Archaic, which is subdivided into Early, Middle, and Late stages as characterized by a range of distinctive projectile point styles. The Plains Archaic persisted for some 6,000 years until the Late Prehistoric period about 2,000 years ago, which is marked by the technological change from dart projectiles to the bow and arrow and by the appearance of ceramics. Throughout the Plains Archaic and Late Prehistoric periods, the present project area was occupied by small bands of hunter-gatherers whose movements were dictated primarily by seasonal change. Thus it is the open camps and lithic scatters of these two periods that make up the majority of prehistoric sites that have been documented in the area. Sites of the subsequent Protohistoric period, which represents the time when Euroamerican influences were beginning to impact the region, are not known to occur in the project area.

The first known historic land use of the area was related to fur trapping and trading as represented by the Ashley-Smith Expedition, which entered what is now Carbon County in 1825 (Seiersen 1981). Subsequently, and prior to the 1880s, cattle ranching became a major enterprise that claimed vast tracts of land. However, a prolonged period of severe drought and harsh winters ultimately bankrupted many of these ranchers. Large-scale sheep ranching followed in the late 1800s. To serve the livestock industry and other enterprises, the Union Pacific Railroad was built into Carbon County in 1868. Given this history, abandoned livestock camps and other ranching-related materials and facilities are the most common historic site types found in the project area.

3.11.2 Class I File Search Results

A file search of the Hanna Draw Project area was conducted through the online database of the Wyoming Cultural Records Office (WyCRO) and directly from the files of the BLM Rawlins FO. The Class I study encompasses over 84 sections and includes the entirety of the original Hanna Draw Exploration POD, Williams EA study area (BLM 2002a; Stainbrook 2004); a proposed project-related power line (Buenger 2004a); and the route of a proposed 8-inch pipeline (Buenger 2004b) for which the BLM has required a 2-mile-wide cultural resources study corridor. The results revealed a total of 163 archaeological sites, both prehistoric and historics (Table 3-10). The majority of these sites consists of prehistoric sites (n=124). Of the remaining sites, 33 are historical in age, 3 exhibit both prehistoric and historical components, and the ages of 3 are unknown or not reported.

Regarding site significance, 105 sites have been assessed as not eligible for the NRHP and as such will not be discussed further. Of the remainder, 15 sites are NRHP-eligible and 43 remain unevaluated. Of those sites that are NRHP-eligible, 8 are deemed so by the Wyoming State Historic Preservation Office (SHPO). These sites include prehistoric stone circle sites 48CR730, 48CR731, and 48CR732 and prehistoric camp sites 48CR135, 48CR776, 48CR816, and 48CR7074. Of particular note is the spatially extensive 48CR135, which was initially recorded in 1976 and has subsequently been re-recorded and evaluated in conjunction with various gas field projects (Buenger 2004a, 2004b). The eighth officially eligible site is the old Lincoln Highway (48CR1191), several segments that are reported to occur in the vicinity of the study area, especially near the southern end, and are variously assessed as contributing or non-contributing portions of the larger site. Six sites bear field-eligible recommendations and include prehistoric sites 48CR84, 48CR533, 48CR962, 48CR1375, 48CR7259, and 48CR7263. A seventh field eligible site, 48CR4430, is identified as a burial, but the recorder failed to report the age and/or cultural affiliation.

The file search also revealed that 64 cultural resource surveys were previously conducted in the project area. A total of 35 surveys were completed prior to 1990, and 29 were conducted in 1990 or after, the most recent being five Class III inventories conducted by Western Archaeological Services, Inc. for the APC Hanna Draw Pilot Project, which is the subject of this current EA (Buenger 2004a, 2004b; Stainbrook 2004; Gries 2005a, 2005b). Virtually all of the previous cultural resource studies are related to gas field development and some coal mining. A few are associated with proposed seismic line installations.

Table 3-10 Previously Recorded Site Types and Eligibility Status

Site Type	NRHP Status					Total
	Field Not Eligible	Field Eligible	Officially Eligible	Officially Not Eligible	Not Evaluated	
Prehistoric Camp/Hearths	36	4	3	2	25	70
Prehistoric Lithic Scatter/Artifacts	30	0	1	0	10	41
Prehistoric Stone Circles	4	0	3	0	3	10
Prehistoric Hunting Blind	0	1	0	0	2	3
Historic Stock Camps	6	0	0	0	1	7
Historic Cairns/Rock Piles	13	0	0	1	0	14
Historic Bridge	2	0	0	0	1	3
Historic Debris/Trash	7	0	0	1	0	8
Other Historic Sites	1	1	1	0	1	4
Burial, Unknown Age	0	1	0	0	0	1
Rock Alignment, Unk. Age	2	0	0	0	0	2
					Total Number of Sites:	**163**

3.12 RANGE RESOURCES AND OTHER LAND USES

The proposed Hanna Draw Pilot Project would be constructed on land within the Hanna Basin of Wyoming. The drilling area is located on federal land managed by the BLM (T23N R81W, S2); the facility area is located on private land (T24N, R81W, S35). In addition, the proposed 25.3-mile-long interconnect pipeline route would cross portions of 14 public land sections, 17 sections of private land, and 1 Wyoming state section. Most of the private land is owned by Q Creek Land and Livestock, LLC; Union Pacific Land and Resources Company owns the north half of the project site and portions of the pipeline route; Peterson Livestock owns the remainder of the pipeline route near the southwest terminus. The mixed ownership reflects the location in the "checkerboard" land paralleling the Union Pacific Railroad route.

3.12.1 Range Resources

Undisturbed portions of the proposed project site and surrounding lands are used primarily for livestock grazing. The majority of the project area is within the 66,583-acre Dana Block North federal grazing allotment, number 00822 (BLM 2004c). The entire allotment is approved for 4,962 AUMs for both cattle and sheep between March 1 and November 10 (BLM 2004c).

Project ancillary lines (transmission and pipeline) cross two other allotments. The Quealey Block Allotment, (No. 00820) is southwest of the Pilot Project and includes 54,262 total acres, of which 23,681 acres are public (3,848 public AUMs for cattle and sheep). Near the southwest

end of the proposed interconnect pipeline, the allotment is Pass Creek Ridge (No. 00827), which includes 59,996 acres, with 26,308 acres being public (3,597 AUMs for cattle).

The Dana Block North Allotment has two permittees, Q Creek Land and Livestock, LLC and Victor Anderson (incommon use). Peterson Livestock and Wallis Livestock Company (incommon use) are the permittees in the Pass Creek Ridge Allotment, and Q Creek Land and Livestock, LLC is the only permittee in the Quealey Block allotment.

3.12.2 Other Land Uses

Remnants of an inactive petroleum exploration project occur immediately south of the proposed site, and there are coal mines several miles to the south. These features, together with limited recreational activity in the area and on Seminoe Reservoir located 10 miles to the west (see Section 3.14), are the only non-agricultural uses identified in the area.

Carbon County has adopted a Land Use Plan and Zoning Resolution (Carbon County 1998, 2004). The Land Use Plan has three main purposes: 1) to "… serve as a general guide to future land and resource management in the unincorporated areas of …" the county, with a regional vision for the future development pattern; 2) "… to articulate the County's position concerning land uses on federal and State lands"; and 3) "… to provide … municipalities … with the County's vision concerning future land uses … in the unincorporated areas of the County" (Carbon County 1998).

The Land Use Plan articulates the county's concern for the long-term support of commercial agriculture, primarily ranching, both because of the economic value and because of the myriad of other benefits it provides to the county, including wildlife habitat, extensive vistas, open space, and other associated values. It also recognizes and encourages development of mineral resources in concert with continued agricultural use when the two can coexist to their mutual benefit. In the context of these considerations, the plan recommends that all lands that have suitability for agriculture, both public and private, should be used for future agricultural use.

Carbon County zoning regulations apply only to private lands. But the county has designated zone districts for public lands, as well, providing the county's perspective on the appropriate use patterns for the entire county. The project area is in the Ranching, Agricultural, Mining (RAM) Zone district (Rowen 2005). Principally permitted uses in the RAM district include commercial agriculture and oil, gas, and mineral exploration, development, and production, among several other uses (Carbon County 2004).

3.13 NOISE

Noise levels in the vicinity of the proposed Hanna Draw Pilot Project area have not been measured. Based on studies from other areas, it is expected that noise levels would be quite low, influenced mainly by wind, insects, birds, and animals. The background noise in the area without these influences is likely in the range of 40 to 45 dBA (EPA 1971). When the wind is blowing, the noise levels are substantially higher.

There are no consistent sources of man-made noise in the vicinity. Occasional traffic on County Road (CR) 291 and occasional aircraft overflights are the only such sources.

No noise sensitive receptors have been identified in the vicinity of the proposed project area. The nearest locations of regular human activity are several miles distant from the site.

3.14 RECREATION

Recreation opportunities in the vicinity of the Hanna Draw Pilot Project site are limited. There are no developed recreation sites nearby; the closest are community facilities in Hanna, nearly 10 miles south, and the Seminoe Reservoir-Bow Arm Public Access Area boat ramp, 12 miles to the west. Seminoe Reservoir is a popular recreation resource, but the highest activity is focused at Seminoe State Park on the west side of the reservoir. CR 291 provides access to the Bow Arm boat ramp, but it is relatively lightly used because the only facility, other than the ramp itself, is an outhouse.

Hunting is the most popular among a small variety of dispersed recreation activities in the area. Other dispersed activities include sightseeing, wildlife viewing, fishing, and limited off-highway vehicle (OHV) use. Comprehensive data on recreation usage in the immediate vicinity of the project area are not available, but large game hunting in the fall seasons is likely the largest generator of recreation activity. Over 10,500 hunter days were recorded in 2004 for the hunt areas encompassing the project area (WGFD 2005a, 2005b). Over 90% of the hunter days were devoted to antelope (pronghorn), deer, and elk. The deer and elk hunting and, to a lesser extent, the antelope hunting tend to be located in the more mountainous sections of the hunt areas several miles north of the project area (Guenzel 2004). Hunting success varies with the game population; deer and elk harvests in the project area hunt areas in 2004 were fairly consistent with those over the preceding decade, while the antelope harvest was the largest since 1995 (WGFD 2005a). There is also a smaller amount of hunting in the general area for birds, such as sage-grouse, and small game, such as cottontail rabbits.

Although the Medicine Bow River runs adjacent to the project area, it is not heavily fished in this area (Gunzel 2004). Presumably, this is because there are better fishing opportunities elsewhere in the region, including several world-class fisheries (BLM 2004c).

OHV use is limited to existing roads and vehicle routes, other than at the Dune Ponds open area west of the reservoir (BLM 2004c).

Classification under the Recreation Opportunity Spectrum (ROS) would likely include most of the project vicinity as Roaded Natural with a network of roads and two-tracks traversing an otherwise mostly natural setting (BLM 2004c). Previous disturbance of the Hanna Draw Project site and the section immediately to the south would probably cause them to be classified as Rural.

There are no designate wilderness areas near the project area; the nearest Wilderness Study Area (WSA), the Bennett Mountain WSA, is located approximately 15 miles northwest of the project site. There are no designated or eligible Wild and Scenic Rivers near the project area (BLM 2002b).

Although access to the Hanna Draw Project area is generally good via improved and maintained county roads (CR 291 and CR 121/270), there are no specific attractions to draw large numbers of recreationists to the project vicinity. The checkerboard ownership pattern also may discourage use by limiting access to public lands. Additional information on recreation resources in the region can be found in the *Rawlins Resource Management Plan DEIS* (BLM 2004c).

3.15 VISUAL RESOURCES

The visual landscape in the vicinity of the proposed Hanna Draw Project is typical of the Hanna Basin sub-basin of the Wyoming Basin physiographic province. Terrain is predominantly rolling, dissected by small drainages and punctuated by occasional buttes and rock outcrops. The grand scale of the landscape tends to veil the severity of the topography, which is quite steep in some places. The varied terrain defines relatively small viewsheds from valley perspectives, although the viewsheds from higher elevations are expansive, stretching for many miles when the air is clear.

Colors are generally medium greens and gray-greens in the spring and as long into the summer as precipitation will support growth. As the summer wears on, the colors trend to paler gray-greens, beiges, and golds. Background soil colors are mostly beige, buff, and soft brown.

Vegetation is dominated by low shrubs, including sagebrush, saltbush, and a mixture of grasses and forbs. There is virtually no vertical plant growth higher than 2 to 3 feet. The visual effect tends to be a tufted mat, soft textured with subtle variations in color from differing vegetation.

Cultural modifications to the natural landscape primarily include roads, two-tracks, and utility lines. There are a few relatively small, aboveground power lines in the general area. There are also buried pipelines, which are noticeable primarily because of the linear changes in vegetation they produce.

The BLM has inventoried the area using its Visual Resource Management (VRM) classification system (BLM 2004c). The system provides for classification of the landscape into four management categories based on scenic quality, visual sensitivity, and distance from viewers (BLM 2004c). Each VRM class has an associated management objective. VRM Class I is the most restrictive, intended for areas that should be preserved in a natural state, such as Wilderness Study Areas; Class IV is the least restrictive, it will accommodate activities that require major changes to the landscape.

The Hanna Draw Pilot Project site, the power line corridor, and most of the interconnect pipeline corridor are designated VRM Class IV. The management objective indicates, "… management activities may dominate the view and may be the major focus of viewer attention. Every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repetition of the basic visual elements of form, line, color, and texture." Approximately 5 miles of the southwest end of the interconnect pipeline corridor is designated VRM Class III. Class III areas are intended to partially retain the natural character of the landscape; the management objective indicates, "… activities may attract the attention of the casual observer, but should not dominate the view changes should repeat the basic elements found in the predominant natural features of the characteristic landscape" (BLM 2004c).

3.16 SOCIOECONOMICS

The Socioeconomics discussion addresses social and economic values in the vicinity of the project area, including population, employment, economic effects, and selected community resources such as housing, emergency services, and potentially affected government revenue resources. The geographic area of interest is Carbon County, including Hanna, the nearest town; Rawlins, the county seat and its largest city; and the towns of Medicine Bow, Elk Mountain, Saratoga, and Sinclair.

3.16.1 Population and Demography

The Carbon County population boomed in the late 1970s and early 1980s, but has been consistently in decline since then (Table 3-11). The growth was spurred by energy development, but coal production, in particular, first became less labor intensive and subsequently production declined and the mines began to close. The loss of jobs led to a decline in population. The county population dropped by almost 30% from 1980 to 2000; it has continued to slide, but at a much slower rate since the 2000 census.

Like the county as a whole, communities near the project area have declined only slightly since 2000. The most recent available estimates (for July 2004) indicate populations for Hanna at 866, Medicine Bow at 267, Elk Mountain at 190, Saratoga at 1,710, Sinclair at 408, and Rock River (Albany County) at 223. These communities together are down an estimated 1.6% from their 2000 census population levels. Rawlins, the county's largest city, had an estimated 8,633 people in 2004, down 4.1% from its adjusted census population of 9,006 (U.S. Census Bureau 2005).

Table 3-11 Carbon County and Wyoming Population Trends

	Census				Estimates			
	1970	1980	1990	2000	7/1/01	7/1/02	7/1/03	7/1/04
Carbon County	13,354	21,896	16,659	15,639	15,263	15,387	15,360	15,271
Wyoming	332,416	469,557	453,588	459,260	494,118	499,192	502,111	506,529

Source: Western Economic Services (WES) 2005

Carbon County has a somewhat different ethnicity pattern than the state as a whole, according to the 2000 census (U.S. Bureau of the Census 2000). Both the county and the state are predominantly white, 90.1% for Carbon County and 92.1% for Wyoming, but the percentages of non-whites differ. Carbon County had lower percentages of Native Americans and African Americans, but a slightly higher percentage of Asians. The most notable difference is that Carbon County's Hispanic or Latino population was at 13.5% compared to just 6.4% for the state as a whole (U.S. Bureau of the Census 2000). The smaller communities near the project area are all predominantly white, ranging from 95.4% in Saratoga to 97.8% in Medicine Bow; Hanna was 95.5% white in 2000 (U.S. Bureau of the Census 2000). Hispanics or Latinos were the largest identified ethnic group in each of the small communities. Not surprisingly, Rawlins, Carbon County's largest city, had the largest population of self-identified non-whites; 21% were classified as Hispanic or Latino of any race. Other racial and ethnic groups were all quite small.

3.16.2 Economic Conditions

3.16.2.1 Employment and Income.

Carbon County was named for the area's coalbeds. As recently as a decade ago, the county's economy was heavily based on natural resources. The county's mining sector once had over 3,000 workers and produced between 3 million and 5 million tons of coal per year from 1988 to 1998. The entire sector, which includes oil and gas workers, was down from 661 workers in 1993 to just 173 workers by 2003 (Table 3-12). (Although similar, the category definitions changed between 1993 and 2003 so the numbers may not be exactly comparable.) Coal production had dropped to less than 276,000 tons in 2003.

Table 3-12 Carbon County and Wyoming Employment by Industry[1] 2003

Industry	Carbon County		Wyoming	
	Employment	Percent	Employment	Percent
Farm Employment	529	5.5%	12,192	3.6%
Nonfarm Private Employment				
Forestry, Fishing & Related Activities	153	1.6%	3,155	0.9%
Mining	173	1.8%	20,881	6.1%
Construction	698	7.3%	27,544	8.0%
Manufacturing	469	4.9%	10,940	3.2%
Wholesale Trade	159	1.7%	8,000	2.3%
Retail Trade	1,135	11.8%	39,577	11.6%
Transportation, Warehousing & Utilities	564	5.9%	14,070	4.1%
Information	91	0.9%	4,802	1.4%
Financial Activities	556	5.8%	23,367	6.8%
Professional & Business Services	ND[2]	---	27,350	8.0%
Educational & Health Services	571	5.9%	28,086	8.2%
Leisure & Hospitality	1,192	12.4%	37,075	10.8%
Other Services, except Public Admin.	523	5.4%	18,217	5.3%
Private Sector Subtotal	7,383	76.9%	275,256	80.4%
Government & Gov't Enterprises				
Federal, Civilian	217	2.3%	7,482	2.2%
Military	85	0.9%	6,349	1.9%
State Government	626	6.5%	14,570	4.3%
Local Government	1,291	13.4%	38,706	11.3%
Public Sector Subtotal	2,219	23.1%	67,107	19.6%
Total	**9,602**	**100.0%**	**342,363**	**100.0%**

Source: WDAI 2005a
[1]2002 North American Industry Classification System (NAICS) Sectors
[2]ND = Data not disclosed to comply with confidentiality standards; estimates are included in totals.

Basic economic sectors (i.e., those that bring outside revenues into the county) still include oil and gas production and processing, coal mining, electric power generation, agriculture (primarily ranching and logging), some manufacturing, transportation, and portions of the retail and service sectors that serve travelers, tourists, and recreationists. However, the balance has shifted. As illustrated in Table 3-13, the economic sectors that exceed state average employment levels by more than 1.0% (on a comparative percentage basis) are now farming, manufacturing, transportation and related services, leisure and hospitality services, and state and local government. A large portion of the first three categories and at least some of the fourth would be considered basic industries.

Total Carbon County employment, defined as the total number of full- and part-time jobs, increased 2.8% over the last decade, from 9,344 in 1993 to 9,602 in 2003. The type of employment shifted somewhat, however, with wage and salary employment losing 231 jobs and proprietors employment increasing by 489, all but 18 of which were non-farm proprietors (Wyoming Department of Administration and Information [WDAI] 2005a). Despite some gains in oil and gas development, the mining sector suffered the largest percentage loss of jobs over the decade at 74%; the construction sector was the largest gainer with a 72% increase in employment, some of which may have been in support of oil and gas drilling (WDAI 2005a).

Carbon County unemployment rates over the past decade have ranged from a high of 6.2% in 1993 to a low of 4.2% in 2000. The rate was 4.6% in 2004, representing 356 people seeking employment (Wyoming Department of Employment [WDOE] 2005). Unemployment rates in the county have consistently been higher than the statewide rate in recent years by from 0.1% to as much as 1.2%. The statewide rate was 3.9% in 2004 (WDOE 2005).

Total personal income for Carbon County grew from $305.4 million in 1993 to $422.1 million in 2003, representing a 3.0% average annual rate of increase (WDAI 2005a). The growth rate lagged substantially behind the average of 5.5% per year for Wyoming as a whole. Per capita personal income is perhaps a more telling comparison. Wyoming statewide per capita personal income grew at 4.6% per year from $19,976 in 1993 to $32,433 in 2003. Starting form a slightly lower average of $18,757 in 1993 (93.9% of the state average), Carbon County's per capita personal income grew at 3.7% per year to $27,479 in 2003, which was 84.7% of the state level (WDAI 2005a).

The Department of Housing and Urban Development (HUD) estimated 2005 median family income at $50,600 for Carbon County and $55,250 for Wyoming as a whole (WES 2005). Using different methods, the Census Bureau estimated that 12.2% of Carbon County's population was living below the poverty level in 2003, compared with an estimated 10.8% of the state population for the same year (U.S. Bureau of the Census 2005).

Carbon County natural gas production has fluctuated between 94 million cubic feet (MMCF) and 98 MMCF over the past 5 years, with 2004 production at 97.2 MMCF (WOGCC 2001-2005). Carbon County oil production has ranged from just under 1.6 million barrels to nearly 1.8 million barrels over the same time period, with 2004 production at the 1.8-million barrels level (WOGCC 2001-2005). There were a total of 1,120 producing oil and gas wells in Carbon County in 2004, producing 6.7% of all gas produced in Wyoming and 2.7% of all oil. There were 293 approved drilling permits in the county in 2004, the most of any of the past 5 years. If oil and gas prices remain at current levels and drilling efforts are successful, it could be expected that drilling will grow and production will increase.

Table 3-13 2004 Annual Average Daily Traffic Counts[1]

Route	Location	AADT		
		Cars	Trucks	Total
I-80	WY 72 Interchange	2,710	3,200	5,910
U.S. 30/287	Hanna Vicinity	540	120	660
WY 72	Between I-80 and U.S. 30/287	110	40	150

Source: Wyoming Department of Transportation (WYDOT) 2005
[1]Annual Average Daily Traffic (AADT)

3.16.2.2 Local and State Government Revenues

In addition to the jobs provided by oil and gas, the communities receive tax revenues from oil and gas severance taxes and from sales and use taxes generated by purchases in the oil fields and spending by workers for goods. Oil and gas producers pay ad valorem taxes on equipment and production. They also pay royalties on production from state and federal leases at 16.67% and 12.5%, respectively. Half of the federal lease payments are returned to the state. In

Wyoming, the state's share is distributed to a variety of accounts, including the university, the school foundation fund, the highway fund, the legislative royalty impact account, and cities, towns and counties.

The severance tax rate for oil and gas is 6.0%, of which 0.25% is distributed to counties and 0.75% is distributed to cities and towns, based on population. The remaining 5.0% is committed to various state funds and accounts. The Oil and Gas Conservation mill levy is now 0.02%, down from the 0.06% as recently as 2004 (WOGCC 2005).

Carbon County's assessed valuation totaled $559.9 million for fiscal year (FY) 2004, 82% of which was "state assessed" property, including oil and gas production. Approximately $366.1 million, or 65% of the total, was attributed to the taxable value of natural gas (Wyoming Department of Revenue [WDOR] 2005). The average mill levy in Carbon County is 63.493 mills for 2004, which yielded a total of $35.5 million in revenue (WDOR 2005).

Sales and use tax collections in Carbon County totaled approximately $4.4 million for FY 2004. Sales and use taxes in the county include a 4% state tax, a 1% general purpose option tax, and a 1% special purpose option tax for a total of 6%. In addition, the county levies a 2% lodging tax for a total of 8% on lodging (WDAI 2005b).

3.16.3 Housing

The exploratory nature and scale of the proposed Hanna Draw Pilot Project is such that most workers would either be local hires or would be in the area for a relatively short time while the wells were drilled and completed. Under these circumstances, there would be little or no demand for permanent housing facilities. Rather, there would be a need for temporary housing, including motel rooms, mobile home and recreational vehicle (RV) spaces, and possibly short-term rental apartments.

The most recent Wyoming housing surveys indicated that the rental housing vacancy rate in Carbon County was 7.6%, more than double the statewide average and higher than most housing planners would consider necessary to accommodate normal flux in a rental market (WES 2005). The survey also found a 32% vacancy rate for mobile home lots for rent (not including RV sites), which represents 102 lots available to rent (WES 2005).

There are numerous temporary lodging facilities in communities near the project area. Hanna has 1 motel; Elk Mountain has 1 hotel with adjacent RV spaces and a guest cabin facility; Medicine Bow has 1 hotel and 1 motel with a combined 60 units, and Saratoga has 9 motels and lodges and 2 RV/campground facilities. Rawlins has 23 motels and bed & breakfast facilities and 4 RV/campground facilities.

3.16.4 Emergency Services

Memorial Hospital of Carbon County in Rawlins is the nearest full service medical facility to the proposed project site. The 35-bed facility provides CT Scan, mobile MRI, ultrasonography, mammography, intensive care, an OB unit, nuclear medicine, a fully equipped laboratory, children's clinic, extended care facility and a physician-staffed emergency room. Emergency medical air transportation links the hospital to Casper, Cheyenne, Denver and Salt Lake City (Memorial Hospital 2005).
Memorial Hospital also provides a clinic in Hanna. The clinic is staffed by a Physician's Assistant (PA) 5 days per week augmented by one or more physicians once per week (Lessard

2005). Other medical services, such as dental care and mental health services are available in Rawlins.

Fire protection in the project area is provided by the all-volunteer fire department based in Hanna, with back-up and support from the Carbon County Fire Department. The Hanna department has a staff of approximately 15, most of whom are also EMT certified. Staff are hazardous materials certified and qualified to provide rescue services. Equipment based at Hanna includes both city- and county-owned pumpers and wildland fire equipment, including a water truck, all-wheel drive trucks and "dip tanks" (Lessard 2005). The Hanna volunteer organization owns its ambulance and provides first responder service and emergency transport to the nearest emergency hospital, usually in Rawllins.

Law enforcement services in the Hanna Draw Pilot Project vicinity are provided by the Carbon County Sheriff's Department, which has a deputy stationed in Hanna and one in Medicine Bow. The Town of Hanna has a town Marshall with three officers providing 24-hour service and emergency dispatch service (Lessard 2005).

3.16.5 Attitudes and Opinions

The last formal survey of Carbon County residents' attitudes and opinions regarding land use, oil and gas development, natural resource conservation and use, and other topics was conducted in 1996 as part of the process to develop the county's Land Use Plan (Carbon County 1998). Although the survey was conducted several years prior to the current interest in development of coalbed natural gas, it provides some background on community priorities. The top priority expressed by county residents was to conserve water resources and there was a related concern for the continuing availability of water to support future development. Many county residents expressed concerns about governmental regulation of land use, apparently in reference primarily to federal agency activities. Residents also were concerned about both the continuing viability of existing natural resource based economic activities (including oil and gas and ranching, among others) and the need to conserve wildlife habitat in the county (Carbon County 1998).

Specifically regarding oil and gas development, results from the Rawlins area indicated conservation of water, land, and wildlife resources was of greater importance than increased oil and gas production, while residents of smaller outlying communities, including Medicine Bow, expressed a greater desire for increased oil and gas production (Carbon County 1998). In contrast, nearly half of the survey respondents favored more leasing of federal lands for oil and gas exploration and production (Carbon County 1998). Regarding management of federal lands, more than two-thirds of respondents wanted more federal lands in the county designated for conservation of fish and wildlife habitat and surface and groundwater resources and nearly as many wanted more land designated for public recreation (Carbon County 1998).

3.16.6 Environmental Justice

Executive Order No. 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations" (59 FR 7629), is "intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority communities and low-income communities access to public information on, and an opportunity for participation in, matters relating to human health and the environment." It requires each federal agency to achieve environmental justice as part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse

human health or environmental effects, including social and economic effects, of its programs, policies, and activities on minority and low-income populations.

Environmental justice concerns are usually directly associated with impacts on the natural and physical environment, but these impacts are likely to be interrelated with social and economic impacts as well.

EPA guidelines (Council on Environmental Quality [CEQ] 1997) for evaluating potential adverse environmental effects of projects require specific identification of minority populations when either: 1) a minority population exceeds 50% of the population of the affected area or 2) a minority population represents a meaningfully greater increment of the affected population than of the population of some other appropriate geographic unit, such as the State of Wyoming, as a whole. While the Hispanic/Latino population of Rawlins is notably higher than for the state as a whole (also resulting in higher levels on average for the county) the percentages of Hispanic/Latinos in all of the smaller communities in the project vicinity are below the state average, sometimes by a large margin (see Section 3.16.1 above). Percentages of families and individuals below the poverty level are higher in Carbon County and most of the communities in the vicinity of the project area than in the state as a whole.

3.17 TRANSPORTATION AND ACCESS

The primary access to the Hanna Draw Pilot Project vicinity is Interstate 80 (I-80) approximately 20 miles south of the project area. I-80 runs east and west to Cheyenne, Salt Lake City, and points beyond. I-80 is a 4-lane, interstate standard freeway in good to excellent condition. U.S. 30/287 also runs east and west approximately 10 miles south of the project area, and just south of the Town of Hanna, looping off of I-80 from Walcott to Laramie. U.S. 30/287 is a 2-lane, paved highway in fair to good condition. State Highway (SH) 72, also a paved, 2-lane highway, connects I-80 at exit 255 to Hanna across U.S. 30/287.

CR 291, also known as the Hanna Leo Road, provides access from Hanna north to the project area. CR 291 is a well maintained, gravel surface, all-weather road. CR 291 continues north from the project area across the Medicine Bow River and on to Alcova. CR 270 intersects CR 291 just north of the river and travels easterly to the Medicine Bow.

Traffic levels on all roads are well below their capacities. Traffic volume counts for the paved state and federal highways are illustrated in Table 3-13. Traffic counts are not available for the county roads.

Current plans for road improvements in the project vicinity include widening and reconstruction of WY 72 between U.S. 30/287 and I-80. Preliminary engineering for this project is scheduled for FY 2005 (WYDOT 2004).

In addition to the improved roads in the project vicinity, there are a number of unimproved and/or seldom maintained two-track routes in various directions across the range. Portions of the proposed interconnect pipeline route can be accessed by two-tracks. Conditions on these routes vary widely, depending on terrain, soil conditions, and whether they have a use that requires regular access and thus warrants maintenance by a user. The existing access road through the project site from CR 291 has been improved with a gravel surface in the past, but is currently in poor to fair condition from minimal maintenance.

The Union Pacific Railroad mainline runs through Hanna; it carried approximately 75, 100-car trains per day in the mid-to-late 1990s (Carbon County 1998). Several spur tracks off the mainline serve larger industrial customers, including coal mines. In addition there are several major east-west natural gas pipelines crossing the area south of Hanna.

3.18 HEALTH AND SAFETY

Due to the relatively remote nature of the Hanna Draw Pilot Project area, there is a low level of concern regarding health and safety impacts to the human population under existing conditions. Activities examined as part of the Proposed Action primarily include occupational hazards associated with oil and gas exploration and operations and risks associated with vehicular travel on improved and unimproved county and BLM roads.

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

CHAPTER 4

Environmental Consequences

This chapter of the environmental assessment provides an analysis of the potential environmental consequences that could result from implementation of the Proposed Action and the No Action alternatives. Potential consequences or impacts under these two alternatives are discussed in separate sections for each resource (Sections 4.1 through 4.18), and cumulative impacts are discussed by resource in Section 4.19. An environmental impact may be either a direct or indirect result of the Proposed Action, and either permanent and long-term or temporary and short-term. This EA assumes that all applicant-committed measures described in Section 2.1.8 would be successfully implemented, and other protection measure required by the BLM or committed to as part of the project's MSUP would apply as well. Additional mitigation was recommended where additional reduction in impacts was warranted by BLM policy and Land Use Plan decisions for specific environmental resources.

4.1 AIR QUALITY

4.1.1 Proposed Action

Air pollutant emissions would be generated from the small number of exploratory wells and facilities proposed for the Pilot Project during well pad construction activities and production. Emissions would occur temporarily during well pad construction and over the life of the project for production.

Air pollutant emissions from the well pad construction activities would result in low level, temporary effects to air quality in the immediate project vicinity, caused by particulate matter and exhausts from vehicles and equipment. As delineated in the project MSUP (see Appendix A), dust abatement measures would comply with all applicable WOGCC requirements.

If these 15 pilot wells were deemed economical to produce, a complete air quality construction permit application would be prepared in strict accordance with WAQSR. The construction permit application package would be completed pursuant to requirements set out under WAQSR Chapter 6, Section 2.

Temporary air pollutant emissions would occur from project construction and production of gas wells within the Hanna Draw Pilot Project area. Emissions from construction would include PM_{10}, SO_2, NO_x, CO, and volatile organic compounds (VOCs) from ground clearing, use of heavy equipment, drilling, and well completion, as well as from construction of access roads. Emissions from construction would be temporary and would occur in isolation, and would not likely interact with emissions from adjacent wells.

Production emissions of NO_x, CO, VOCs, and HAPs (specifically formaldehyde) would result primarily from operation of the compressor engines. Estimated impacts to air quality assumed that the average potential emission rate of NO_x for the compressor engines would be approximately 1.5 grams per brake horsepower hour (g/bhp-hr) of operation and CO and VOC emissions would be approximately 0.5 g/bhp-hr. Application of state-regulated BACT was considered in estimating emissions from compression.

Current control technology can reduce NO_x emissions to between 0.7 and 1.5 g/bhp-hr. Emissions of CO and HAPs (formaldehyde) would be controlled with an oxidation catalyst. The emissions generated from operation of the compressors would contain negligible amounts of SO_2 and particulate matter because of the composition of natural gas. The emissions resulting from compression operations were calculated for a total of 2,300 horse power (hp) (based on 2 IC engines rated at 1,151 bhp each) resulting in 33 tons per year (tpy) NO_x, 11 tpy CO, 11 tpy VOC, and less than 1.6 tpy formaldehyde. Production emissions from the compressor engines would occur over the life of the project. Emissions from production wells would be negligible because the produced gas is nearly 100% methane and would require no ancillary production facilities at the well site.

The BLM issued the Final Environmental Impact Statement for the Desolation Flats Natural Gas Development Project in 2004 (BLM 2004a). The proposed project is located south of the Pilot Project 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% 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 kilometers [km]) and far-field (50 to more than 200 km) levels. The results of the modeling studies for this project indicate that no adverse impacts to air quality from the Desolation Flats Project alone would be anticipated as a result of development of any alternative for sub-grid or near-field domains. Therefore, no adverse impacts to air quality would be expected from the much lower levels of development for the Pilot Project.

The Pilot Project 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. 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.

In summary, no violations of applicable ambient air quality standards (NAAQS/WAAQS), PSD increments, or Air Quality Related Values (AQRV) would be expected to occur as a result of direct or indirect emissions of air pollutants from natural gas development (including both construction and operation) in the project area, particularly when compared to the detailed air quality impact assessment completed for the proposed Desolation Flats full-field development (BLM 2004a). Future well development would be in strict accordance with the WAQSR. Additionally, APC measures to reduce impacts to air quality, as outlined in Section 2.1.5.4 of this EA and the MSUP in Appendix A, would reduce non-particulate emissions by ensuring vehicles, rig engines, and other similar equipment are maintained in proper operational condition. Frequent watering of project access roads would likely achieve reductions in PM_{10} emissions by 50% or better.

4.1.2 No Action Alternative

Under the No Action Alternative, proposed development would not occur and no increased project-related air pollutant emissions would be generated in the short term.

4.1.3 Mitigation

No additional mitigation or monitoring measures have been developed for air quality resources.

4.2 GEOLOGY AND GEOLOGIC HAZARDS

4.2.1 Proposed Action

The Proposed Action would result in the removal of CBNG resources from Hanna Formation coals through the drilling of wells and the construction of pipelines. The process would involve drilling and completing wells to depths of approximately 5,000 feet below the ground surface. Installation of the proposed CBNG interconnect pipeline from the well sites to the south and southwest would necessitate trenching through soil cover and weathered bedrock units including the Hanna, Ferris, Medicine Bow, Lewis and Mesa Verde Group formations.

No impacts from reduced slope stability would be anticipated from project construction in the drilling area. Some changes to topography from cut and fill operations during construction of new roads, drill pads, and ancillary facilities would occur; however, this level of impact would be low for a project of this scale and given the project area topography.

Potential geologic hazards that could impact the proposed project include seismicity, flooding, subsidence, and landslides. The proposed Pilot Project activities would pose no additional risk to seismic activity as the project would involve the extraction of water as opposed to underground injection of fluids. Overall, the seismic risk in southern Wyoming is very low so that the impact of potential seismic activity on the proposed project is anticipated to be low.

Flooding would pose little risk to infrastructure associated with the Pilot Project. Although the proposed CBNG interconnect pipeline would cross several drainages, once constructed, flash-flooding would not affect a completed and operational pipeline. Construction may provide an increase in sediment load to local drainages. Given the high sediment yield associated with flash flooding in this region, this increase would be temporary and negligible as stream bed and vegetation is re-established.

The proposed interconnect pipeline alignment would avoid active and historic coal mining operations in the area, thereby minimizing potential subsidence impacts from project construction. As stated in Section 3.2.3, ground subsidence from the withdrawal of produced water is of concern for CBNG development. The removal of groundwater from unconsolidated sand and gravel aquifers has resulted in subsidence in areas such as the San Joaquin Valley, Las Vegas, New Orleans, Houston, and Mexico City. As much as 29 feet of subsidence has been recorded. However, the geologic strata underlying the Pilot Project consists of consolidated rock with porosities much lower than unconsolidated sand and gravel, and, therefore, much less likely to be compressed following dewatering. The estimates of ground subsidence associated with CBNG production for the Wyodak coal in the Powder River Basin predict subsidence of less than 0.5 inch (Case et al. 2002). Additionally, affected coal seams are much deeper

than those in the Powder River Basin and any subsidence would be expected to be attenuated because of the increased depth.

Landslides deposits or active landslides have not been documented within the project area. Excavation for pipeline construction on steep slopes or along the toe of hillslopes could trigger small slides under ideal slope, soil type, and saturation conditions. Movement of backfill material in the pipeline excavation could lead to small slides after completion of pipeline construction activity. Overall potential for slope failure would be considered low, however, given the use of erosion control and reclamation procedures to minimize soil erosion from pipeline backfill.

4.2.2 No Action Alternative

Under the No Action Alternative, the Pilot Project would not be implemented and CBNG in the project area would not be developed through surface disturbance or excavation related to drilling and pipeline construction activities. Therefore, there would be no impacts related to geology and geologic hazards from the No Action Alternative.

4.2.3 Mitigation

No additional mitigations have been developed for geology or geologic hazards.

4.3 PALEONTOLOGICAL RESOURCES

4.3.1 The Proposed Action

Potential direct impacts to paleontological resources could occur during implementation of the Pilot Project if surface disturbance associated with the project results in the exposure and destruction of important fossil resources and the loss of geologic information. Paleontological resources may be exposed and/or destroyed during excavation activities associated with drill pad, facility, and pipeline construction for the Pilot Project. As discussed in Section 3.3, Paleontological Resources, several geological formations underlie the Pilot Project area that meet the criteria for PFYC Class 4 with exposures of geological units or settings that have high potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. An indirect impact to resources also could occur due to private collection or vandalism related to increased human presence in the area.

Potential impacts to paleontological resources would be minimized because of the requirement in the BLM's Great Divide Resource Management Plan (BLM 1987, 1988) which requires the recovery or avoidance of paleontological resources uncovered during ground-disturbing activities. Additionally, APC has committed to the standard BLM stipulation to protect paleontological resources, as outlined in Section 2.1.8. If paleontological resources were discovered, a BLM-approved professional paleontologist would evaluate these finds and BLM would determine the appropriate action or actions to maintain the scientific value of a discovery.

4.3.2 The No Action Alternative

Under the No Action Alternative, no additional direct or indirect incremental effects to

undiscovered paleontological resources would occur.

4.3.3 Mitigation

No additional mitigation measures have been developed for paleontological resources.

4.4 SOILS

4.4.1 Proposed Action

An estimated 399 acres of soils would be impacted during project construction and operation. During the construction phase, facility and utility sites would be cleared of vegetation, graded or excavated to specifications, and the construction/burial of facilities and utilities completed. As delineated in APC's MSUP (see Appendix A), surface soils would be salvaged and windrowed/stockpiled along the borders of all proposed disturbed sites. Subsoils and other subgrade materials would remain in place for the life of the project, excepting for utility line burial disturbances where the subsoils would be excavated and replaced within a relatively short time span. Erosion and sediment control features would be constructed, as required. The construction phase of the project would be completed with the implementation of a concurrent reclamation plan applied to disturbances not required for the operations phase of this project (see Appendix A).

The operations phase would involve the continued disturbance of soils associated with the operating well pads, utility corridors (including roads and utility lines), and CCF. At the close of operations, aboveground facilities and road surfacing materials would be removed, disturbed sites regraded to the desired contours, stockpiled soil replaced, and revegetation completed. Erosion and sediment features would remain in place until no longer needed.

The linear nature of the proposed interconnect pipeline and power line corridors, yielding disturbances with high edge:area ratios, would increase the potential for overall reclamation success as compared to broader-type and more extensive surface disturbances. Desirable plant species establishment from adjacent undisturbed areas would be enhanced and the time required to achieve successful reclamation potentially shortened.

4.4.1.1 Impacts to Soil Chemical, Physical, and Microbial Characteristics

Impacts to soil resources resulting from these proposed disturbances include those that would affect the chemical, physical, and microbial nature of the endemic soils as well as the volumes available for reclamation. Soil chemical parameters that could be permanently modified as a result of the proposed soil salvage program include pH, salinity, sodicity, and fertility. Soil surface horizons would be mixed during soil salvage, resulting in a blending of characteristics, as compared to the soils in their natural state. Soil chemistry also would be modified through soil stockpiling as anaerobic conditions within the stockpiles develop, depending on stockpile size, depth, and longevity. A number of soil physical characteristics such as structure, texture, and rock fragment content would be permanently modified through blending during surface soil salvage and

replacement operations. Given that only surface soils would be salvaged/stockpiled, individual disturbances would result in little mixing of divergent soil types is likely to occur, the impacts to soils associated with salvage and replacement activities are considered to be limited in duration and intensity. The surface soil horizons would be mixed at any one site and would likely be similar in both chemical and physical characteristics and, given the site-specific soil volumes involved, would not likely result in a negative impact in terms of reclamation potential. The proposed reclamation program should, overall, adequately address these soil chemical and physical concerns and limit the impacts of soil salvage and replacement in the short term, following soil reapplication on disturbed surfaces.

Isolated spill accidents, should they occur, would result in soil contamination from oils, diesel fuel, solvents, etc. Soils impacted by chemical spills would either be removed to an approved disposal site or bio-remediated in-place to effectively reduce the effects of this potential impact. No impacts to the revegetation potential of the soil resource would be anticipated.

Compaction, particularly along access road disturbances and along linear ROWs, would reduce the aeration, permeability, and water-holding capacity of impacted soils from construction through the operations phase of this project. However, APC has committed to disk, rip, or otherwise treat disturbed sites where compaction could interfere with successful revegetation as part of the project's reclamation plan (see Section 2.1.8). The effects of compaction, once these techniques are properly applied, would be reduced to a short-term impact.

Soil microbial populations would likely change with a potential overall loss of nitrifying-type species as surface soils are salvaged and placed in stockpiles. This impact would be most notable in larger stockpiles where surface soils supporting microbial populations are buried to depths dominated by anaerobic conditions. The loss of such species would be less notable in smaller stockpiles windrowed along access roads or well pad boundaries where aerobic conditions dominate. Impacted soil microbial populations should reestablish readily over time following soil reapplication through natural invasion from adjacent undisturbed soils. The reclamation techniques to be applied also would aid in reestablishing soil microbial populations as reclaimed plant communities develop. This is considered to be a short-term impact.

It is assumed that any dust control chemicals used onsite would be non-toxic to soil micro flora/fauna and no long-term buildup leading to soil sterility would occur.

Cryptobiotic soils (soil crusts) are of concern to the BLM in terms of the ability of these soils to stabilize undisturbed soil surfaces and enhance the growth of plant species in semi-arid areas. Cryptobiotic soils are formed by blue-green algae, soil lichens, mosses, green algae, micro-fungi, and bacteria. Filaments, sheaths, hyphae, rhizines, and rhizoids are produced by these entities resulting in a bonding of soil particles forming a biological soil crust. The soil crusts that are formed typically decrease runoff and overall erodibility of the soil and increase water filtration and soil fertility levels (Belnap no date; USGS 2000). Soil crust development is not typically amenable to surface disturbances such as intense fires or cattle grazing. It also is uncommon on soils dominated by high coarse fragment contents, rock outcrops, or surface rock exposures. Soils exhibiting high herbaceous plant cover percentages do not typically support soil crust formation.

Cyptobiotic soils were not surveyed for in the field as a part this project. It is assumed that crusts occur within the boundaries of the proposed disturbances, although to what degree is uncertain. It can be assumed that surface disturbance activities associated with this project would disturb and/or eliminate crusts onsite. The degree or intensity of this impact cannot be accurately assessed.

4.4.1.2 Impacts to Sensitive Soils

Saline and sodic soils are rare across the project area as mapped by the NRCS. Such soils are associated primarily with the proposed drilling area disturbance. Potential impacts to saline and/or sodic soils focus on the suitability of these soils for reclamation and the availability of sufficient quantities of soil material for salvage and reapplication. These soils often exhibit droughty profiles due to high salinity levels and also may be subject to decreased soil aeration, infiltration, and permeability under high sodium levels when coupled with clayey soil textures. However, the soils exhibiting these characteristics in the proposed Section 2 drilling area support adapted, native vegetation communities. It can be assumed that with sufficient soil depths, efficient soil handling, and the planting of adapted species, reclamation of these disturbances could be achieved.

No activities, excepting potential temporary disturbances associated with pipeline and power line construction ROWs would occur on slopes greater than 25%. Soil map units overlying steeper slope ranges occur across the area proposed for such disturbances but are most commonly associated with the “breaks” south of the Medicine Bow River and in the area of Sand, Edson, and Dana ridges near the southern terminus of the proposed CBNG interconnect pipeline ROW. Shallow soil depths coupled with moderate to severe wind and/or water erosion potentials are the norm for such map units. Stockpiled soils and soils respread over regraded disturbances on steeper slopes may be subject to increased runoff and higher erosion potentials until soil stabilization goals have been met. Mulching may be required to successfully stabilize these disturbed soils and to meet vegetation establishment goals.

Impacts to steeper slopes are considered to be mitigable and short-term, assuming that proper soil handling and revegetation techniques are employed. Disturbance footprints may be visible for a limited time beyond the point when they are successfully stabilized and vegetation production is restored.

Shallow soils are common across the project area and dominate all or in part, the majority of the proposed disturbances excluding drainage, floodplain, alluvial fan, and pediment land forms. Shallow soils are more susceptible to the negative affects of increased erosion due to the limited soil material available for supporting vegetation. Soil salvage and reapplication operations occurring on more gentle slopes could be conducted in shallow soil situations with adequate efficiencies. However, salvage/reapplication operations conducted under steep slope conditions would potentially be less efficient requiring a greater attention to detail during equipment operations. Similarly, surface stabilization following soil reapplication would be important to be certain that a sufficient depth of soil remains over disturbed sites to achieve site stabilization and plant establishment goals.

Impacts to shallow soils, where soil salvage/replacement and revegetation techniques could be applied efficiently, also are considered to be short-term and mitigable. Impacts

to shallow soils where soils could not be salvaged or replaced due to equipment capabilities or slope/topographic influences would be viewed as a long-term impact. The few areas proposed to be disturbed as part of the proposed Pilot Project that fall into this category are associated with steeper slopes and rock outcrops.

Soil map units characterized by moderate to severe or severe water and/or wind erosion potentials are dominant across the project area. Erosion potentials are typically highest during the construction phase of this type of project, decreasing in severity as concurrent revegetation, soil stockpile, and erosion control activities are completed. Erosion potentials would again rise at specific sites as the project is terminated and regrading/resoiling operations are initiated. Erosion hazard potentials would then again decline as the reapplied soils are stabilized and vegetation communities become established.

APC has developed a number of site management and construction techniques as part of the Proposed Action and the company's MSUP (see Section 2.1.2 and Appendix A). These techniques and approaches include using existing roads for access purposes to the degree possible, applying BLM "best management practices" during construction and revegetation activities (BLM 1988), minimizing new disturbances to the acreage necessary to complete construction and operations, siting project facilities to avoid or minimize disturbances to sensitive soils, and employing appropriate road maintenance techniques. Overall, impacts to highly erodible soils on more gentle slopes would be mitigable and short-term, assuming the application of the appropriate construction and reclamation techniques. The confounding factors of steep slopes and/or shallow soil depths added to high erosion hazards would inhibit reclamation potentials to varying degrees and increase the time required to achieve site stabilization and reclamation objectives.

4.4.2 No Action Alternative

Under the No Action Alternative, no project facilities would be constructed. The portions of the project area proposed for disturbance under the Proposed Action would continue in its present state supporting existing land uses. Natural rates of soil development and erosion would continue mirroring historic conditions.

4.4.3 Mitigation

No additional mitigation measures have been developed for soils resources.

4.5 WATER RESOURCES

4.5.1 Surface Water

4.5.1.1 Proposed Action

Under the Proposed Action, a maximum of 40,000 bbl/day (equivalent to 2.6 cfs) would be generated and stored (under a WYPDES permit) in the permitted, existing reservoir located in Section 13 (see Figure 2-2), not to exceed the estimated reservoir capacity of 500 acre-feet. Produced water would be collected in buried polyethylene flowlines at individual wells for transport to the reservoir.

Chapter 2 describes the extent of anticipated surface disturbance from (see Table 2-1) project construction. Impacts to surface water are not directly related to surface disturbance. Roads and pads can impact surface hydrology beyond the initial disturbance concentration of run-off. The Proposed Action may result in adverse but localized impacts to intermittent and ephemeral water resources as a result of removal of surface cover, mixing of soil horizons, compaction, loss of topsoil productivity, and increased susceptibility to erosion. Such impacts, if any, would occur within fee section T24N R81W S35 and public section T23N R81W S2 (see Figure 2-2).

The existing, permitted reservoir intended to accommodate the produced water has an estimated capacity of 500 acre-feet with a minimum freeboard of 5 feet. It is expected to accommodate the temporary water storage needs under this exploratory drilling program and the terms of the WYPDES permit. Based on the maximum anticipated flow rate of 40,000 bbl/day, the reservoir could contain approximately 97 days of production water. APC would operate the system to meet the requirements of the permit while not exceeding the holding capacity of the reservoir, as described in the SEO permit for the reservoir.

No removal or diversion of existing surface water resources is planned for the proposed project, so no impacts to existing surface water rights would be anticipated. The existing reservoir is permitted as a Class 3B water body and is located entirely on private land. Water quality data suggest that the produced water would be suitable for livestock and wildlife consumption, the likely uses of this water. Furthermore, the data also suggest that the produced water will meet the criteria for the designated uses of Class 3B waters (aquatic life other than fish, recreation, agriculture (livestock watering), wildlife, industry and scenic value). As noted in the WMP and in Section 2.1.7.2, APC would inspect two monitoring locations (downstream of each dam face) on a weekly basis during operations to ensure there is no reservoir seepage.

As specified in the renewed permit for the reservoir (Permit #WY0044164), the produced water would be contained in an on-channel reservoir within a class 3B receiving stream, which is eventually tributary to a class 2AB perennial water of the state. The permit establishes effluent limits for the end of pipe are protective of all designated uses of the class 3B receiving waters, which include aquatic life other than fish, recreation, agriculture (livestock watering), wildlife, industry, and scenic value.

Some infiltration of waters from the reservoir is anticipated and may result in seepage areas below the dikes on the east and west sides of the reservoir. Infiltration from the reservoir could potentially result in surface flow below the reservoir during the life of the project. The WYPDES permit has two points of compliance on either end of the reservoir that would be established to determine if surface flows occur, contrary to the intent of the permit for full containment. Monitoring would be done through visual inspection, but no monitoring of the shallow groundwater by APC is planned. Based on the intent of the WYPDES permit of full containment, there are no impacts expected to BLM lands below the reservoir. Impacts to channels below the reservoir due to surface flow resulting from reservoir seepage were not evaluated in this analysis (Hanna Draw tributary on the west or Pine Draw tributary on the east). No surface flows are anticipated based on the WYPDES permit's intent of full containment of produced water in the reservoir.

As the reservoir fills, dike faces that have not been saturated in the past would be saturated for the first time. Discharge from the reservoir would occur through only evaporation of infiltration given that there is no outfall or method to withdraw water from the reservoir once the reservoir is filled. In addition, the WYPDES permit does not allow any discharge of project-produced water below the reservoir. The long dimension of the reservoir is aligned parallel to the prevailing winds, and this coupled with the long fetch (~2,500 feet), is likely to result in wind-generated wave action at the dam faces. Since there is no outlet works or spillway, if such erosion were observed, the only recourse would be to cease discharge, with the expectation that evaporation and infiltration would lower the volume of water before further damage or potential failure of the dikes occurred. As stated in the WMP APC would reinforce the dam faces with an erosion control device to help prevent any erosion due to wave action, and they would inspect the dams quarterly or after major storm events for the first year of operation. Furthermore, the SEO has determined that this reservoir appears to be properly functioning and is not a high hazard dam because dam failure would not likely result in the loss of life or significant property loss.

Upon completion of the proposed Pilot Project, the water in the reservoir would be allowed to evaporate. Assuming an annual evaporation rate of 123 acre-feet, an annual precipitation input to the reservoir of 35 acre-feet, annual runoff into the reservoir of 13 acre-feet, and a full reservoir (500 acre-feet) at the end of the project, it would require approximately 6 years for complete water evaporation in the reservoir. Complete evaporation would likely occur more quickly because, as water levels decline, water temperatures would increase and evaporation rates would increase, accordingly. Salts and other major constituent concentrations would increase during this process, as is commonly observed in local stock ponds and other impoundments, which typically fill and dry annually, and because of the salt content in the produced waters.

Reservoir Reclamation

For the existing reservoir area, WDEQ would require reclamation of the impoundment through its WYPDES permitting process. If the reservoir would not be retained for further use following cessation of CBNG produced water discharge, APC may be required to perform some or all of the following reclamation activities, in accordance with the state permit:

- Sample and analyze the soil on the floor of the reservoir.
- Excavate layers of salts and mineral residue that may exceed acceptable agronomic concentrations, and isolate or place this material in a shallow disposal pit (less than 2 acre disturbance) so it would not leach into surface or groundwater.
- Backfill, contour, and grade the disturbed area of the reservoir to the approximate original contours.
- Stabilize all surface drainage channels that flow through the disturbed area.
- Replace topsoil and seed and mulch the area with a native grass and shrub seed mixture, unless the landowner specifies another seed mixture consistent with the

land use. If the area is open to active grazing, make arrangements to protect the reclaimed area to ensure successful revegetation.

If APC, as the landowner and with authorization from the SEO, chooses to retain a portion of the impoundment for continued use, APC would be required to reclaim applicable portions of the reservoir, although the disturbed area would not be required to be reclaimed to the approximate original contours. However, the disturbed area above the authorized reservoir level, including the remaining embankment, spillway, and outlet structures must be stabilized to provide for long-term low maintenance care.

Runoff and Sedimentation

Wind and water erosion rates would increase above current rates until disturbed areas are successfully reclaimed. However, the potential for increased soil erosion and potential stream sedimentation would be minimized through the implementation of the applicant-committedmeasures (see Section 2.1.8), APC's MSUP (see Appendix A), and BLM policies as delineated in the Great Divide RMP (BLM 1988). These measures include proper facility siting to avoid riparian areas and floodplains, use of best management practices, and proper reclamation techniques. No springs or seeps occur in the proposed drilling or facilities area.

Surface water resources located along the proposed CBNG interconnect pipeline corridor (i.e., Hanna Draw, Big Ditch, and St. Mary's Creek) would not be impacted by interconnect pipeline construction because of the various protection measures described in Chapter 2.0, Appendix A, and the BLM's RMP (1988) and discussed further in Section 4.6 for wetlands resources. The small amount of water used for pipeline testing and dust control would not affect downstream users. Proper erosion control and hazardous material containment would reduce the potential for impacts to springs and seeps. With successful reclamation, only a very minor amount, if any, of project-related sediments would reach surface water resources.

Even successful reclamation may not return an area to the previous function for surface hydrology, as perennial forbs and brush generally are more effective at reducing run-off energy. These plants are generally not required in reclamation, where seed mixtures are dominated by grasses and annual forbs. Conversion of steep forested or brush lands to grasslands may increase sediment yield up to five times (Anderson 1975). Although these represent extreme cases and are not likely to pertain to the Proposed Action, they suggest that interim reclamation, albeit successful, may not return some areas to predisturbance conditions for 30 to 50 years.

4.5.1.2 No Action Alternative

Hydrology and Water Quality

Under the No Action Alternative, no discharge of produced water would occur to the existing water reservoir. No changes to water quality or hydrology would occur as a result of any action related to this project. The existing water reservoir would not be used for storage of produced water and would remain in its present condition with the potential addition of small quantities of produced water from the existing Well 2-2.

Sedimentation and Runoff

No increased sedimentation or runoff over baseline conditions would occur in the affected watersheds in the project area or the interconnect pipeline corridor.

4.5.1.3 Mitigation

1. Any deviations from WYPDES discharge conditions that could result in potential future impacts to receiving waters would be mitigated under the administrative procedures set out in the WYPDES to ensure the protection of receiving waters.

2. If seepage occurs at the reservoir resulting in open water present in Hanna Draw or Pine Draw below the reservoir, the operator would notify the WDEQ and the BLM immediately and would cease discharges into the reservoir until impacts can be assessed.

3. If it appears that the reservoir capacity would be exceeded, APC would either shut in wells or reduce the rate of water discharge in one or more wells until the issue is resolved.

4. If the existing water reservoir would not be needed for further storage of produced water following the end of the proposed project, the reservoir would be managed, removed, or reclaimed in accordance with reclamation and closure guidance from the SEO and WDEQ.

4.5.2 Groundwater

4.5.2.1 Proposed Action

The Hanna Formation is a complex connection of interbedded sedimentary rocks with multiple aquifers under unconfined to confined groundwater conditions interspersed with multiple aquitards. The water table within the formation varies in depth from near surface to several hundred feet below grade depending on topography. Under the Proposed Action, confined groundwater would be produced from deep within the Hanna Formation (greater than 4,000 feet) at a rate of approximately 300 gpm for a period of 1 year. This rate effectively equates to the reservoir capacity distributed over a 1-year period with no surface water discharge. Potential impacts to groundwater during operation of the Pilot Project could include the loss of groundwater in existing wells due to dewatering of the coal seams.

The targeted coal seams are classified as confined to semi-confined aquifers because they are bounded by confining layers of fine-grained strata consisting of claystone and siltstone. Given these conditions along with the depth of the coal seams to be dewatered, the hydraulic connection to between the coal seams and any aquifer stratigraphically above or below is limited. The primary effects on groundwater resources as a result of project activities would be associated with the removal of groundwater contained in coal seam aquifers. The removal of groundwater from the coal aquifer results in the reduction of the hydraulic pressure head. The hydraulic pressure head is the vertical distance between the water level in a well and the top of the confined aquifer in which the well is completed. The lowering of water levels in an aquifer also is referred to as drawdown. Given the proposed pumping conditions, the

drawdown and radius of influence can be estimated using an equation for confined aquifers (Theis 1935).

Using the Theis equation to calculate drawdown effects for the proposed pumping parameters, a drawdown of up to 10 feet would occur within the coal beds (if lumped together), a distance approximately 2.5 miles outward from the section in which the pumping wells would be located. The 10-foot level was used for the analysis to differentiate project impacts from seasonal variability, typically in the 1- to 2-foot range. Potential impacts to surface water features hydraulically connected to the pumped horizons of the Hanna Formation and within the 10-foot drawdown contour could include decreased flow instreams, seeps, and springs, and increased seepage loss from reservoirs, lakes, and ponds if direct hydraulic connection were to exist between the coalbed aquifers and the shallow water table.

The Wyoming SEO groundwater database contains 88 permitted well records within 3 miles of the section from which groundwater dewatering is proposed (WSEO 2006). A list of the permitted wells within this area is provided in Appendix C. The wells in Appendix C represent those that are potentially within the zone of influence from coalbed dewatering where at least 10 feet of drawdown was estimated. Well use within the potentially affected area is almost exclusively related to oil and gas exploration and from wells used for dewatering and monitoring of surface mines in Hanna Basin (Appendix C).

Given the depth of the coalbeds and their hydraulic isolation from underlying and overlying confining units, drawdown at the water table would not be anticipated. This assumption also is supported by the isotopic data, which indicates that the water has been out of hydraulic communication with surface waters or shallow groundwater for thousands of years.

4.5.2.2 No Action Alternative

Under the No Action Alternative, groundwater resources would not be further impacted, as drilling would not occur and groundwater levels would not be affected by proposed dewatering activities. Additionally, no discharge of produced water to surface water resources would occur.

4.5.2.3 Mitigation

Potentially affected landowners owning properly permitted water wells with the Wyoming SEO that may be impacted by water withdrawals from the project shall be offered a Water Well Agreement. If a water well agreement is not reached with the landowner, APC would mitigate the impact in accordance with State of Wyoming water laws. Some examples of mitigation could be drilling an additional supply well or providing CBNG water as an offset for the beneficial use.

4.6 FLOODPLAINS

4.6.1 Proposed Action

Flood-prone areas occur adjacent to perennial streams, dry washes, and ephemeral streams in the Pilot Project area. Drainages with identified or possible flood hazard

areas include the Medicine Bow River, Hanna Draw, Big Ditch, and Saint Mary's Creek. Impacts could occur to floodplains in the project vicinity if permanent alteration of the flood-prone area restricted the movement of floodwaters.

Elements of the proposed Pilot Project would be constructed along or across flood-prone areas identified in the project area. Northern portions of the interconnect CBNG pipeline would follow Hanna Draw and would be located within flood-prone areas. In addition, the interconnect pipeline would cross floodplains associated with Big Ditch and Saint Mary's Creek at approximately right angles to the direction of flow. Since pipeline construction would occur over a relatively short period of time and would not result in permanent alteration of the floodplain surface, negligible impacts to floodplain areas are anticipated from construction of the interconnect pipeline.

4.6.2 No Action Alternative

Under the No Action Alternative there would be no construction or potential for surface modification of flood-prone areas.

4.6.3 Mitigation

No additional mitigation measures have been developed for floodplain or wetland resources.

4.7 VEGETATION, WETLANDS, AND RECLAMATION

4.7.1 Proposed Action

Direct effects to vegetation resources from the proposed Pilot Project would include the removal of vegetation as a result of the construction of various project components. Utility line burial would occur in association with road construction and impact approximately 13 acres of vegetation. Construction of the interconnect pipeline would impact approximately 306 acres of vegetation in a manner similar to that of the buried utility line construction. It is assumed that less than 2 acres of vegetation impacts would be associated with construction of the aboveground electric power line. These disturbances would be mitigated concurrently following facility burial through backfilling, resoiling, and the application of approved revegetation techniques completed the first full growing season following disturbance (see Appendix A).

The construction of access roads, drilling pads, and associated production facilities would remove vegetation from approximately 44 acres. Disturbances would typically be confined to surface soils leaving the subsoils in place. Portions of these disturbances not needed for continuing operations would be available for reclamation following construction. The remaining acreage would remain in a disturbed state through the life of the project or until such facilities are no longer needed and are reclaimed.

In comparison to other impacts, the magnitude and duration of impacts related to the acreage reclaimed concurrently are lower overall due to the timely application of revegetation techniques. The loss of existing vegetation would reduce the plant productivity until vegetation has become re-established. It is assumed that acceptable revegetation on amenable sites can be achieved in a 5-year period given the application

of the appropriate revegetation and management techniques. Disturbed sites exhibiting low reclamation potentials due to soil physical and chemical limitations could take longer to respond and require a greater attention to detail.

The impacted acres associated with the operations phase of this development would remain in a disturbed state for the life of the project. Final reclamation of these sites would occur in the same manner as for the sites subject to concurrent reclamation in terms of the mitigation approach. However, these sites would remain unvegetated for a notably longer period resulting in a loss of vegetation production through time. It is assumed that the time frame required to achieve acceptable revegetation for this acreage following project element termination would be essentially the same as noted above.

It is reasonable to assume that herbaceous species would become established initially with the development of desired forb and shrub components lagging due to typical establishment and growth potentials. The narrow, linear nature of road disturbances and the relatively small disturbed acreage associated with well pad sites should promote the invasion of the desired native shrub and forb species from adjacent, undisturbed areas over time.

It is assumed that any dust control chemicals used onsite would be non-toxic to vegetation, either during application or with respect to long-term buildup in the soil. No impact to the vegetation resource is expected. However, increased heavy traffic would, in turn, increase dust production to some level beyond that existing, as would wind erosion from temporarily unvegetated disturbed areas. Heavy dust accumulations on adjacent vegetation could cause a decrease in plant productivity and reduce palatability for livestock and wildlife.

Table 4-1 depicts the acreages of each vegetation type likely impacted under the Proposed Action for both concurrent and final reclamation. The revegetation potentials shown were estimated based on field observations. Reclamation potentials ranging from “low to moderate” were assigned to vegetation map units within which 86 acres of concurrent and 19 acres of final reclamation would be required. Supporting soil map unit characteristic data and soil use interpretations also were reviewed.

Vegetated wetlands and open water features occur within the project boundaries in the form of drainages, stock ponds, isolated ox-bows, diversion ditches, and the Medicine Bow River. The majority of such sites occur along the interconnect pipeline ROW. As stated in Section 2.1.8, APC has committed to span the existing vegetated wetlands of the Mixed Grass-like/Grass Meadow Community along the proposed electric distribution line ROW and avoid disturbance to other vegetated wetlands and open water features, where practicable. Avoidance of vegetated wetlands and open water features along the ROW may not be possible where such features cross the ROW in a perpendicular manner. The acreage of such features that could be impacted is not known at this time but is estimated to total less than 10 acres. It is assumed that, prior to construction APC would contact the U. S. Army Corps of Engineers to obtain the proper permits from this agency with respect to jurisdictional features.

Table 4-1 Vegetation Map Unit Impact Acreages and Reclamation Potentials

Map Unit Name	Total Acreage	Reclamation Potential	Proposed Action Impacted Acreage (Concurrent/ Final Phase)[1]	No Action Alternative Impacted Acreage (Current/ Final Phase)[1]
Wyoming Sagebrush/Mixed Grass Community	283	Moderate	272/11	0/0
Low Shrub/Mixed Grass Community	80	Low to Moderate	62/18	0/0
Mixed Shrub Community	4	Low to Moderate	4/0	0/0
Greasewood and Basin Big Sagebrush Drainages	21	Low to Moderate	20/1	0/0
Mixed Grass-like/Grass Meadow Community	<1	High	0/0	0/0
Reclaimed Grass Community	7	Moderate	7/0	0/0
Rock Outcrop/Broken Land/Miscellaneous Land Types	4	Low	4/0	0/0

[1]"Concurrent" refers to the disturbed acreage to be reclaimed following initial construction. "Final Phase" refers to the disturbed acreage remaining to be reclaimed following the conclusion of project operations.

Both the Wyoming Sagebrush/Mixed Grass and Reclaimed Grass units were given a “moderate” rating for reclamation potential. These units typically occur on nearly level to moderately rolling terrain and exhibit shallow to moderately deep soil profiles. The primary revegetation constraints associated with these map units include moderate to high pH values, the potential for sandy soil textures leading to droughty seedbed conditions, and occasional steep slopes, particularly across the “breaks” formation located south of the Medicine Bow River. Concurrent (i.e., short-term) and final phase reclamation (i.e., long-term) would be required on 279 and 11 acres, respectively, in these vegetation types.

The Mixed Shrub community is typically among the more productive of the vegetation communities mapped onsite, although elements of these units occupy steeper slopes and exhibit shallow soils leading to a lower potential rating. Where deeper soils occur on more gentle slopes, reclamation potentials would be higher. Constraints related to the Low Shrub/Mixed Grass unit are typically associated with soil chemistry parameters including pH and salinity and with a propensity to shallow soil profiles. Deep soils and nearly level topographies are characteristic of the Greasewood and Basin Big Sagebrush Drainages community resulting in a trend to a higher rating. However, this map unit may exhibit the same soil chemistry constraints as noted for the Low Shrub/Mixed Grass unit. A lower potential is assumed for this unit where pH and soil salinity levels are excessive.

A “low” reclamation potential was assigned to the Rock Outcrop/Broken Land/Miscellaneous Land Type unit due to steep slopes, shallow soil depths, a lack of soil material, and high profile coarse fragment contents acting singly or in combination. A total of 4 acres of short-term and 0 acre of long-term disturbance would occur within this map unit.

APC outlines a potential reclamation seed mixture in the MSUP (see Appendix A), if no seed mixture specifications are identified for the proposed project. APC also has committed to work with the BLM to develop an appropriate seed mixture(s) for the varying site characteristics, such as soil chemical and physical parameters and the different vegetation community types (see Section 2.1.8). Seed mixtures could be developed to specifically address the varying characteristics of the Wyoming Sagebrush/Mixed Grass, Low Shrub/Mixed Grass, Mixed Shrub, Greasewood and Basin Big Sagebrush Drainages communities. According to the MSUP, seeding is proposed to occur in the fall after September, prior to ground frost, or in the spring after frost. This reclamation approach would address many of the issues associated with applying an appropriate seed mix, such as enhancing revegetation success and minimizing the spread of invasive weeds.

Three state-listed noxious weed species (whitetop, Canada thistle, and Dalmation toadflax) and one Carbon County-declared noxious species (halogeton) were found in larger populations during the July 2004 field survey. Populations of two additional state-listed noxious species (leafy spurge and Russian knapweed) also have been observed within, or in close proximity to, the project area boundaries. With respect to invasive weed species not listed as noxious, four such species are known to occur within the boundaries of the project area. These species include Russian thistle, cheatgrass, curly-cup gumweed, and babysbreath.

Invasive weed populations, whether considered noxious or non-noxious, can increase as a result of both project construction and operation, including monitoring. Drill pad clearing and grading operations can stimulate the germination and establishment of weed seeds present in the soil prior to disturbance. The construction and upgrading of roads can result in a similar enhancement of weed populations as can the disturbances related to the burial of the proposed pipeline facilities. Equipment initially brought into the project area can bring with it weed seeds from offsite sources engendering the spread of undesirable invasive species and can enhance such infestations through continued travel within project area boundaries.

APC has committed to monitoring and inspecting project facilities regularly to ensure that noxious weeds do not become established in newly disturbed areas. Weed control methods would be based on available technology, weed species involved, and the applicable BLM requirements associated with the control of noxious weeds (see MSUP in Appendix A). Therefore, while the Pilot Project activities would likely enhance the spread of noxious weed species, APC has committed to and would be required to control such infestations, as per BLM requirements related to monitoring and control activities.

Although not specifically committed to in the MSUP, it need be noted that APC would be required, as directed by the BLM, to control specified non-noxious invasive weed species such that these species do not expand or become established and pose a threat to existing native plant communities.

4.7.2 No Action Alternative

The project area would continue in its present state, subject to the vagaries of climatic influences and continued land use activities. No vegetation type would be impacted under the No Action Alternative for both concurrent and final reclamation. It is assumed

that the existing grazing, recreation, and open space land uses would continue in essentially their present form and intensity impacting the vegetation communities onsite in a manner consistent with historic land uses. Weed populations would remain present and may expand or contract as a result of changes to climate, human activity, and human intervention.

4.7.3 Mitigation

No additional mitigation measures have been developed for vegetation resources or reclamation.

4.8 TERRESTRIAL WILDLIFE

4.8.1 Proposed Action

Habitats and Overview

The analysis of potential direct, indirect, short-term, and long-term impacts to terrestrial wildlife species was based on documented species' use of the area, associated habitat values, relative degree of historical and ongoing mineral (e.g., coal, CBNG) exploration and development activities in and near the Pilot Project and its ancillary facilities (i.e., Proposed Action). Direct habitat losses would result from well pad, access road, and utility line construction, and indirect impacts would occur from increased human presence. Short-term impacts would arise from habitat removal and disturbance, as well as from activities associated with construction, drilling, and production. These impacts would cease upon project closure and completion of successful reclamation. Long-term impacts would consist primarily of permanent changes to habitats and the wildlife populations dependent on those communities. Historically, the area has experienced a low to moderate level of coal extraction and CBNG exploration; however, the area habitats, terrain, and landscape features support a diverse number of terrestrial wildlife species, as outlined in Section 3.8. The Proposed Action's project components were examined relative to the temporal and spatial patterns of both resident and migratory wildlife species and the current wildlife population trends apparent in the project area.

The Proposed Action proposes a fairly contained drilling scenario of 15 vertical CBNG wells; however, the placement and density of these wells entirely within Section 2 combined with the existing Well 2-2 would fundamentally result in 40-acre well spacing for the Hanna Draw Pilot Project. The presence of the existing roads combined with the previous, current, and proposed gas exploration and development activities would reduce the overall habitat values and associated carrying capacities of these native habitats and increase overall habitat fragmentation for area wildlife species in a small, but concentrated area. The ancillary CBNG interconnect pipeline and electric distribution line ROWs also would contribute to the loss and disturbance of native and reclaimed habitats, overall habitat fragmentation, and animal displacement, but effects would be more dispersed along these linear features. The potential direct loss of wildlife species from project construction and operation would be expected to be low to moderate, depending on the species (as discussed below), and habitat fragmentation and animal displacement would be moderate to high, as discussed in more detail for each species or animal group.

Impacts to terrestrial wildlife species from an increase in human presence are generally proportional to the size and duration of the project, construction work force, overall land use, recreational demands (e.g., hunting ORV use), and other regional activities. Increased noise levels during project construction and operation often results in some animal displacement in both the short and long term. Typically, animals either avoid noise sources or become accustomed to the increased noise levels. Abrupt and intermittent noises would be more likely to disturb individuals than the more continuous noises (e.g., traffic, equipment operation). The severity of the potential impacts from both an increase in human presence and increased noise levels would depend on factors such as the species' sensitivity, seasonal use patterns, the type and timing of project actions, noise sources and duration, and physical parameters (e.g., buffering capacity of area topography, cover, forage, other environmental factors).

The Proposed Action would result in 399 acres of new disturbance (i.e., direct habitat loss). The habitat types impacted by new surface disturbance associated with the Pilot Project are delineated in Section 4.7.1 for vegetation resources. Of the 399 acres of disturbance estimated for the Proposed Action, 369 acres would be reclaimed within 1 year of construction, or as soon as possible, and 30 acres would be left unreclaimed for the duration of the project. No impacts to area cliff habitats, which provide a higher species' richness and diversity for terrestrial wildlife (Ward and Anderson 1988), would occur from implementation of the Pilot Project.

The disturbance of wildlife habitat would reduce habitat availability for a variety of small birds and mammals. The temporary disturbances that would occur during the construction period would tend to favor early successional wildlife species such as ground squirrels and horned larks and would have more impact on mid-to-late-succession species such as sage sparrows, sage thrashers, and voles. The long-term disturbance acres would have a minor effect on wildlife species not dependant upon shrubs. In addition to the direct disturbance acreage, dust would directly and indirectly impact 15% to 30% more acreage. Dust not only directly impacts the plants, but also reduces plant palatability for livestock and wildlife, possibly resulting in habitat avoidance by birds, mammals, and insects. Indirectly, this may increase inter- and intra-species competition for nesting and foraging areas. In habitats already fully occupied (i.e., at carrying capacity), density-dependant species would be further displaced, possibly outside of the project area. This may force animals to utilize lower quality habitats, which may lead to a reduction in reproduction rates or an increase in predation.

Potential direct and indirect effects to wildlife species from changes in water quantity or quality during project construction or operation are discussed in detail for those applicable species (e.g., waterfowl and other water birds) dependent on aquatic communities. As outlined in Section 2.1.8 for Floodplains and Wetlands, APC has committed to span the existing vegetated wetlands of the Mixed Grass-like/Grass Meadow Community along the proposed electric distribution line ROW and avoid disturbance to other vegetated wetlands and open water features, where practicable. Avoidance of vegetated wetlands and open water features along the ROW may not be possible where such features cross the ROW in a perpendicular manner; however, the acreage of such features that could be impacted is estimated to total less than 10 acres. No impacts to water quality from project construction would be anticipated, based on the construction practices and protection measures outlined in APC's MSUP to minimize soil erosion and potential materials spills during construction activities (see Appendix A) and on the BLM's guidelines to minimize surface disturbance within 500 feet of surface water

and riparian areas in the BLM's current Great Divide RMP (BLM 1988). Additionally, compliance with the WDEQ stormwater permit would protect water quality during construction on the private fee lands.

The analysis of potential impacts to water and associated terrestrial species encompasses use of temporary reserve pits for each well site and use of the existing reservoir in Section 13. These analyses focus on the potential effects to resident and migratory birds as discussed below for waterfowl and other water birds.

Big Game Species

The discussion of potential direct and indirect impacts to big game species focuses on the potential short- and long-term impacts to pronghorn (antelope) and mule deer relative to these species' crucial winter range use. No impacts to elk or moose from the proposed Pilot Project would be anticipated, based on the habitats found in and near the project area and these two species' distribution and habitat use.

Over time, individual animals may habituate to certain disturbances, depending on the spatial relationship (i.e., distance) between these areas of disturbance to available forage, water, and thermal cover. However, this is true for only certain individuals within a population. Other individuals may exhibit a lower tolerance to certain human-related activity thresholds. Therefore, animals within a population may respond differently to construction and operational actions. Pronghorn have a tendency to exhibit a greater level of movement on winter ranges, as compared to other big game species. Therefore, pronghorn winter range boundaries are somewhat less fixed than those of mule deer (Wyoming Chapter of the Wildlife Society 1990). However, Rawlins FO biologists have noted anecdotally that in impacted areas, pronghorn herd sizes are significantly smaller than in relatively pristine areas. Those animals that potentially acclimate seem to do so only in smaller herd sizes. In undisturbed areas, the herds are much larger and show flight responses at much greater distances than in disturbed zones.

The following analysis focuses on the limiting factors associated with the pronghorn crucial winter/yearlong range that intersects with 10 of the 16 proposed well locations located in Section 2, the CCF in Section 35, the northern portion of the proposed interconnect pipeline and distribution line ROWs, and farthest terminus of the interconnect pipeline ROW (see Figures 3-4 and 3-5). Of the 10 wells located in the northern two-thirds of Section 2, one is the existing Well 2-2 (see Figure 3-4). Pronghorn crucial winter range, in particular, is considered by the BLM and WGFD to be a critical limiting factor for the overall carrying capacity of the native range.

The BLM stipulation of prohibiting construction and other activities potentially disruptive to wintering wildlife during the period of November 15 to April 30 for the protection of big game winter habitat would minimize the potential for direct and indirect disturbance of wintering mule deer and pronghorn during construction phases (BLM 1988). It does not address the potential loss of wintering habitat due to the presence and operation of wells in winter range for the life of the project after construction is complete.

Therefore, no impacts to pronghorn on the crucial winter/yearlong range would occur from project construction, based on these BLM requirements (BLM 1988). However, relative to project operation, Point 8 of APC's MSUP (see Appendix A) indicates routine

maintenance of producing wells would be conducted approximately every other day. Therefore, potential direct and indirect impacts to big game species focused on the proposed operation of the Pilot Project.

The drilling of eight additional wells within the pronghorn crucial winter/yearlong range in Section 2, building the ancillary access road and flow line ROWs, and the construction of the CCF in Section 35 would result in a total direct loss of 64 acres of this crucial winter range in the short term and 17 acres in the long term following site reclamation. Following reclamation, herbaceous vegetation and grasses would re-establish in the short term, and woody species may require 20 to 50 years to re-establish. The primary woody species impacted would be sagebrush, an important winter food component for both pronghorn and mule deer.

Although the direct acreage effects to pronghorn crucial winter range would be only a fraction of the entire Medicine Bow Herd Unit (#525) area, potential indirect impacts during project operation warrant additional analysis. The proposed well density (i.e., approximate 40-acre spacing) is considered to be dense for big game ranges (WGFD 2004c). The influence of each project component effectively extends outside the surface disturbance footprint, which is generally determined by the individual animal's avoidance and stress responses to an activity or facility. These factors not only reduce the associated habitat value of the adjacent areas, they also extend the displacement zone of individuals. Consequently, impacts to wildlife could extend farther offsite than the actual amount of disturbed area for the Proposed Action. As densities of wells, roads, and facilities increase, the effectiveness of adjacent habitats decrease, and even if natural features remain unaltered near oil and gas features, wildlife typically uses proportionately less of these areas relative to their availability. Additionally, increased physical or psychological (i.e., disturbance-related) barriers lead to habitat fragmentation and further reduce the availability of effective habitat. These impacts can be especially problematic when they occur within limiting habitat components such as crucial winter ranges and reproductive habitats (WGFD 2004c).

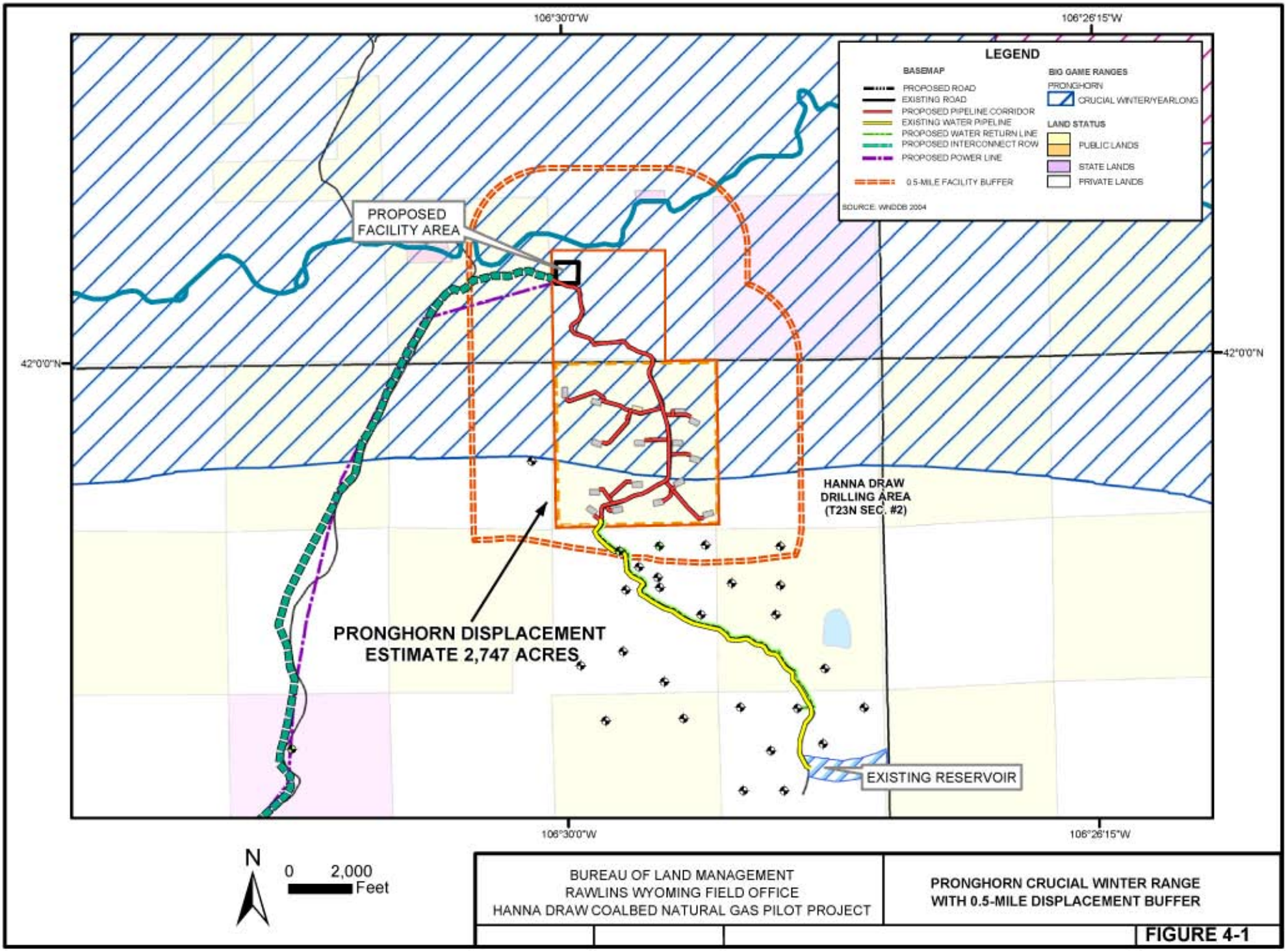
Assuming a displacement distance of 0.5 mile for pronghorn, the consequential indirect effects to crucial winter range were calculated for the area surrounding and including crucial winter range located in Section 2 and approximately one half of Section 35. Assuming the development and use of the project components in these areas would result in the overall loss and reduction of crucial winter range habitat value, approximately 2,747 acres would be affected in the long term (LOP) (see Figure 4-1). While this is, as noted, a small portion of the total pronghorn herd unit area (approximately 1%), the contiguous winter range habitat block that this project affects is much smaller than the herd unit area. The total crucial winter range component extending east-west from the project area is approximately 61,593 acres (see Figure 3-4), which translates to the loss of approximately 4.5% of this affected crucial winter range area from indirect effects in the Pilot Project area. The portions of the CBNG interconnect pipeline and electric distribution line ROWs would directly affect an additional 29 acres in the short term and only 0.1 acre of pronghorn crucial winter range in the long term. Because of the linear nature of these ROWs, temporary nature of construction impacts, and successful reclamation efforts, it is assumed that these linear facilities would incrementally increase habitat fragmentation and loss in the short term, but not result in total displacement of individuals during project operation (i.e., long term).

Although a native range's carrying capacity for wildlife will vary, based on precipitation levels and vegetative trends, the proposed well density and extent of ancillary facilities in the immediate project area would reduce the relative carrying capacity of the crucial winter range in the drilling area. The habitat fragmentation and animal displacement would result in the underuse of habitats in close proximity (within 0.5 mile) of the disturbance areas (i.e., a reduction in habitat value); increased animal densities on remaining habitats; and increased stress from inter- and intra-specific competition. The degree of pronghorn displacement and reduction in habitat values would vary, depending on the habitat types, vegetative cover (forage and thermal), topography, aspect, existing population dynamics, traffic levels, and future road use. Displacement would result in local reductions in wildlife populations if adjacent, undisturbed habitats are at carrying capacity. In this situation animals are either forced into less than optimal habitats or they compete with other animals that already occupy unaffected habitats. Possible consequences of such displacement are lower survival, lower reproductive success, lower recruitment, and ultimately lower carrying capacity and reduced populations (WGFD 2004c).

The WGFD (2004c) developed recommended minimum recommendations on thresholds for oil and gas development in crucial and other important wildlife habitats on BLM lands. These management guidelines were structured to provide a tool to be implemented on a programmatic basis on BLM lands in Wyoming. In this review, the WGFD classifies "important wildlife habitats," based on certain defining factors. "Vital habitats" are defined as "directly limit[ing] a community, population, or subpopulation, and restoration and replacement may not be possible." Big game crucial winter ranges are classified as "vital habitats," and the WGFD recommends "no loss of habitat function" for these areas (WGFD 2004c).

According to the WGFD (2004c), thresholds based on well pad densities and cumulative acreages also may under represent the actual level of disturbance to wildlife. As discussed above for pronghorn displacement effects, the WGFD states the function of big game crucial winter range would decline in the zone of influence, resulting in the effective loss of that habitat for long-term use. The agency also notes that under certain impact categories (e.g., extreme) "habitat function is substantially impaired and cannot generally be recovered through management or habitat treatments." However, it is difficult to apply these guidelines and thresholds generated for large-scale oil and gas development on more of a landscape scale to the Hanna Draw Pilot Project. Parallel assumptions between the state's standards and this project would be the assessment that given the well density in Section 2 and presence of ancillary facilities (e.g., road, CCF) in Section 35, pronghorn would be displaced in the long term from an estimated 2,747 acres of crucial winter range for the life of the project (10 to 20 years), and a reduction in habitat value for this area would result until final reclamation.

Herd health and longevity are key in assessing both short- and long-term impacts to pronghorn. In 2004, the Medicine Bow Herd Unit (#525) was considered to be at objective (i.e., 60,000 pronghorn for the entire unit) (WGFD 2005c). Hunting seasons and harvest limits have been established to reduce or maintain this herd. However, the ongoing drought in the western U.S. continues to affect native ranges and the big game species that depend on these ranges. The WGFD believes that the area may not continue to support the herd unit objective given the drought conditions (WGFD 2005c).


106°30'0"W
106°26'15"W
42°0'0"N
LEGEND
BASEMAP
PROPOSED ROAD
EXISTING ROAD
PROPOSED PIPELINE CORRIDOR
EXISTING WATER PIPELINE
PROPOSED WATER RETURN LINE
PROPOSED INTERCONNECT ROW
PROPOSED POWER LINE
0.5-MILE FACILITY BUFFER
BIG GAME RANGES
PRONGHORN
CRUCIAL WINTER/YEARLONG
LAND STATUS
PUBLIC LANDS
STATE LANDS
PRIVATE LANDS
SOURCE: WNDDB 2004
PROPOSED FACILITY AREA
HANNA DRAW DRILLING AREA (T23N SEC. #2)
PRONGHORN DISPLACEMENT ESTIMATE 2,747 ACRES
EXISTING RESERVOIR
N
0
2,000
Feet
BUREAU OF LAND MANAGEMENT
RAWLINS WYOMING FIELD OFFICE
HANNA DRAW COALBED NATURAL GAS PILOT PROJECT
PRONGHORN CRUCIAL WINTER RANGE
WITH 0.5-MILE DISPLACEMENT BUFFER
FIGURE 4-1

In addition to animal displacement from human-related activities by avoidance, increased human presence also would directly increase the potential for wildlife-human interactions, ranging among wildlife harassment, poaching, and increased legal hunter success and the associated hunting pressure. Harassment, whether intentional or unintentional, can impact wintering animals and can result in both direct and indirect mortalities of individuals during periods of high stress and extreme winter conditions. Additionally, increased traffic levels on new and existing access roads could increase the potential for wildlife-vehicle collisions.

The potential effects to native habitats surrounding the proposed reservoir site in Section 13 from a potential increase in future use by big game and other terrestrial wildlife species would be expected to be small. Although some increase in vegetation removal and trampling along the margins of the reservoir may be expected during project operation, the reservoir site is located outside of crucial winter range for pronghorn (see Figure 3-4) and water available from the Medicine Bow River and other area stock tanks or ponds would aid in minimizing effects to the terrestrial habitats surrounding the reservoir.

The anticipated direct and indirect impacts to mule deer from implementation of the construction and operation of the Proposed Action would be less than those discussed for pronghorn. The only project component that intersects with crucial winter range for mule deer is an approximate 3-mile segment of the proposed gas transmission ROW. An estimated 27 acres of this range would be affected in the short term from project construction. Assuming successful ROW reclamation, it is assumed that the habitat along this corridor would return to pre-construction conditions, and no habitat loss was calculated for the long term. Projected habitat loss and fragmentation, increased human presence, and indirect effects to local deer in the proposed drilling area would result in impacts to mule deer winter-yearlong range for the Shirley Mountain and Platte River Herds.

In summary, a number of factors apply and should be examined relative to the Proposed Action, its potential direct and indirect effects to pronghorn on designated crucial winter range, and certain factors that help to mitigate these effects. First, the immediate project area is located on the edge of this crucial winter range and pronghorn generally exhibit greater variance in movements on winter range than other big game species (Wyoming Chapter of the Wildlife Society 1990). Therefore, the scale, location, and nature of the Pilot Project would result in incremental effects to this range and the animals that depend on it. Second, potential effects from this small, but concentrated project scenario extend beyond the proposed footprints of the anticipated surface disturbance. The proposed well density (approximate 40-acre spacing) would reduce the habitat effectiveness for an area that encompasses the assumed displacement distance of 0.5 mile for pronghorn surrounding and including the proposed drilling area and ancillary facilities. Third, the Medicine Bow Herd Unit is currently at herd objective, although the continuing western drought may affect pronghorn numbers and the established population threshold of 60,000 animals. Finally, proposed development at the current well and facility density in the immediate project area (i.e., Section 2 and a portion of Section 35) would likely result in the loss of that crucial winter habitat component in the long term for pronghorn. Although some individual animals can habituate to the increased infrastructure, it is generally assumed the increased human footprint on a previously lightly developed area would be detrimental to big game species. As well, acclimation to activity may increase predation on some species. However, although the

Proposed Action would result in relatively concentrated effects to pronghorn and to a lesser extent mule deer in the immediate project area, the anticipated scale of this potential habitat loss and fragmentation and resulting effects to the local animals from the Pilot Project applies to a relatively small area and would not likely affect the overall herd health and ability to support the state and federal objectives for the Medicine Bow Herd.

Upland Game Birds, Waterfowl, and Other Water Birds

Potential impacts to terrestrial species generally associated with open water or the riparian community (e.g., waterfowl, wading birds, shorebirds) may occur. As discussed above for general wildlife habitats, APC has committed to span the existing vegetated wetlands of the Mixed Grass-like/Grass Meadow Community along the proposed electric distribution line ROW and avoid disturbance to other vegetated wetlands and open water features, where practicable (see Section 2.1.8). Also, no impacts to water quality from project construction would be anticipated, based on the construction practices and protection measures outlined in APC's MSUP (see Appendix A) and the assumption the APC would follow these measures in activities occurring on fee estate.

There could be potential impacts to birds that may be attracted to the temporary reserve pits during project operation. As stated in the project MSUP (see Appendix A), APC has committed to develop procedures to prevent wildlife from accessing temporary reserve pits, in the event that water quality is determined to be potentially detrimental to wildlife (e.g., oil deposition). However, even with the best available protection measures, not all wildlife can be excluded from reserve pits. Consequently, some impacts to wildlife may occur through their inadvertent access to pits.

Potential effects to terrestrial wildlife from operation of the existing reservoir in Section 13 also was examined. During project operation, increased soil salinity from continual water evaporation in the reservoir area would likely occur; however, elevated soil or water salinity levels would not impact bird species that may use this resource. This analysis focused on the possible exposure risks of avian species to metals and other constituents of concern from ingestion of water, plants, or macroinvertebrates. Although water quality analyses conducted to date (e.g., wells 14-35 and 2-2) indicate that impacts to terrestrial species would likely be none to small, some unknowns still exist for long-term project operation.

APC must adhere to state and federal water quality regulations, meeting at a minimum the limits and monitoring requirements set by WDEQ for end-of-pipe water quality in off-channel impoundments. The storage in the existing water reservoir is permitted as a Class 3B water body. Water quality data suggest that the produced water would be suitable for livestock and wildlife consumption, the designated uses applicable to this class of waters. The possibility of bioaccumulation of constituents of concern for terrestrial wildlife species within the reservoir pool is discussed further.

From past studies, potential bioaccumulative substances that may be found in CBNG produced water include selenium, boron, cadmium, chromium, and mercury (Ramirez 2005). Presently, the WDEQ water quality classification standard for selenium is 5 µg/L. However, a Powder River Basin report for CBNG produced water states, "The WDEQ aquatic life chronic criterion of 5 µg/L (parts per billion) selenium is not adequate for preventing adverse effects on fish and aquatic birds. Several scientific experts on

selenium have recommended a 2 µg/L criterion because concentrations exceeding 2 µg/L may create a bioaccumulation risk for fish and sensitive species of aquatic birds (Lemly 1993; Skorupa and Ohlendorf 1991)."

The existing, permitted reservoir would be the only receiving water for production water discharge and does not and would not maintain a fish community. It may be used intermittently by birds for resting and limited ingestion of water, plant materials, and/or macroinvertebrates. Top level consumers in aquatic systems, such as waterfowl, can accumulate selenium concentrations leading to low reproduction, embryonic deformities, and increased mortality (Ohlendorf et al. 1988). Previous testing on well 2-2 did not identify these constituents in the analysis; however, the detection limit for selenium was 5 µg/L. Therefore, an assessment of selenium in the range of 2-4 µg/L is not possible at this time.

Testing on the 14-35 well (the first test well) included:

- Dissolved mercury at 0.12 µg/L. The chronic (long term exposure) aquatic standard under WDEQ regulations for total mercury is 0.77 µg/L.
- Dissolved cadmium was not detected.
- Boron and chromium were not analyzed.

The low concentrations of tested metals indicate that bioaccumulation potential into terrestrial food webs from the permitted reservoir is low. However, without test results from the 15-blended well effluent for these additional potential bioaccumulates, the potential for these constituents cannot be definitively discounted and it is unknown if the potential for selenium to bioaccumulate would exist.

Raptors

Raptors exhibit varying tolerances to human-related disturbances (e.g., increased presence, noise). Species such as the ferruginous hawk and golden eagle are more susceptible to disturbances and may more readily abandon nest sites in the proximity to project actions. Ferruginous hawks are particularly sensitive to disturbance during the breeding period. An increase in human-related activities (e.g., presence, noise, pedestrian, or vehicle traffic) could directly impact nesting raptors if they occur in close proximity to the nest site. Loss of eggs or young would be in violation of the Migratory Bird Treaty Act, and if the nest were occupied by a golden eagle, potential loss of eggs or individual birds in addition to disturbance to adult birds would be in violation of the Bald and Golden Eagle Protection Act.

Figure 4-2 depicts the known raptor nest sites with the applicable buffer areas applied. In accordance with the BLM's permitting stipulations outlined in the existing Great Divide RMP (BLM 1988) and expanded in APC's committed protection measures in Section 2.1.8, raptor nests are protected during the breeding season to minimize the potential for nest abandonment or loss of eggs or young. Therefore, project construction would be restricted within 1 mile of a ferruginous hawk or golden eagle nest and 0.75 mile for other raptor species between February 1 and July 31 to protect breeding raptors and their nests. If a nest exists, it represents a "nesting opportunity" for raptors and thus, all nests would receive this protection (except for "historic" nests, e.g., nests that

have been destroyed). As stated in Section 2.1.8, an exception to these seasonal restrictions would be approved only after a thorough, site-specific analysis by the BLM or designated representative concluded that a negative impact would not occur.

Table 4-2 summarizes known raptor nest sites located with these established buffer areas, based on previously documented nest sites for the project area. Four golden eagle nest sites occur immediately adjacent to the proposed CBNG interconnect pipeline corridor and electric distribution line ROW; three of these four nests are likely alternate nest sites for the same breeding pair, given the proximity of the nests to each other (see Figure 4-2). A fifth golden eagle nest also was previously recorded immediately adjacent to the existing access road in Section 12, which would parallel the proposed water pipeline to the existing water reservoir. Three red-tailed hawk nests occur immediately adjacent to the proposed interconnect pipeline ROW (one of these also parallels a portion of the power line ROW). Three prairie falcon eyries are located adjacent to the proposed pipeline and power line ROWs; again, these nest sites are likely alternate sites for the same breeding pair given their locations. One northern harrier nest occurs adjacent to the pipeline and power line ROWs (see Figure 4-2). One ferruginous hawk nest has been documented within 1 mile of the proposed drilling area and 16 nests occur within 1 mile of the proposed gas and power line corridors, which is discussed further for special status species in Section 4.10.2.2.

Therefore, based on the implementation of these BLM policies and the supporting committed measure in Section 2.1.8, no impacts to nesting raptors from short-term project construction of the Pilot Project would be anticipated. Long-term effects would include habitat loss and fragmentation, small changes in prey species distribution and abundance, and changes in vegetation composition from the operation of the specific project components.

This EA analysis also examined the potential for avian electrocution risk for birds that may perch on the proposed 34.5-kilovolt (kv) electric distribution line associated with the proposed Pilot Project. Advanced planning of overhead power line design and construction can greatly reduce the potential for avian electrocution risks during line operation. As stated in Section 2.1.8, APC has committed to design, construct, and operate the electric distribution line in accordance with the standard raptor protection measures outlined in the Avian Power Line Interaction Committee's (APLIC's) *Suggested Practices for Avian Protection of Power Lines: The State of the Art in 2006* (APLIC 2006). This line design and planning also would require coordinating with the operating utility, Pacific Power. Although larger birds (e.g., raptors) are generally of primary concern for electrocution hazards, applying the line design specifications outlined in APLIC (2006) would aid in protecting birds of all sizes (including smaller birds perched on distribution equipment poles). This measure is particularly important given the number of raptor nests recorded for the project area (see Figure 3-9), including a number of golden eagle, ferruginous hawk, red-tailed hawk, and prairie falcon nests that occur in close proximity to the electric distribution line. (Even smaller raptors, such as falcons, can be at risk of electrocution on electric equipment structures.) No increased avian collision risk was identified for this line, given its location primarily along the existing road ROW and the fact it does not cross the Medicine Bow River.

106°56'15"W 106°52'30"W 106°48'45"W 106°45'0"W 106°41'15"W 106°37'30"W 106°33'45"W 106°30'0"W 106°26'15"W 106°22'30"W 106°18'45"W

42°3'45"N
42°0'0"N
41°56'15"N
41°52'30"N
41°48'45"N
41°45'0"N

Seminoe Reservoir

Medicine Bow River

PROPOSED FACILITY AREA

HANNA DRAW DRILLING AREA (T23N SEC. #2)

EXISTING RESERVOIR

HANNA

Hwy 30

LEGEND

BASEMAP
- WELLS
- P & A WELLS
- ANADARKO WELLS
- CONTROL POINT
- PROPOSED ROAD
- EXISTING ROAD
- PROPOSED PIPELINE CORRIDOR
- EXISTING WATER PIPELINE
- PROPOSED WATER RETURN LINE
- PROPOSED INTERCONNECT ROW
- PROPOSED POWER LINE

LAND STATUS
- PUBLIC LANDS
- STATE LANDS
- PRIVATE LANDS

- GOLDEN EAGLE
- PRAIRIE FALCON
- NORTHERN HARRIER
- FERRUGINOUS HAWK
- RED-TAILED HAWK
- SWAINSON'S HAWK
- AMERICAN KESTREL
- GREAT HORNED OWL
- BURROWING OWL

BUFFERS
- 825 FEET
- 1200 FEET
- 0.75 MILE
- 1 MILE

SOURCE: WNDDB 2004

N

0 4,500 9,000 13,500 Feet

0 0.5 1 2 Miles

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RAWLINS WYOMING FIELD OFFICE
HANNA DRAW COALBED NATURAL GAS PILOT PROJECT

RAPTOR NESTING WITH CONSTRUCTION AND OPERATIONAL BUFFERS

FIGURE 4-2

Table 4-2 Known Raptor Nests Located within Applicable Buffer Areas

Species	Construction Buffer (1 mile) (FEHA and GOEA)[1]	Construction Buffer (0.75 mile) (Other Raptors)	Operational Buffer (1,200 feet)[2] (FEHA)	Operational Buffer (825 feet)[3] (GOEA and Other Raptors)
Drilling Area (Section 2) and Facility Area (Section 35)				
Golden eagle	4			0
Ferruginous hawk	1		0	
Red-tailed hawk		1		0
Great horned owl		2		0
Northern harrier		1		0
Gas Pipeline and Power Line ROWs				
Golden eagle	9			4
Ferruginous hawk	1		0	
Red-tailed hawk		2		2
Northern harrier		1		1
Prairie falcon		4		2
Power Line ROW Only (No Overlap with Gas Pipeline Corridor)				
Golden Eagle	2			0
Ferruginous hawk	1		0	
Red-tailed hawk		1		0
Prairie falcon		2		1
Gas Pipeline ROW Only (No Overlap with Power Line Corridor)				
Golden Eagle	16			
Ferruginous hawk	14		0	
Red-tailed hawk		6		2
Swainson's hawk		2		0
Prairie falcon		2		0
American kestrel		1		1

[1]FEHA = Ferruginous Hawk; GOEA = Golden Eagle

[2]Nest sites coincide and overlap with those reported within the 1-mile construction buffer for ferruginous hawks.

[3]Nest sites coincide and overlap with those reported within the 1-mile construction buffer for golden eagles and 0.75-mile construction buffer for other raptor species.

Other Birds, Mammals, Amphibians, and Reptiles

Habitat changes and increased human presence described for the Proposed Action would likely increase habitat fragmentation effects and displacement for other, more sensitive animals, such as the bobcat, mountain lion, and some species of songbirds. However, other species would more readily adapt to these types of incremental effects, particularly for a project at this scale. Changes to the relative prey density and distribution (i.e., prey base of rodents and other small- or medium-sized mammals) would be expected to be low from implementation of the Proposed Action. Potential disturbance from increased noise levels would be more prevalent for terrestrial animals, such as songbirds that typically rely more on auditory cues, particularly during breeding. Effects to reptiles would be potential loss of individuals in the immediate project area and construction zones, especially those species that burrow.

As discussed for waterfowl and other water birds, the potential for direct impacts to vegetated wetlands or other riparian vegetation used by riparian obligate songbirds, amphibians, or other water-dependent species would be low, based on the limited amount of these habitats in the proposed project area and APC's committed measures to avoid disturbance to wetlands and open water features, where practicable (e.g., spanning vegetated wetlands along the power line corridor). As stated in Section 2.1.8, if reserve pit water quality is determined to be potentially detrimental to wildlife (e.g., oil deposition), applicable protection measures would be applied to protect wildlife species. As previously noted, even with the best available protection measures, not all wildlife can be excluded from reserve pits. Consequently, some impacts to wildlife may occur through their inadvertent access to pits during project operation. Finally, the potential exposure of animals to surface water in the existing reservoir would be the same as discussed for waterfowl. It is assumed water quality would meet or exceed state and federal water quality regulations, meeting the limits and monitoring requirements set by WDEQ for end-of-pipe. The potential for bioaccumulation of constituents of concern in the reservoir area would be small. Although, the low concentrations of tested metals indicate that bioaccumulation potential into terrestrial food webs from the permitted reservoir is low, without test results from the 15-blended well effluent for these additional potential bioaccumulates, the potential for these constituents cannot be definitively discounted and it is unknown if the potential for selenium to bioaccumulate would exist.

4.8.2 No Action Alternative

Under the No Action Alternative, no habitat loss or fragmentation from project construction activities would occur beyond those already existing within the immediate project area. The loss of habitat value and function in pronghorn crucial winter range would not occur, and an increase in big game species' displacement would not occur. The ranges' habitat values and associated carrying capacities would remain at current levels. No increase in available surface water for area wildlife species would occur from groundwater pumping and discharge. Soil salinity also would remain at current conditions.

4.8.3 Mitigation

No additional mitigation measures have been developed for terrestrial wildlife resources.

4.9 AQUATIC RESOURCES

4.9.1 Proposed Action

Under the Proposed Action, produced water would be held in the currently empty constructed impoundment (i.e., existing reservoir) located in Section 13. Section 4.5.1 presents further details on the anticipated volume, water quality, and management of potential future water discharges.

Long-term presence of water in the permitted reservoir would result in the creation of an aquatic habitat where none currently exists. The biota present in this impoundment would be limited to species adapted to the conditions and able to colonize this upland location distant from other bodies of water. Biota may include opportunistic insect species and other invertebrates via egg deposition or from birds. Additionally, a population of algae and zooplankton may establish within the reservoir, via wind dispersion of propagules or by birds. Because the aquatic biota by definition would be adapted to future aquatic conditions, no impacts to aquatic life that may become established would be expected. The temporary reserve pits and the lined impoundments also may experience similar colonization by adapted species.

4.9.2 No Action Alternative

Under this alternative no discharges of produced water would occur. The reservoir impoundment would remain dry.

4.9.3 Mitigation

No additional mitigation measures have been developed for aquatic resources.

4.10 SPECIAL STATUS SPECIES

Federal agencies, in consultation with the USFWS, are required to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a federally listed species or species proposed for federal listing. The BLM, as the federal lead agency, is currently coordinating with the USFWS in accordance with the section 7 process of the Endangered Species Act (ESA) to analyze the effects of the Proposed Action on federally listed species (i.e., the Ute ladies'-tresses orchid, Colorado butterfly plant, desert yellowhead, blowout (Hayden's) penstemon, bald eagle, and black-footed ferret). A separate Biological Assessment (BA) is being prepared for the USFWS' review. Additionally, BLM Manual 6840 establishes Special Status Species' policy for plant and animal species and the habitats on which they depend. The BLM in Wyoming also has developed a list of BLM sensitive species to focus species management efforts towards maintaining habitats under a multiple-use mandate. This policy refers not only to species protected under the ESA, but also to those designated by the State Director as "Sensitive." The goals of this sensitive species policy are to: 1) maintain vulnerable species and habitat components in functional BLM ecosystems; 2) ensure sensitive species are considered in land management decisions; 3) prevent a need for species listing under the ESA, and 4) prioritize needed conservation work with an emphasis on habitats.

4.10.1 Plants

4.10.1.1 Proposed Action

Of the 13 threatened, endangered, or sensitive species and Wyoming species of concern considered in this EA, three plant species are considered as potentially occurring within the boundaries of the project area. Surveys for persistent sepal yellowcress, a BLM sensitive plant species, were conducted in areas of potential habitat in 2004 and none was found. Therefore no impacts to this species would be anticipated. Marginal habitat for the Colorado butterfly plant is limited to the Mixed Grass-like/Grass Community in Hanna Draw. Marginal habitat for the Ute ladies'-tresses orchid also occurs in association with this community in Hanna Draw. No impacts to these species would be anticipated along this drainage.

4.10.1.2 No Action Alternative

The project area would continue in its present state, subject to the vagaries of climatic influences and continued land use activities. It is assumed that the existing grazing, recreation, and open space land uses would continue in essentially their present form and intensity impacting the vegetation communities onsite in a manner consistent with historic land uses.

4.10.1.3 Mitigation

No additional mitigation measures have been developed for special status plant species.

4.10.2 Animals

The following impact analyses focus on the special status terrestrial wildlife species that may occur in or near the proposed Pilot Project. As summarized in Table 3-9 in Section 3.10.2, the BLM identified 21 special status animal species for the Pilot Project, including 2 federally listed and 19 BLM sensitive species.

4.10.2.1 Surface Water Analysis

The following water analysis for special status wildlife species has been developed specifically for three species associated with open water, riparian habitats, and wet meadows and that have a moderate probability of occurring in the project area, including the bald eagle, long-billed curlew, and white-faced ibis. The effects to surface water would indirectly apply to species such as the peregrine falcon and northern goshawk, based on these species' preferred prey base (i.e., birds) and foraging habitat, which includes riparian habitats.

Potential impacts from potential water quantity and water quality changes were examined from project construction and operation. Anticipated impacts from project construction would be short-term. Avoidance of vegetated wetlands and open water features along the ROWs would not be possible where such features are crossed perpendicularly. The acreage of such features that could be impacted is estimated to total less than 10 acres (see Section 4.7.1). No impacts to water quality from project construction would be anticipated, based on the construction practices and protection measures outlined in APC's MSUP (see Appendix A).

Impacts to sensitive birds or mammals that may be attracted to the temporary reserve pits could occur, but would be limited to the extent possible. Applicable protection measures would be

implemented, such as modified fencing design, temporary covers, or other means acceptable to BLM, if warranted.

Potential impacts to animals from exposure to surface water in the proposed water impoundments or the existing reservoir located in Section 13 would be low. APC must adhere to state and federal water quality regulations, meeting the limits and monitoring requirements set by the WDEQ for end-of-pipe water quality for off-channel impoundments. The possibility of bioaccumulation of constituents of concern for terrestrial wildlife species would be low. However, as discussed in Section 4.8.1, without test results from the 15-blended well effluent for potential bioaccumulates, the possibility for these constituents cannot be definitively discounted and it is unknown if the potential for selenium to bioaccumulate would exist. Increased soil salinity from continual water evaporation in the reservoir area would likely occur; however, elevated soil or water salinity levels would not impact mammal species that may use this resource.

Impacts to aquatic life and other beneficial uses of surface waters would not be anticipated, as long as permit requirements are met (see Section 4.10.3). Therefore, these same assumptions have been incorporated into the following terrestrial special status species' assessments.

4.10.2.2 Species Analyses

Five special status raptor species were examined for the proposed Pilot Project, including the bald eagle, American peregrine falcon, ferruginous hawk, northern goshawk, and burrowing owl. Of these five species, the ferruginous hawk and burrowing owl are documented breeders in the project area. As discussed in Section 3.10.2, the other three sensitive raptors may occasionally occur in the project vicinity for foraging, particularly along the Medicine Bow River, cliff areas, and adjacent uplands. Potential impacts to the breeding ferruginous hawk and burrowing owl would be the same as those discussed for general raptor species in Section 4.8.1. As stated, ferruginous hawks are particularly sensitive to disturbance during the breeding period. Burrowing owls are more tolerant of disturbance, but may be directly lost from surface disturbance during project construction, as they nest in underground burrows.

Figure 4-2 depicts the known raptor nest sites with the applicable buffer areas applied, and Table 4-2 summarizes these sites relative to the required buffer zones established by the BLM's permitting stipulations outlined in the existing Great Divide RMP (BLM 1988) and expanded in APC's committed protection measures in Section 2.1.8. During project construction, project activities would be restricted within 1 mile of a ferruginous hawk nest between February 1 and July 31, applicable to all existing nest sites. During project operation, Controlled Surface Use would apply within 1,200 feet of an active ferruginous hawk nest. As shown in Figure 4-2 and summarized in Table 4-2, one ferruginous hawk nest has been documented within 1 mile of the proposed drilling area and 16 nests occur within 1 mile of the proposed gas and power line corridors. Based on the implementation of these required BLM policies, no impacts to nesting raptors from short-term project construction of the Pilot Project would be anticipated. Long-term effects would include incremental habitat loss and fragmentation, small changes in prey species distribution and abundance, and changes in vegetation composition from the operation of the specific project components.

The potential for avian electrocution risk for special status raptors would apply primarily to the bald eagle, peregrine falcon, and ferruginous hawk, although goshawks have been shown to perch on power poles in more open, less forested habitats. As discussed in Section 4.8.1, APC has committed to design, construct, and operate the electric distribution line in accordance with

the standard raptor protection measures outlined in the APLIC's (2006) guidelines (see Section 2.1.8). Applying these line design specifications would aid in protecting birds of all sizes (including species such as peregrine falcons that may perch on distribution equipment poles, such as transformers). Additionally, no increased avian collision risk would apply to this line, based on its location and avoidance of the Medicine Bow River corridor.

No other potential impacts to the bald eagle, American peregrine falcon, or northern goshawk would be anticipated from construction or operation of the Proposed Action. No water quality exposure or bioaccumulation issues would apply to these three sensitive raptor species.

In accordance with section 7 of the ESA, a "May Affect, Not Likely to Adversely Affect" impact determination has been made for the federally threatened bald eagle, based on this species' sporadic distribution; the lack of known nest sites, communal roosts, or winter concentration areas in or near the project area; the requirement for APC to meet WDEQ water quality standards and the small size and nature of the proposed Pilot Project.

Black-footed Ferret. No direct impacts to the federally listed black-footed ferret would currently be expected from project implementation. Although, historically, ferrets occurred in and near the immediate project area (see Figure 3-11), the USFWS and the WGFD have designated affected prairie dog colonies as "block-cleared" for the black-footed ferret. This designation does not infer that the area has no value for ferrets, but it indicates the discountability of a wild population of black-footed ferrets presently occurring in the project area. This designation does not preclude the prairie dog colonies within the project area as potential for future black-footed ferret reintroduction. Specifically, the Pilot Project is located within the Shirley Basin-Medicine Bow black-footed ferret management area. The possibility exists for future reintroductions nearby. Dispersal of ferrets within the boundaries of the management area also is expected to occur, although where ferrets will re-colonize is not known. At present, no prairie dog towns of sufficient size are present within the Pilot Project area. Prairie dogs are capable of recolonizing an area only if suitable habitat remains intact. Ferret recovery depends on future availability of suitable sites for reintroduction/dispersal. With the concentration of development within the project area, it is unlikely in the future that prairie dog colonies would gain sufficient size to support ferret dispersal. To date, no direct impacts to ferrets from the Proposed Action would be anticipated; however, the proposed project would preclude ferret reintroduction or dispersal.

In accordance with section 7 of the ESA, a "No Effect" impact determination has been made for the federally endangered black-footed ferret. This determination is based on this species' current distribution; the USFWS' block clearance in this region; and the low probability that ferrets could occur.

White-tailed Prairie Dog. One of the black-footed ferret's primary prey species, the BLM-sensitive white-tailed prairie dog, occurs throughout the project area (see Figure 3-11). Potential impacts to prairie dogs from the construction and development of the 15 new wells, minor access roads, electric distribution line, gas transmission line, and associated facilities could result in crushing of burrows and direct mortality of individual animals, if present in these development areas. However, no prairie dog colonies over approximately 10 burrows (field onsite, Rawlins BLM wildlife staff, 2005) would be directly impacted by project construction (see Figure 3-11), and overall effects would be expected to be incremental and dispersed for a Pilot Project of this size.

Long-billed Curlew. The long-billed curlew is a large shorebird commonly associated with drier, upland habitats and mesic meadows and could occur in and near the project area.

Potential impacts to this species would directly reflect those discussed for general water bird species in Section 4.8.1 and the above surface water analysis in Section 4.10.2.1. Minor impacts to birds from the proposed reserve pits would be possible (as previously discussed). The bioaccumulation potential for long-billed curlew from using the surface water resources at the existing reservoir site in Section 13 would be low, based on water quality analyses conducted to date (e.g., wells 14-35 and 2-2). However, without test results from the 15-blended well effluent for potential bioaccumulates, the possibility for these constituents cannot be definitively discounted and it is unknown if the potential for selenium to bioaccumulate would exist. An increase in soil salinity from continual water evaporation in the reservoir area would likely occur; however, as stated for general water bird species, elevated soil or water salinity levels would not be expected to impact bird species that may use this resource.

White-faced Ibis. Although some breeding habitat may exist along the Medicine Bow River corridor and some small wetlands/stock ponds may be used during migration for this water bird species, the likelihood of occurrence is low. Potential impacts to white-faced ibis from proposed project construction and operation would parallel those issues discussed above for the long-billed curlew, albeit a lower level, based on the lower probability of occurrence.

Passerines. Potential impacts to the five sensitive songbirds identified as potentially occurring in the project area (i.e., sage thrasher, Brewer's sparrow, sage sparrow, Baird's sparrow, and loggerhead shrike) would primarily include incremental habitat loss and fragmentation and potential displacement of adult breeding birds, if present. Figure 3-10 depicts documented locations for two of these special status songbirds (the Brewer's sparrow and sage thrasher), with a number of Brewer's sparrow occurrences recorded for the proposed power line ROW. Displacement of breeding birds could result from project construction and increased human presence in native shrubland steppe habitats. Assuming an incremental reduction in habitat, some of these breeding birds could be displaced in the short term (i.e., during construction and site reclamation) and in the long term (e.g., until shrubs become re-established). Displacement or nest abandonment during the breeding season could result in the loss of productivity for that breeding season. Birds are highly mobile and would disperse into surrounding areas, using suitable habitats to the extent they are available. The long-term loss/reduced usability of shrub habitat would lead to an increase in use by all shrub-dependent passerine species. Potential impacts to nesting birds would depend on the nest location relative to the proposed project components, the species' breeding phenology, the duration of the potential impacts, and the individual bird's tolerance of disturbances. Project construction would likely have a moderate to high impact on breeding birds, if construction activities were to occur during the breeding season. Habitat loss and displacement during project operation would likely be low to moderate, given the relative size of the proposed project and the level of drilling development proposed for Section 2.

Mountain Plover. In September 2003, the USFWS determined federal listing of the mountain plover as federally threatened was not warranted; however, the species remains a BLM sensitive species. Plover nest sites are protected on BLM lands with applied seasonal restrictions for surface use and human-related activities from April 10 to July 10. Potentially suitable habitat for the mountain plover occurs in and adjacent to the project area. If development activities were to occur during the breeding season, increased human presence and noise could result in displacing breeding adult plovers (if present) from their respective territories resulting in the potential loss of productivity for that season. With the proposed density of wells and roads, mountain plovers are not likely to return to utilize the area for nesting opportunities during the life of the project and until final reclamation. While mountain plovers do

use disturbed habitats on occasion, the resulting long-term human activity within this disturbed area would more than likely preclude nesting activity.

If project development were to occur within suitable plover habitat during the breeding season, the BLM would require specific mountain plover surveys, and if present, applicable restrictions would be required near active nest sites. These procedures are outlined in the BLM Instructional Memorandum No. WY-2004-035, dated April 16, 2004. Restrictions include mountain plover surveys conducted in potentially suitable habitat, if project-related activities were to occur between April 10 and July 10. Three surveys (14 days apart) would be required prior to the initiation of project actions to minimize impacting breeding or nesting birds. The BLM also has developed additional protection measures, in the event a nest site were recorded in the vicinity of project activities.

Greater Sage-grouse. Overall, the potential impacts to the greater sage-grouse from CBNG production can include loss of nesting or early brood-rearing habitat; decreased population productivity; reduced utilization of suitable habitats from indirect disturbance; loss of winter habitat; and displacement of birds into lower quality habitats. Construction of facilities and roads creates a long-term loss of greater sage-grouse habitat and increases fragmentation of remaining habitat. All of these impacts lead to lower productivity and a possible decline in this species' local populations. In the long-term, recovery of sagebrush to pre-disturbance levels would not occur during the life of the project. Therefore, there would be a long-term loss of nesting habitat.

This EA analysis focused on potential disturbance to breeding sage-grouse on or near lek sites, nesting hens, and brooding hens and young. Sage-grouse populations statewide appear to be in decline. Although there is no documented evidence as to the causes of this decline, wildlife specialists from the BLM, USFWS, and WGFD believe that drought conditions of the past decade and increased natural resource development activities (e.g., oil and gas exploration and development) may be contributing factors. In Wyoming, information suggests that greater sage-grouse populations are negatively affected by energy development activities, especially those that degrade important sagebrush habitat, even when mitigation measures are implemented (Braun 1998; Lyon 2000). Greater sage-grouse populations can repopulate areas developed for resource extraction after habitat reclamation for the species (Braun 1987); however, there is no evidence that populations attain their previous levels, and reestablishment of sage-grouse in a reclaimed area may take 20 to 30 years, or longer (Braun 1998).

Specific to the proposed Pilot Project and shown in Figure 3-12, no project components would directly intersect with a known sage-grouse lek or the 0.25-mile buffer delineating the Controlled Surface Use area surrounding the lek site. However, the proposed drilling area in Section 2, the CCF in Section 35, portions of the CBNG interconnect pipeline, and portions of the electric distribution line would cross the established 2-mile buffers surrounding specific lek sites. The BLM has designated this 2-mile buffer primarily to protect nesting hens and minimize noise effects to breeding birds occupying lek sites.

Any loss of an individual nest from project construction would be expected to be only for that season, if construction activities were to occur during the breeding season (March 1 to July 15). Potential direct noise impacts from project construction to sage-grouse breeding or nesting within 2 miles of an active lek would be minimized, based on the BLM's protection measures delineated in the Great Divide RMP (BLM 1988). These measures restrict construction activities within the 2-mile-radius buffer zone intersected by the project components from March 1 to

July 15. Additionally, human activity (and associated noise) would be restricted within 0.25 mile of the lek perimeter between 6 p.m. and 9 a.m. from March 1 to May 20.

Sagebrush obligate species, such as the greater sage-grouse, depend on habitat features, such as shrub structure and patch size. Braun et al. (2002) states that although sage-grouse may continue to use areas in and near CBNG development, suitable sagebrush-dominated habitats must be available, and birds tend to select the habitats that are not disturbed by or apparent from physical structures (e.g., wells, power lines, compressor stations), paved roads, human presence, etc. Lyon (2000) reports that sage-grouse appear to shift habitat use when nesting near roads to patches of sagebrush with a higher canopy cover and height. A few preliminary data also show that sage-grouse tend to select both lek sites and nest sites that are farther removed from disturbances, such as active wells, roads, and utility corridors (Braun et al. 2002; Lyon 2000; Holloran 2005). Holloran (2005) additionally suggests that natural gas field development within 2 to 3 miles of an active greater sage-grouse lek could reduce breeding populations, with possible total effects not apparent for 5 to 9 years. Therefore, the incremental habitat fragmentation and increased human presence from project operation would likely continue to reduce the amount of suitable sage-grouse habitat in the project area.

Few data exist on noise effects to either species of sage-grouse (i.e., greater or Gunnison). Although Holloran's (2005) study results suggest that increased noise intensity at lek sites influence male lek attendance, it is difficult to quantify defensible noise thresholds near lek sites; determine adequate distances between these sources and sage-grouse; and compare short- and long-term effects to breeding, nesting, and brooding birds. The Powder River Basin Oil and Gas Project EIS and Proposed Plan Amendment (BLM 2003a) references a specific standard for compressor noise levels relative to sage-grouse leks, using 49 dBA as the threshold at the lek site. Braun et al. (2002) states that sage-grouse numbers on active leks located within 1 mile of a CBNG compressor station are lower than those leks not in proximity to a compressor site. Similar to big game impacts from oil and gas, the WGFD (2004c) outlines impact issues for sage-grouse and recommends sources of continuous or frequently intermittent noise should not exceed 10 dBA at the perimeter of an active grouse lek between March 1 and May 15, with no detectable noise at the lek between 1 hour before and 2 hours after sunrise. The recommended noise threshold for "lek habitat" for the federal candidate Gunnison sage-grouse in southwestern Colorado and southeastern Utah also is 10 dBA since most grouse vocalizations are less than 20 dBA, with the recommended noise range for nesting and brooding habitat to be 10 to 49 dBA (see Appendix I in Gunnison Sage-grouse Rangewide Steering Committee 2005).

Section 4.13.1 describes the maximum probable noise level estimates for the various project components during both construction and operation. In summary, noise emissions estimates are 85 dBA at a distance of 50 feet for construction activities; 86 dBA at 50 feet for drill rigs; 61 dBA at 50 feet for internal combustion engine driven generators; and 77 dBA at 50 feet for large compressors enclosed in buildings. Using 55 dBA as the acceptable target threshold for humans, project-related noise during construction would achieve reduction to the standard at slightly less than 3,000 feet from the source. During project operation, the combined noise emissions would be approximately 80 dBA at 50 feet, and the noise level would drop to the 55 dBA threshold at approximately 900 feet from the source.

As shown on Figure 3-12, four sage-grouse leks occur approximately 1 to 2 miles from the proposed drilling area and CCF. Given the anticipated noise levels listed above for human receptors, it is assumed that project operation, including the proposed compressor station would be well below the 55 dBA threshold at lek sites; however, it may not be less than the 10 dBA threshold recommended by the WGFD (2004c) for one to four leks located south of the project

area. Since ambient noise levels vary with a number of site factors (such as wind and weather) and noise thresholds for greater sage-grouse are not proven, it us unknown whether the anticipated noise levels during project operation would impact lek attendance by male or female grouse. Until future lek counts are done to determine if the number of strutting males on the four leks is impacted over time, the possibility of noise greater than 10 dBA at the lek sites could potentially have an impact on breeding sage-grouse.

For the more uncommon Gunnison sage-grouse, the Gunnison Sage-grouse Rangewide Steering Committee (2005) recommended all surface-disturbing activities should be prohibited within 0.6 mile of an active lek. As previously stated, the proposed Pilot Project drilling area and ancillary facilities are located 1 to 2 miles from the closest sage-grouse lek, which would meet this recommended buffer threshold and may minimize impacts to breeding and nesting grouse from increase operational noise.

Other potential impacts to greater sage-grouse, such as habitat changes in mesic meadows commonly used for brooding and exposure to reserve pit water would be the same as discussed above for special status wildlife species. One unique factor for sage-grouse and water resources has been the recent expansion of West Nile Virus into the western U.S. As water sources expand and provide additional breeding sites for mosquitoes, the primary disease vector for this virus, there is a potential for increased incidences of West Nile Virus in sage-grouse. A number of studies have shown sage-grouse to be susceptible to the disease and identify potential concerns, including proximity of grouse to CBNG development (Clark et al. 2006; Naugle et al. 2005; Walker and Naugle 2004). It is feasible the proposed reservoir and reserve pits could support mosquitoes capable of transmitting West Nile Virus.

Finally, the EA analysis examined potential increased predation on grouse in the proximity to the proposed electric distribution line and other aboveground structures. There is a current theory that predators, such as golden eagles, may use these structures as hunting perches to predate on displaying male sage-grouse, nesting hens, and brooding chicks. However, no increased predation levels would be expected from the proposed Pilot Project, based on the location of aboveground structures greater than 0.5 mile from two lek sites and the topographical shielding of the proposed power line poles along the proposed ROW alignment (see Figure 3-12). The proposed power line corridor is not within line of sight of the sage-grouse leks to the east.

Swift Fox. Potential impacts to the swift fox from the proposed Pilot Project would be expected to be small. As discussed in Section 3.10.2, habitats are potentially suitable for this mammal species and documented occurrences have been recorded for the area; however, records are rare and incidence would likely be low. Based on the low probability of occurrence, it would be a low likelihood that direct mortality could result from equipment crushing and excavation, if fox natal dens occurred in proposed construction areas. Overall, impacts from the project would primarily encompass incremental habitat fragmentation and reduced habitat values in areas of surface disturbance and increased human presence, activities, and noise.

Pygmy Rabbit. Potential impacts to the pygmy rabbit, if present in the project area, would primarily encompass possible crushing of burrows, some direct mortality, and overall habitat fragmentation and reduced habitat values. These impacts would parallel those identified for the burrowing swift fox, as well. However, the potential presence and distribution of this declining rabbit species is presently unknown for the project area; therefore, the anticipated level of impacts cannot be defined. Given the small size of the proposed Pilot Project, direct and indirect impacts to this species, if present, would be limited in scale.

Wyoming Pocket Gopher. Potential impacts to another burrowing mammal would be similar in that loss of individuals may occur from project construction. A habitat description taken from the Wyoming Natural Diversity Database species assessment states, "The Wyoming pocket gopher uses upland drier ridge tops, gravelly loose soils, and greasewood habitats." Some of this potential habitat exists in the project area. Although no surveys have been conducted for this species, the likelihood of direct mortality would be small, based on the low likelihood of occurrence throughout the project area. Individual pocket gophers could be impacted during project construction.

Townsend's Big-eared Bat and Spotted Bat. No direct impacts to either the Townsend's big-eared bat or spotted bat would likely occur. No suitable habitat to support communal bat roosts (e.g., hibernacula, maternity colonies, or bachelor roosts) for either of these species occurs in the project area, and if present, bats would likely occupy individual day roosts only. Surface disturbance to potential foraging areas for these bat species would be low.

4.10.2.3 Mitigation

No additional mitigation measures have been developed for special status animal species.

4.10.3 Aquatic Species

4.10.3.1 Proposed Action

The BLM sensitive aquatic species identified in Section 3.10.3 were examined for the proposed Pilot Project. The boreal toad lacks suitable habitat in the project area; therefore, no impacts to this species would be anticipated. Suitable habitat may exist in the project area for the northern leopard frog and the Great Basin spadefoot. The northern leopard frog may occur in the riparian zone along the Medicine Bow River, although its preferred habitat, backwaters and areas with emergent vegetation, are rare along the river. No impacts to the northern leopard frog would be anticipated from the Pilot Project, given the avoidance of the Medicine Bow River corridor and its associated habitats. The Great Basin spadefoot is primarily a terrestrial species. It reproduces in stock ponds, irrigation ditches, and pools. Section 4.6.1 notes that the majority of such sites occur along the interconnect pipeline ROW. Since few of these features occur along this pipeline corridor and APC has committed to avoid disturbance of water features, where practicable (see Section 2.8.1), potential impacts to the Great Basin spadefoot would low to none during project construction.

4.10.3.2 No Action Alternative

Under the No Action Alternative the current level of area activities would continue and no impacts to aquatic resources have been identified.

4.10.3.3 Mitigation

No additional mitigation measures have been developed for special status aquatic species.

4.11 CULTURAL RESOURCES

Cultural resources are regarded as significant if they are enrolled in or meet the eligibility criteria of the NRHP. NRHP eligibility criteria are enumerated in 36 CFR 60 and are described as follows:

The quality of *significance* in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, *and*:

(a) That are associated with events that have made a significant contribution to the broad patterns of our history.

(b) That are associated with the lives of persons significant in our past.

(c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

(d) That have yielded, or may be likely to yield, information important in prehistory or history.

To qualify for NRHP eligibility, a property must meet two separate types of requirement. It must exhibit integrity of location, design, materials, etc. and it must meet one or more of the four additional criteria. The National Historic Preservation Act (NHPA) of 1966, as amended, is clear that a site need not be of national historic significance to be considered eligible; sites of local, state, and regional importance also may be listed, and thus are significant in the legal sense. The phrasing of NHPA is critical with respect to actual management of cultural resources. A site does not have to be included on the NRHP to receive protection under the law, but must simply meet the requirements of eligibility.

Impacts to cultural resources may be direct or indirect. Direct impacts are those that occur as a primary result of project designs and might be associated with actual gas field development (e.g., well pad construction activities, equipment staging areas, building of temporary access roads) and subsequent gas field maintenance operations. The greatest direct impacts can be expected to occur early in the course of any undertaking when surface disturbance takes place. Indirect impacts are those that occur as a secondary consequence of a project and are generally associated with increased human activity in previously inaccessible areas. Illicit surface collection of sites is a common form of indirect impact. Indirect impacts can occur at any time during or after construction; however, their effects must be anticipated at the outset.

4.11.1 Proposed Action

Class III cultural resource investigations have been conducted for the entire Hanna Draw Pilot Project area, resulting in the discovery and documentation of 163 sites (Buenger 2004a, 2004b; BLM 2002a; Stainbrook 2004). Of the total, 15 sites are NRHP-eligible and 43 sites remain unevaluated. The Proposed Action would directly impact one of the former. Site 48CR135 is a large site that includes both prehistoric and historic components. Although the proposed CBNG interconnect pipeline would cross some portions of the site, these areas have been tested and assessed as non-contributing to the eligible site. Otherwise, APC's protection measures

developed to protect historic and prehistoric cultural resources (see Section 2.1.8) and the BLM's standard policies for cultural resources protection (BLM 1988) are expected to protect known and unrecorded cultural sites during proposed project construction and operation of the Pilot Project.

4.11.2 No Action Alternative

Under the No Action Alternative, no additional impacts to cultural resources would be anticipated.

4.11.3 Mitigation

No additional mitigation measures have been developed for cultural resources. However, the BLM would require an open trench inspection of the CBNG interconnect pipeline, which us the only action that would extend beyond the applicant-committed measures delineated in Section 2.1.8.

4.12 RANGE RESOURCES AND OTHER LAND USES

4.12.1 Proposed Action

4.12.1.1 Range Resources

Project development would result in the loss of 399 acres of rangeland. A portion of this loss (369 acres) would be relatively short-term since disturbances associated with the utility corridors outside of roadways would be reclaimed the first planting season after construction is completed. Reclamation of utility corridor disturbances outside of roadways would improve forage conditions in these areas once revegetation is complete. A total of 30 acres of rangeland disturbance associated with well pads and roads would result in a long-term loss of rangeland and reduction in forage availability. Based on an average of 6.25 acres per AUM calculated for the Dana Block North Allotment, this would result in a loss of approximately 5 AUMs for the life of the project. APC's commitment to employ Best Management Practices ; spill and fire prevention measures; noxious weed control during construction, operation, and reclamation activities; vehicle speed limits; and measures to minimize livestock injury in open excavations (e.g., pits, trenches) would minimize offsite impacts and maintain rangeland health in adjacent undisturbed areas and reclamation sites (see MSUP in Appendix A).

At the end of the well testing period when closure operations are complete, reclamation would focus on establishing mid-successional grass/herbaceous and shrub communities. Reclamation goals for disturbed areas would eventually improve overall forage conditions within the Dana Block North Allotment and be consistent with BLM Standards for Rangeland Health and Guidelines for Grazing Management.

4.12.1.2 Other Land Uses

Effects on other land uses from the proposed Pilot Project would be limited to potential conflicts with existing uses or inconsistency with adopted plans for the area. As noted in Sections 3.12 and 3.14, existing uses in the area are limited to grazing, a defunct CBNG exploration project, and some amount of dispersed recreation, primarily hunting. Effects on grazing are addressed under range resources above in Section 4.12.1.1. There would be no conflict with the defunct

CBNG project. Effects on recreation are addressed in greater detail in Section 4.14, but existing recreation use is low in the immediate project vicinity; therefore, conflicts would be low, as well. Seminoe Reservoir and the existing coal mines are sufficiently distant from the proposed project that there would be no conflict with those activities.

Carbon County's Land Use Plan (Carbon County 1998) expresses support for sustaining agricultural activities over the long term and for development of mineral resources when it can coexist with agriculture. The proposed project would be in the county's RAM zoning district, which permits both oil and gas development and commercial agriculture (Carbon County 2004). The proposed project would be in compliance with the zoning regulation and, as noted in the range resources discussion of this section, would have only small effects on ranching activity. Also, the interconnect pipeline parallels existing two-track roads and energy corridors to the degree possible to minimize any potential effects from that facility.

4.12.2 No Action Alternative

4.12.2.1 Range Resources

Under the No Action alternative, there would be no change in current range conditions, livestock carrying capacity, or rangeland health within the Dana Block North Allotment resulting from the proposed activities associated with the Pilot Project.

4.12.2.2 Other Land Uses

Under the No Action Alternative, existing land use activities would continue as they have been. No effects to land use have been identified.

4.12.3 Mitigation

4.12.3.1 Range Resources

No additional mitigation measures have been developed for range resources.

4.12.3.2 Other Land Uses

No additional mitigation measures have been developed for other land uses.

4.13 NOISE

4.13.1 Proposed Action

Development of the proposed Pilot Project would inevitably increase noise in the project area. Oil and gas development require extensive use of heavy machinery, which is inherently noisy. The significance of that noise, however, depends in the simplest sense on how loud it is, where it is, and who (or what) is in a position to hear it.

The maximum probable development scenario for the Pilot Project would include construction of project facilities simultaneously with the operation of two drill rigs and two electric generators. Noise emissions estimates for construction activities are 85 dBA at a distance of 50 feet; for drill rigs they are 86 dBA at 50 feet; and for internal combustion engine driven generators they are

61 dBA at 50 feet (BLM 2003a). Noise levels are measured on a logarithmic scale so the emissions numbers can't simply be added together. The combined noise emission level for two drill rigs, two generators and heavy construction activity would be 91 dBA at 50 feet. Using 55 dBA as the acceptable target threshold, project related noise would achieve reduction to the standard at slightly less than 3,000 feet from the source. During quiet times in the vicinity, the noise would be audible beyond the 3,000 foot distance, but would not generally be considered obtrusive or offensive.

During the operations phase of the project, the primary noise sources would be natural gas or propane-fired compressors, which would be used to raise low pressure gas from the well field to between 800 and 1,500 psi for insertion into the pipeline system. Large compressors, enclosed in buildings as they would be for the project, generate noise levels estimated at 77 dBA at 50 feet (BLM 2003a). The Hanna Draw Pilot Project would employ two large compressors, and might continue to use the two generators during operations. The combined noise emissions for this equipment scenario would be approximately 80 dBA at 50 feet. The noise level would drop to the 55 dBA threshold at approximately 900 feet from the source.

While the distances to comply with the threshold standard may seem large, a key consideration is that there are no noise sensitive areas within well over 3,000 feet of the proposed project site. Consequently, noise emissions from the proposed project would not be problematic for implementation of the Proposed Action.

4.13.2 No Action Alternative

The No Action Alternative would not alter the noise environment in the vicinity of the proposed project site from the existing conditions discussed in Section 3.13.

4.13.3 Mitigation

No additional mitigation measures have been developed for noise.

4.14 RECREATION

4.14.1 Proposed Action

The Proposed Action would have only small effects on recreation. There could be a small amount of displacement of hunters, particularly for pronghorn antelope, but hunting activity in the immediate project area is believed to be light with areas farther north more popular and productive for hunting. Hunters could relocate to other parts of the relatively large hunt units that overlap the project site either during the drilling period or longer, depending on their sensitivity to the project activities.

Other recreationists may be displaced by the project, but the disturbance area is a small part of a very large scale landscape in the project area. Considering the nature of the existing site and the previous disturbance nearby, it is likely that there are very few recreational users of the site who would be displaced. Any displacement of recreationists other than hunters that would occur would likely continue for the life of the project because of the visual and auditory effect of the compressor facilities that would be required to deliver the gas to pipelines.

ROS classification of the site would likely change from roaded natural to rural for the life of the project. There are ample alternative use areas in close proximity to the proposed project site, however, many of which offer more desirable recreation opportunities.

There would be no effects on Wilderness Study Areas (WSAs). The project also would have no measurable effect on recreation activity at Seminoe Reservoir.

Overall, project effects on recreation resources and activities would be small due to the short term nature of drilling and construction activities, relatively small project footprint, and the small number of recreationists potentially affected.

4.14.2 No Action Alternative

The No Action Alternative would have no effect on existing recreation resources or activities in the project vicinity.

4.14.3 Mitigation

No additional mitigation measures have been developed for recreation resources.

4.15 VISUAL RESOURCES

4.15.1 Proposed Action

Visual impacts of the Proposed Action are evaluated under the Contrast Rating provisions of the BLM's VRM System (BLM 1986a). The proposed project would introduce structural elements into a landscape with only a few small structural features from prior exploration drilling efforts. In the short term, one or two drilling rigs would be large, dominant visual features; however, they would be present for only approximately 6 to 8 months. After drilling is completed, the remaining structures would be smaller and lower to the ground. Longer term structures would include the CCF, either electric distribution lines and a relatively small electric substation or a set of generators, small wellhead structures, and water pumps. To the degree possible, in compliance with safety standards and regulations, structures would be painted with the federal "standard environmental color" shale green to blend with the natural color pallet of the area.

Most of the well field portion of the project site would be screened from CR 291 by terrain because the road is in a draw and the site is back to the east on a plateau behind a series of small ridges. The electric distribution line, if built, would parallel the road for approximately 5 miles and would be visible in the foreground from the road. The CCF in Section 35 also would be visible from the road at a distance of approximately 0.5 mile.

Modifications to the existing terrain would be small. Drill pads would be flattened and there would likely be some sidehill cuts for the proposed CBNG interconnect pipeline. None of these would be visually dominant in the context of the large scale of the existing terrain.

Vegetation modifications would introduce color contrast and strong linear features, such as the interconnect pipeline, that would contrast with the existing landscape that has few linear elements. Most of these features would be out of site of most viewers, however, because there is little use of back country areas and even the county road is lightly traveled.

Considering the relatively small scale of the proposed project, the modest visual changes it would introduce, the small number of people who would be in a position to view them, and the requirement to use appropriate paint colors on structures to minimize their visual impact, the proposed project would readily comply with the standards of the Class IV VRM objective for most of the affected area.

The only project feature that would be in a VRM Class III area would be the southwesterly 5 miles of the proposed CBNG interconnect pipeline. Portions of the last 2 miles would be visible from lightly traveled U.S. 30/287. However, there are three existing pipelines in the corridor and none of them is visually dominant at the distance and angle of view from the highway. It is anticipated that the proposed interconnect pipeline would, in a similar fashion, not be visually dominant once reclamation of the construction disturbance has been successfully completed.

4.15.2 No Action Alternative

Under the No Action Alternative, the visual landscape as described in Section 3.15 would remain unchanged. No visual effects have been identified.

4.15.3 Mitigation

No additional mitigation measures have been developed for visual resources beyond the standard VRM Class IV stipulation that attempts should be made to minimize visual effects "through careful location, minimal disturbance, and repetition of the basic (visual) elements" (BLM 1986b).

4.16 SOCIOECONOMICS

4.16.1 Proposed Action

Socioeconomic effects of the proposed Pilot Project would be largely positive. The project would provide a small increment of short-term jobs and, if successful, would generate local, state, and federal government tax and royalty revenues. The relatively small, short-term drilling and field construction workforce would create only an equivalently small increment of demand for temporary housing or local government services. The very small operating workforce would have essentially no effect on housing or public service needs in Carbon County.

4.16.2 Population and Demography

Population effects of the Proposed Action would be small. Most of the skills and services required for the project are available in the local and regional labor pool. Although recent increases in both conventional and CBNG drilling activity in southwest Wyoming have employed much of the available oil and gas service workforce, any shortage of workers would likely result in hiring contractors from other areas of Wyoming or from nearby states. Given the short 6- to 8-month duration of the drilling phase, few, if any, non-local workers would be likely to permanently relocate to Carbon County; most would be expected to leave family members at home and commute on a weekly basis. Most field development and construction workers would likely to be drawn from the local or regional pool of workers and contractors. The relatively small workforce and short-term nature of the drilling and field development phase of the

proposed project suggests it is likely that area businesses would accommodate the increase in economic activity with existing employees.

Given all of the above considerations, the net effect of the drilling and development phase of the Pilot Project on Carbon County population levels would likely be small and temporary. At most there would be a small population "bump" from a few non-local contract workers relocating to the area for up to 8 months.

For the operations phase, it is assumed that only a small handful of jobs would be created, most of which would be filled from the local labor pool. Consequently, any population change associated with the operations phase of the Hanna Draw Pilot Project would be small.

4.16.3 Economic Conditions

4.16.3.1 Employment and Income

The Pilot Project, as described in Chapter 2, proposes drilling up to 15 CBNG wells. It also would involve construction of roads, a produced water disposal system, and a pipeline network as a gathering system for the gas. It may include construction of an electric distribution line and, if production warrants, construction of a CCF and CBNG interconnect pipeline.

The drilling plan anticipates a crew of 10 to 15 workers per well, in 2 shifts, including a supervisor for each shift, an engineer, and a mechanic. It is possible that there would be a second drill rig operating with a comparable crew, although it has not yet been determined whether this would occur. Each well would take from 7 to 10 days to drill plus 2 to 5 days for completion. Fifteen wells at 9 to 15 days each would require from 135 to 225 calendar days to complete (half as long if two crews were used throughout). With a crew of 10 to 15, there would be between 1,350 and 3,375 worker-days of employment generated by the drilling effort. Based on these estimates, and analyses done for gas drilling in southwest Wyoming (BLM 2004d), each well would generate the equivalent of approximately one person-year of work, or, stated more simply, one direct full-time job for a year. The 15 wells would generate the equivalent of 15 direct jobs.

In addition, construction of roads, the electric power line, gas and produced-water gathering systems, interconnect pipeline, and other infrastructure would require a number of construction workers. These activities would be temporary in nature, involving small crews working in the area for a matter of days or weeks. Given the relatively well-developed oil and gas service industry in Carbon and surrounding counties, construction crews are likely to be locally based. No estimates of actual numbers of workers or jobs have been developed for these jobs.

It is anticipated that each well would require an investment of approximately $350,000, including $30,000 to $45,000 for wages and benefits. The total for 15 wells would be $5.25 million and $450,000 to $675,000 for wages and benefits.

Construction of water and gas gathering systems, the electric distribution line, a substation (or generators), and the water transfer system would require materials and labor from a variety of local, regional, and possibly national sources, as would the CCF and the interconnect pipeline, if sufficient quantities of gas are produced. Expenditures for facilities other than the CCF and interconnect pipeline would be approximately $3.35 million; the CCF and pipeline would add $6.25 million. The total direct investment required for facilities and drilling for the proposed Pilot Project is estimated at nearly $15 million. Based on estimates documented in the Jack Morrow

Hills Coordinated Activity Plan (BLM 2004d), the total direct and indirect economic activity generated by this level of investment would be approximately $20.4 million.

Economic impacts from production of CBNG were estimated based on calculations prepared in the Jack Morrow Hills Plan. That analysis assumed a wellhead price of $2.81 per thousand cubic feet (MCF) and estimated total economic impact of $2,793 per MMCF with .0054 jobs per MMCF produced (BLM 2004d). Assuming these impact assumptions are reasonable, the estimated second year production of 4,875 MMCF would generate $13.7 million in total economic impact and 26.3 direct and indirect jobs annually in the early years. These numbers would gradually decline over time as production is estimated to drop to 625 MMCF (12% of the second year production) by year 15. It is likely that the actual effects would be larger than those estimated in the Jack Morrow Hills Plan because wellhead prices for gas have risen substantially since the analysis was conducted in 2002. The average wellhead price for gas was $5.49 per MCF in 2004, nearly double the $2.81 price used in the analysis (USEIA 2005). Simply scaling the estimated impact up in proportion to the difference in wellhead price would increase the total economic impact to $26.8 million. Realistically, the total impact is likely to be somewhere between the two figures.

It should be noted that the Pilot Project is an exploration project and the actual production numbers are speculative. If the project meets expectations, the second year production of 4,875 MMCF would equal approximately 5% of 97,205 MMCF total gas produced in Carbon County in 2004. Regardless of whether the production estimates are accurate, the economic effects of developing the project would be positive for the county and the state.

4.16.3.2 Effects on Other Economic Activities in the Vicinity of the Proposed Action

The principal economic activity in the project area vicinity currently is grazing, possibly with a small amount of recreational hunting. Implementation of the Proposed Action would result in a loss of forage from disturbed areas, both in the short term and, to a lesser extent, for the life of the project. These potential losses are discussed in greater detail in Section 4.12.

As noted in Section 4.14, the few hunters that use the area in the vicinity of the proposed project would be displaced for at least the development period and, possibly, up to the life of the project. However, the hunt units that include the project area are quite large and the better hunting is believed to be farther north in the units. Any displacement that occurs would not be expected to measurably lower hunter success rates or satisfaction so the economic effects would be small.

4.16.3.3 Effects on Government Revenues

The proposed Pilot Project would generate several forms of tax revenues, including local ad valorem property taxes on production and facilities; state and local sales and use taxes; federal government royalties on production, a portion of which would be returned to state and local governments; and state severance taxes.

Ad valorem and severance taxes and federal mineral royalty estimates are based on the $2.81 per MCF gas price forecast developed by the federal Energy Information Administration and used in numerous recent BLM documents. As noted above, gas prices are currently notably higher than $2.81 per MCF and a higher price is sometimes noted in the text to provide context.

Ad Valorem Taxes

The Proposed Action would generate ad valorem property taxes to Carbon County, the Wyoming School Foundation Fund, Carbon County Schools, and various taxing districts within the county. Ad valorem taxes would be generated from the fair market value of CBNG produced and sold; and from the value of aboveground capital facilities within the well fields. The average total mill levy for Carbon County is 63.493 mills.

Constant Carbon County mill levies were assumed for these estimates. In reality, mill levies are set each year by the officials of the taxing jurisdiction based on the assessed valuation of the county or district and the revenue needs of the taxing entity, so they may change from year to year. Natural gas is assessed based on the previous year's production; therefore, the revenues associated with the assessment would be received the following year. Since it is estimated that gas production from the Proposed Action would peak in the second year and then decline over the 15-year project life, production-related ad valorem property tax revenues would be highest in the third year of production and gradually decline through the end of the project.

Based on the assumptions described, ad valorem tax revenues from production and facilities would total approximately $5.1 million over the 15-year life of the project. Table 4-3 illustrates an approximate breakdown of how the total revenues would be distributed. As noted above, if the average wellhead price of gas were different from the $2.81 per MCF price used in the analysis, tax revenues would differ from these estimates. If the price were to average the $5.49 per MCF price seen in 2004, ad valorem revenues could approach $10 million over 15 years.

Table 4-3 Estimated Total Property Tax Revenues from the Proposed Action

Jurisdiction	Mill Levy	Revenue
Carbon County	12	$1,000,000
Total Schools	45	$3,750,000
Special Districts	4.42	$369,000
Total	**61.42**	**$5,119,000**

Federal Mineral Royalties and Wyoming Severance Taxes

The federal government collects a 12.5% royalty on the fair market value of gas produced from federal leases, less production and transportation costs. Half of mineral royalty revenues are returned to the state where the minerals were produced. In Wyoming, a portion of the state's share is distributed to local governments and to the Wyoming School Foundation Fund. Actual Mineral Royalty revenues collected would vary based on production levels, gas sales prices, and production and transportation costs. Assuming production of approximately 41,000 MMCF over the life of the project, at a sales price of $2.81 per MCF, the gross value would be approximately $115 million; 12.5% would be approximately $14.4 million. (In actuality, the taxable value would be reduced by production and transportation costs. Assuming these costs would be approximately 35% of the sale price, the royalty revenue would be closer to $9 million, although a higher sale price would increase this value.) Half of the revenue would be returned to Wyoming and redistributed to various state and local entities.

The State of Wyoming collects a 6% severance tax on the fair market value of natural gas produced within the state. Federal mineral royalty payments and production and transportation costs are exempt from this tax. The state uses revenues from this fund for a variety of purposes,

including the General Fund, the Water Development Fund, the Mineral Trust Fund, and the Budget Reserve. It also returns a portion to counties and municipalities. Using the same assumptions noted above, the 6% tax would yield approximately $3.8 million. Actual severance tax revenues would vary based on actual production levels, gas sales prices, and production and transportation costs. They may be lower than these estimates if a portion of the gas is used for production purposes, or higher if the gas price is higher.

Sales and Use Tax

Wyoming levies a 4% sales and use tax on the gross receipts of tangible goods and certain services (drilling services are exempted). The state returns 28% of the revenue (less administrative costs) to the county and municipalities where the taxes were collected. Carbon County also levies a 1% local option sales and use tax, which is distributed to the county and its municipalities, and a 1% special purpose tax, for a total of 6% (WDOR 2005).

During the construction and development phase of the Pilot Project, an estimated $4.3 million would be spent for goods and services subject to state and local sales and use taxes. This amount would generate about $124,000 for the State of Wyoming and about $134,000 for Carbon County and its municipalities.

4.16.4 Housing

The relatively small workforce needed for the Proposed Action, the short duration of most of the work, and the likelihood that many of the workers would be either local or weekly commuters (i.e., not bringing new families into the area) indicates that the project-related demand for housing would be small and short-term. Most non-local workers would seek short-term, temporary housing such as motel rooms and RV camping sites. The small amount of housing needed would be readily accommodated by the large number of motel rooms and camp sites available within a reasonable commuting distance of the project site.

4.16.5 Emergency Services

The small workforce and population effects of the proposed Pilot Project indicate that existing law enforcement, medical, and fire protection service capabilities would be adequate to accommodate the project.

4.16.6 Attitudes and Opinions

There has been no formal survey of community attitudes since the 1996 survey conducted as part of the Carbon County Land Use Plan process. Although the 1996 survey did not specifically address CBNG, it has been assumed residents' attitudes about CBNG development would be similar to the attitudes they expressed about traditional natural gas development activity (BLM 2001b, 2003b). In general, the residents' responses indicate they recognized "… a need to balance the conservation of natural resources and the economic viability of resource-based industries in the county" (Carbon County 1998). Residents also expressed some support for leasing of more federal lands for oil and gas development. Together, these sentiments have been taken to indicate residents, especially those in smaller communities like Hanna and Medicine Bow, would likely tend to support CBNG development as long as the development wouldn't damage water resources or wildlife habitat or degrade recreation resources in the county.

The analyses in this EA conclude that the proposed project would not substantially degrade water quality, wildlife habitat, or recreation opportunities. Assuming these conclusions are accurate, negative attitudes about the proposed project should be minimized and most residents would likely hold positive to neutral attitudes about the project.

4.16.7 Environmental Justice

The proposed Pilot Project site is located approximately 50 miles from Rawlins, where the nearest identified minority population concentration is located. At this distance, social and economic issues would be the only serious concern and, for the proposed project, social and economic effects would be positive. There are slightly higher than average concentrations of low income families and individuals in the communities closer to the project site. However, no residual adverse physical, social, or economic effects from the project have been identified so there would be no disproportionate, adverse effects on the low income population to raise environmental justice issues.

4.16.8 No Action Alternative

The No Action Alternative would result in a continuation of existing social and economic conditions and trends in Carbon County and in the vicinity of the Proposed Action.

4.16.9 Mitigation

No additional mitigation measures have been developed for social or economic effects, as the effects are generally positive or inconsequential, or both.

4.17 TRANSPORTATION AND ACCESS

4.17.1 Proposed Action

The proposed Pilot Project would generate traffic increases primarily during drilling and project development with substantially lower volumes during project operation. The highest numbers of trips would result from workers commuting to the site on a daily basis, while movement of equipment, materials, and supplies would generate smaller numbers but substantially heavier loads. Table 2-2 illustrates an estimate of the number of trips that would be generated by well field development activities.

It is assumed that drill rigs, dozers for pad construction, water trucks, and other heavy equipment would be transported to the site at the beginning of the project and would remain there until the construction/development phase of the project was completed. Materials and supplies would be delivered on a weekly basis. Drilling and completion crews and other personnel would commute to the project area daily, except for drilling engineers who would stay at a trailer on the drill site during the workweek.

Traffic impact analyses are conducted for peak hour traffic. For a proposal like the Pilot Project, peak traffic would occur during a drilling shift change when the fresh crews travel into the site and the retiring crews depart. Assuming a maximum case with all types of development activities occurring at the same time, including two drill rigs operating, completion activities on recently drilled wells, and several construction activities in process, it is assumed that the project could generate from 45 to 50 vehicle trips in a morning peak hour with approximately

75% (38 trips) inbound and the rest outbound. Most of the traffic would be light vehicles (i.e., cars and pickup trucks), although there could be a small number of delivery trucks, as well. It is expected that virtually all of the traffic would travel between the project site and the Hanna area on CR 291. Traffic would disperse south of Hanna via U.S. 30/287, SH 72, and I-80. This level of traffic added to existing traffic, as noted in Section 3.17, would be well within the capacities of all potentially affected roadways.

Although project-related traffic would represent substantial percentage increases to existing traffic, all affected roadways have significant amounts of unused capacity at the present time. No noticeable degradation of traffic flows would occur on area highways. The capacity of a gravel road like CR 291 is generally unquantifiable; however, CR 291 is well maintained and has a high quality, all weather surface, so up to 50 cars in an hour should flow reasonably well. Over the 6- to 8-month duration of the development phase of the proposed project, the increased traffic might cause an increase in maintenance required, but it should be within the capability of the road in other respects.

After the proposed project is developed and enters the operations phase, traffic would be much lighter, probably less than a half dozen trips in a typical day. The trip generation would be slightly higher periodically for maintenance, but would remain well below the levels estimated for project development.

It is unlikely that project-related traffic would measurably increase the risk of traffic accidents in the project vicinity considering the relatively small numbers of estimated vehicle trips and the short duration of the higher activity phase of the project.

Roads within the project site would be built and maintained by APC to BLM standards (see Figure 2-4 for a typical road profile). Onsite roads would carry relatively little traffic and would generally not be used if conditions were too wet to support vehicle weights.

4.17.2 No Action Alternative

The No Action Alternative would have no effect on existing traffic and road conditions in the project vicinity.

4.17.3 Mitigation

No additional mitigation measures have been developed for transportation and access.

4.18 HEALTH & SAFETY

Potential health and safety impacts from implementation of the Pilot Project would include a relatively low risk to project workers from industrial accidents and a slight increase in risk of traffic accidents for the general public during drilling and field development. Highway safety impacts are discussed in Section 4.17, Transportation and Access.

4.18.1 Proposed Action

Two types of workers, as classified by the U.S. Department of Labor, would be employed during implementation of the Pilot Project: oil and gas workers, who had a 2004 annual incident rate of 2.6 per 100 workers, and special trade contractors, who had a non-fatal incident rate of 6.8 per 100 workers (U.S. Department of Labor, Bureau of Labor Statistics 2005). These rates

compare with an overall private industry average incident rate for all occupations of 4.8 per 100 workers.

During the drilling and field development phase of the project, the statistical probability of injuries is low. During field operations, the annual statistical probability of injuries is low, given the low level of employment.

The BLM, Occupational Safety and Health Administration (OSHA), U.S. Department of Transportation (USDOT), WOGCC, and Wyoming OSHA each regulate certain safety aspects of oil and gas development. Adherence to relevant safety regulations on the part of the applicant and enforcement by the respective agencies would reduce the probability of accidents, accordingly. Additionally, given the remote nature of the project area, and the relatively low use of these lands by others (primarily grazing permittees and hunters), occupational hazards associated with the Proposed Action would mainly be limited to employees and contractors rather than the public at large.

The Pilot Project would include the construction of a CBNG interconnect pipeline from the drilling area to the southwest. This relatively small amount of new pipeline, as compared to a total of over 300,000 miles of gas transmission pipelines in the U.S., coupled with the low probability of failure and the remoteness of the project area would result in low risk to public health and safety. Nationwide, injuries associated with gas transmission pipelines averaged 8 per year from 1996 through 2005, fatalities averaged 3 per year, and incidents such as ruptures averaged 93 per year (USDOT 2005). Signing of pipeline ROWs could reduce the likelihood of pipeline ruptures caused by excavation equipment-particularly in the vicinity of road crossings or areas likely to be disturbed by road maintenance activities.

In summary, the increase in risk to public health and safety as a result of the Pilot Project is expected to be small.

4.18.2 No Action Alternative

Under the No Action Alternative there would be no development activity within the project area, and therefore, no impact to public health and safety from this alternative.

4.18.3 Mitigation

No additional mitigation measures have been developed for health and safety.

4.19 CUMULATIVE IMPACTS ASSESSMENT

This section provides a discussion of cumulative impacts for each resource analyzed in Sections 4.2 through 4.18. Cumulative impacts are those impacts to the environment resulting from the incremental impacts of the Proposed Action when added to past, present, and reasonably foreseeable future actions. Cumulative impact assessment areas (CIAAs) or cumulative domains vary among resources and are generally based on relevant landscape, resource, project, and/or jurisdictional boundaries (Table 4-4).

Table 4-5 outlines the project (well locations, facilities, proposed access roads, gathering pipelines, utility lines, interconnect pipeline, and power line) is located within six Hydrologic Unit (HU) 12-level watersheds:

Table 4-4 Cumulative Effects Analysis Domains

Resources	CIAA[1]	Rationale
Climate and Air Quality	Sub-grid, Near-field	Far-field analysis will refer to most recent BLM EIS
Geology and Geological Hazards	Project Area	
Paleontological Resources	Project Area	
Soils	Project Area	
Water Resources		
Surface Waters	Six HUC-12 level watersheds (see text)	
Groundwater	Producing formation + 1 mile from outcrops	
Floodplains	Six HUC-12 level watersheds (see text)	
Vegetation, Wetlands, and Reclamation	Six HUC-12 level watersheds (see text)	
Terrestrial Wildlife	Project Area + One-Half Home Range	
Aquatic Resources	Project Area	
Special Status Species		
Raptors	Project Area + 1 Mile	Nesting raptor protection stipulations proscribed by RMP
Sage grouse	Project Area + 2 Miles	Lek protection stipulations proscribed by RMP
Mountain plover	Project Area + 1 Mile	Available and contiguous habitat
Big game/CWR	CWR 61,593 Acres	Management unit of DGF
Other migratory birds	Project Area + 1 Mile	Available and contiguous habitat
Small mammals	Project Area + One-Half Mile	Available and contiguous habitat
Aquatic species	Medicine Bow River + Seminoe Reservoir	Available and contiguous habitat
Sensitive plants	Project Area + One-Half Mile	Available and contiguous habitat
Cultural Resources	Project Area	No trails/viewshed issues with this project
Range Resources and Other Land Uses	Allotment(s)	Management unit of BLM
Noise	Project Area +2000'	EPA guidelines=55dBA (drilling/construction=54 dBA@2000")
Recreation	Project Area + 1 mile buffer	Checkerboard ownership: N/A
Visual Resources	Area visible from County Road 291	Checkerboard ownership: N/A, VRM Class IV
Socioeconomics	Carbon County	Ad Valorum
Transportation and Access	County Road 291 from its intersection with County Road 270 to Hanna and Highway 72 from Hanna to the I-80 interchange, including the Highway 30/287 intersection	Roads used for project
Health and Safety	Project Area	Tie in with Transportation & Access

[1] "Project Area" = Section 2, Section 35, and 100-foot buffer of linear features.

Table 4-5 Hydrologic Units Associated with Pilot Project Area

HUC-12 Name	Area	HUC-12 ID #
Medicine Bow River- Hanna Draw	26,347 acres	101800040501
Lower Big Ditch	24,752 acres	101800030202
Middle Ditch	15,201 acres	101800030203
Upper Big Ditch	34,924 acres	101800030201
Middle Saint Mary's Creek	30,509 acres	101800021202
Lower Saint Mary's Creek	23,334 acres	101800021203

These watersheds (Figure 4-3) are located within the North Platte hydrologic basin, with eventual tributary contribution to the Gulf of Mexico. Both portions of Saint Mary's Creek drain to the southern arm of Seminoe Reservoir. The other four watersheds drain to the Medicine Bow River. The six HUC 12-level watersheds comprise a total of 155,067 acres. These watersheds serve as discrete planning units of a manageable scale for the assessment of cumulative impacts associated with surface water, floodplains, and vegetation resources. Thus, this 155,067-acre area is considered the CIAA for these resources.

In total, the Pilot Project would add approximately 399 acres of surface disturbance to the CIAA. There are 11 wells that are either producing, shut-in, or in the process of being drilled within the CIAA (Figure 4-3) as of February 2006. There are no additional proposed APDs on file at the WOGCC. The Proposed Action includes the drilling of 15 additional CBNG wells, resulting in a total of 26 existing and reasonably foreseeable APDs in the watershed.

In development of the Desolation Flats EIS, a natural gas project within south-central Wyoming, an analysis of the expected short-term disturbance area for typical oil and gas wells within the exploratory development area provided an estimate of 12 acres per well (including well pad, access road, and pipeline for most wells). It should be noted that the short-term disturbance figure represents the disturbance associated with a typical well prior to any reclamation activities. Many of the producing wells have been reclaimed to their production facilities.

Using an assumption of 12 acres of disturbance per well, the proposed action (399 acres), in combination with the 11 existing and reasonably foreseeable (non-project) wells (132 acres), would result in a total cumulative oil and gas development disturbance (short-term) of 531 acres within the watersheds. This equals approximately 0.3% of the CIAA.

4.19.1 Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and reasonably foreseeable future actions applicable to the proposed Pilot Project would include a number of activities associated with past and present mineral exploration and development in the region in addition to historic land uses, such as livestock grazing. Specifically, past oil and gas exploration and development by Williams Production Company (formerly Barrett Resources Corporation), coal mining and associated reclamation, livestock grazing, road development, utility corridor placement, and a small degree of increased recreational access and use (e.g., hunting).

There are no known, unreclaimed disturbances associated with the coal mining activities, and none reasonably foreseeable. Several railroad lines and various roadways also are present within the area. The Town of Hanna is located in the center of the CIAA, and includes housing-

and municipality-related surface disturbance. The impacts contributed from the Town of Hanna are unknown.

Past actions on or in the vicinity of the Pilot Project include the previous CBNG well exploration and development by Williams, the existing water containment reservoir, Hanna Draw Road and other ancillary access roads, six coal mines, livestock grazing, and more recent development of Well 2-2 by APC.

The one reasonably foreseeable future action identified for the Hanna Draw cumulative assessment is Dudley and Associates proposed CBNG development and operation, Seminoe Road Gas Development (Seminoe Road) Project (BLM 2005b). The Seminoe Road Project is located approximately 20 miles northeast of Rawlins, in Carbon County, approximately 20 miles west of the Hanna Draw Pilot Project area. The Seminoe Road Project proposed to drill and develop up to 1,240 wells, on up to 785 well pad sites, spaced at one well pad site per 160 acres. Associated facilities would include roads, gas and water collection pipelines, compressor stations, water disposal systems, and an electric power supply system. This project's analysis area encompassed a 137,000-acre area, which includes a checkerboard pattern of mostly federal (greater than 49%) and private (greater than 49%) surface, with some state lands (less than 1%).

Total disturbance for drill pads, access roads, and ancillary facilities would be approximately 6,174 acres (4.5% of the overall project area). Construction and drilling activities are proposed for a 10-year period from the start of the project. Approximately 60% of the initial site disturbance would be reclaimed after construction; therefore, an estimated 2,349 acres (1.7% of the project area) would remain disturbed in the long-term. This area would be reclaimed at the conclusion of the estimated 30-year project life.

Each project phase of the proposed Seminoe Road Project would involve the drilling of an average of 124 CBNG wells, with associated road construction and installation (burial) of water, gas and electrical distribution lines. Each project phase would be examined under the applicable NEPA analysis before BLM would issue a final decision.

4.19.2 Air Quality

The cumulative impact analysis for air quality considered the incremental impacts of the Pilot Project when added to the potential impacts predicted for the nearby Seminoe Road Project (BLM 2005b). The anticipated emissions level from the Pilot Project would be incremental and considerably less than those identified for the Seminoe Road Project. The Seminoe Road Project cumulative impact analysis for air quality suggests that air impacts from the Pilot Project would be below applicable federal and state standards. Specifically, the Pilot Project would represent a very small fraction of emissions resulting from increased oil and gas development within south-central Wyoming.

The Seminoe Road Project's cumulative impact analysis for air quality predicted an increase of 340.2 tpy of NO_x emissions over the background emissions. The cumulative impact analysis predicted that the maximum criteria pollutant concentrations would not exceed federal or state ambient air quality standards. Cumulative impacts also were predicted to be less than the PSD Class I increments. Impacts to sensitive lake acid neutralizing capacity (ANC) were less than the applicable limits of acceptable change. The cumulative visibility analysis for all regional sources (including the Seminoe Road Project) revealed that there could be 4 days per year (IMPROVE) and 1 day per year (FLAG) when visibility impacts were greater than the 1.0-dv

threshold for the Bridger and Popo Agie Wilderness Areas in western Wyoming. However, it was determined that the Seminoe Road Project would not be a major contributor to these few visibility exceedances. Impacts from the Seminoe Road Project were predicted to be below the 0.04-dv visibility significance threshold for all days where the cumulative visibility impacts were estimated to be 1.0 dv or greater (BLM 2005b). With development of the Pilot Project, NO_x emissions in the cumulative study area would increase by 33 tpy, a 9.7% increase in emissions over those analyzed in the air quality study. Therefore, the Pilot Project would not alter the overall assessment of cumulative impacts in the region.

4.19.3 Geology and Geological Hazards

Surface and subsurface mining activities along with oil and gas exploration have occurred across the Pilot Project area over the past century. Currently, coal mines in or adjacent to the Pilot Project area are undergoing reclamation or have been reclaimed. Only CBNG exploration was previously conducted by Williams (Barrett) within the Pilot Area. Other proposed CBNG activities, such as the Seminoe Road Project are located outside of the geological CIAA. Overall, cumulative impacts in the Pilot Project area to geologic resources would be considered to be small.

4.19.4 Paleontological Resources

The cumulative impact domain for paleontological resources is the immediate project area. Previous CBNG exploration and associated infrastructure combined with the proposed Pilot Project would be the only cumulative activities that could potentially result in cumulative effects to paleontological resources. No other reasonably foreseeable future projects are planned within this domain. Implementation of the resource protection measures required in the BLM's Great Divide Resource Management Plan (BLM 1987) would reduce the potential for impacts to paleontological resources.

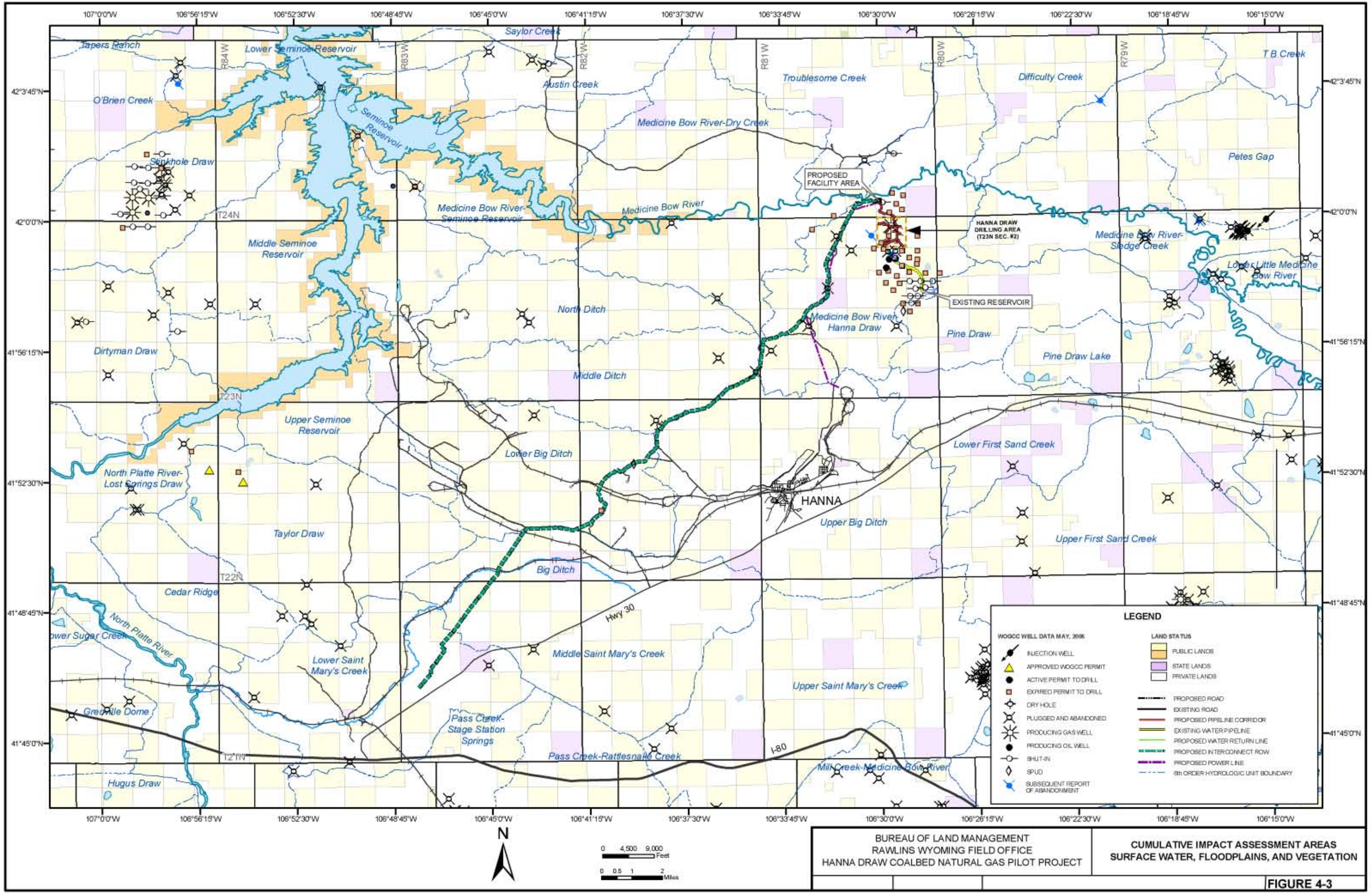
4.19.5 Soils

Given that the CIAA for soils is the project area, the 399 acres of soils proposed to be impacted as a result of this project constitute the impact to this resource in the analysis area. Past CBNG exploration and associated access road construction, in addition to the construction of County Road 291, have removed soils from production as has the construction of a few small stock ponds and a variety of two-track roads serving local grazing operations. Approximately 4 acres of soils have been previously disturbed by coal mining activities along the proposed ROW and are in the process of being reclaimed. This acreage would be re-disturbed under the Pilot Project and reclaimed following ROW construction.

4.19.6 Water Resources

4.19.6.1 Surface Water

The CIAA for surface water resources are the six HUC-12 watersheds shown on Figure 4-3. The Pilot Project, along with other reasonably foreseeable activities in the watersheds, would contribute to surface water degradation through increased erosion and sedimentation. However, given the small number of wells proposed for the Pilot Project and subsequent reclamation of portions of the disturbance areas, the impacts are anticipated to be small. As discussed in the introductory section, total cumulative oil and gas development disturbance is



BUREAU OF LAND MANAGEMENT
RAWLINS WYOMING FIELD OFFICE
HANNA DRAW COALBED NATURAL GAS PILOT PROJECT

CUMULATIVE IMPACT ASSESSMENT AREAS SURFACE WATER, FLOODPLAINS, AND VEGETATION

FIGURE 4-3

estimated to equal approximately 0.4% of the CIAA. Therefore, the proposed project, in combination with other reasonably foreseeable activities and actions within the CIAA, is not expected to cumulatively affect surface water resources if the mitigations provided in the APD and Conditions of Approval are implemented.

4.19.6.2 Groundwater

The groundwater CIAA for the Pilot Project is defined as an area that extends 1 mile beyond outcrops of the producing formation, or the Hanna Formation. This cumulative impact domain essentially occupies the central portion of the Hanna Basin. Activities that could potentially affect hydrologic conditions within and adjacent to the Pilot Project groundwater domain include withdrawal of groundwater for livestock and domestic use and other CBNG exploration activities. Domestic and livestock groundwater use in the Pilot Project and adjacent areas are considered relatively small compared to CBNG dewatering. The only reasonable foreseeable future action is the proposed Seminoe Road Project, another CBNG project located within the Hanna Basin.

Proposed groundwater pumping from the Seminoe Road Project could have additive drawdown effects to the Pilot Project area where cones of groundwater depression may overlap. Under the Seminoe Road Project, dewatering of coals in the Mesa Verde and Medicine Bow formations is proposed. The Mesa Verde coals are hydraulically isolated from the Medicine Bow and Hanna Formations by the low permeability of the 2,800-foot-thick Lewis Shale. The overlying Medicine Bow coals are isolated from the Hanna Formation, as they are interbedded between shales and are separated from the Hanna Formation by the fine-grained rocks of the 6,000-to 11,000-foot-thick Ferris Formation. Given that the Seminoe Road Project CBNG targets are stratigraphically deeper and isolated hydraulically by low-permeability strata, the potential for cumulative groundwater impacts is small.

4.19.7 Floodplains

Known impacts within the floodplains CIAA consist primarily of historic road, railroad and haul/road crossings, as well as domestic developments associated with the Town of Hanna. The acreages resulting from implementation of this proposed project would be small, given the limited acreage of floodplains affected and short-term construction period along the CBNG interconnect pipeline. Additionally, the total cumulative oil and gas development disturbance would be approximately 0.4% of the CIAA. Therefore, the Pilot Porject is not expected to cumulatively impact floodplain resources.

4.19.8 Vegetation, Wetlands, and Reclamation

Approximately 399 acres of vegetation of all community types would be impacted within this proposed project area. Other activities that have occurred within the CIAA include road and haul road construction, railroad construction, Town of Hanna residential and commercial developments, reclaimed coal mine disturbances, and limited oil and gas development (132 acres). As stated for floodplains, the total cumulative oil and gas development disturbance would be approximately 0.3% of the CIAA; therefore, the BLM does not anticipate cumulative impacts to vegetation and wetlands resources.

With respect to state-list and county-list noxious weed species, no increase in such species would be anticipated across the CIAA as a result of the implementation of this project given

APC's commitment to a weed control program. Non-noxious invasive species would also be controlled, per BLM requirements and stipulations.

4.19.9 Terrestrial Wildlife

The CIAA or cumulative domains for terrestrial wildlife vary by wildlife group, based on the species' relative mobility, home ranges, and habitat use. For most species, the CIAA encompasses the project area plus half the species' home ranges. Specific to big game species and seasonal ranges, the cumulative areas include portions of the mule deer herd unit for the Platte River and Shirley Mountain Herds. The pronghorn CIAA encompasses the contiguous crucial winter range within the Medicine Bow Herd unit applicable to the project, which totals an estimated 61,568 acres (see Figure 3-4). For most migratory birds, the CIAA includes the project area plus a 1-mile buffer, and for smaller, less mobile species (e.g., small mammal species), the area extends approximately 0.5 mile beyond the project area boundary.

Past, present, and reasonably foreseeable future actions applicable to terrestrial wildlife species would include a number of activities that have occurred across the landscape within these cumulative impact domains. Specifically, past oil and gas exploration and development, coal mining and subsequent reclamation, livestock grazing, road development, utility corridor placement, and a small degree of increased recreational access and use (e.g., hunting). The one future action identified for the cumulative assessment is the Seminoe Road Project, with the proposed drilling and development of up to 1,240 wells (160-acre spacing) with approximately 124 CBNG wells drilled each phase. Associated facilities would include access roads, gas and water collection pipelines, compressor stations, water disposal systems, and an electric power supply system.

Cumulative effects to regional terrestrial wildlife species would parallel those issues identified and discussed in Section 4.8. The past, present, and future activities combined with the proposed Hanna Draw Pilot Project would incrementally contribute to overall habitat loss and fragmentation, animal displacement in the short- and long-term, changes in the surface water regime, increased vehicle mortalities, increased noise levels and human presence, and increased legal or illegal hunting.

Anticipated cumulative effects to big game species is one of the more important terrestrial wildlife resource issues associated with the increased oil and gas development in Wyoming, including the cumulative effects issues examined for the Pilot Project. Crucial winter range is most important to pronghorn and mule deer during severe storm events, years of high snow pack, or during extended and extreme winter conditions. These environmental conditions force the pronghorn into the lower elevations that historically contained suitable forage and thermal cover necessary to support animals during periods of stress. However, sagebrush communities across Wyoming are exhibiting late successional stages of relatively even age classes dominated by older plants (>50 years) (WGFD 2004c). Displacement of individual pronghorn and mule deer into adjacent areas of winter range that may or may not be characterized by plants of reduced vigor, productivity, and nutritional quality may contribute to the decline of these populations' distribution and number.

Animals may experience severe physiological stress during the winter period, particularly gestating does, which require higher levels of energy for survival and successful reproduction. Specific to mule deer, Hobbs (1989) determined that human-induced disturbances to mule deer (i.e., two disturbances per day, each disturbance causing the animals to move a minimum of 1,500 feet) during a severe winter period could double doe mortality. Mule deer in South

Dakota require an average of 3.5 to 4 pounds of dry-weight forage per 100 pounds of body weight during the winter season (Richardson and Petersen 1974). Therefore, disturbances during the winter could prevent access to sufficient amounts of forage to sustain individual deer. A deer's ability to survive the winter and a doe's ability to produce viable offspring ultimately depend on the fat reserves, which are continuously used during the winter. Increased stress that causes these fat reserves to be used faster reduces survival for deer and reduces the interuterine survival of fawns. Therefore, increased human activity or harassment combined with a severe winter event could lower deer survival (Richardson 1992; Yarmoloy et al. 1988) and lower doe fecundity. These factors would apply to the pronghorn Medicine Bow Herd crucial winter range and to a lesser extent the mule deer Shirley Mountain and Platte River Herds winter ranges located within the CIAA.

Available crucial winter range located within the established pronghorn CIAA encompasses an estimated 61,593 acres. The proposed Pilot Project could affect approximately 2,747 acres in the long term on the edge of this winter range, assuming that well density, human presence, and ancillary facilities would likely displace animals outside of this area during the life of the project. An estimate of past and present surface disturbances within this same CIAA have not been calculated.

The proposed Seminoe Road Project is the largest activity identified for the big game CIAA. This project's proposed well density is projected to be 4 wells per 1-mile-square section and cumulative disturbances of up to 28.6 acres per 1-square-mile (640-acre) section. Assuming full field development (1,240 wells on 785 well pad sites) over a 10-year period, the total disturbance for drill pads, access roads, and ancillary facilities would be approximately 6,174 acres (4.5% of the overall project area). Approximately 60% of the initial site disturbance would be reclaimed after construction; therefore, an estimated 2,349 acres (1.7% of the project area) would remain disturbed in the long-term. This area would be reclaimed at the conclusion of the estimated 30-year project life.

The DEIS (BLM 2005b) states the Seminoe Road Project would "not affect a large amount of crucial winter range" for either pronghorn or mule deer. Five wells are proposed to be drilled in mule deer crucial winter range in the extreme southeast corner of the EIS analysis area. Portions of pronghorn crucial winter/yearlong range would be affected in the west and northwest project area, short-term disturbance estimates approaching the 28.6 acres per section and long-term (after reclamation) disturbance no more than 20 acres per section. However, no total acreage estimates for either of these species' crucial winter range from this project were provided, although the estimate is said to be "low."

Existing access roads in the vicinity of the project increasingly fragment native habitats. The WGFD's scoping comments provided June 21, 2004 discuss preliminary results from the *Southeast Wyoming Cumulative Impacts Analysis.* One primary issue identified by the WGFD is the existing road network and its cumulative effects on terrestrial wildlife. Access road construction and use from the proposed Seminoe Road Project also would contribute to overall habitat fragmentation and displacement within the applicable pronghorn and mule deer herd units. Although it is not quantified, roads can disrupt large mammal populations, even if they do not present a physical barrier (Andrews 1990; Richardson 1992), as typically exhibited in more open grassland and scattered shrubland habitats. As an example, roads resulting from energy development in the Book Cliffs of Utah were shown to result in a greater impact to mule deer than the direct habitat loss (Karpowitz 1984). The cumulative development of regional access roads could continue to increase overall habitat fragmentation and animal displacement, both from road presence and a change to the vegetation composition in proximity to the road

margins, caused by a change in soil temperature, dust accumulation, and moisture content (Vaillancourt 1995). Based on applicable resource studies, the plant community composition would likely be altered within 165 to 200 feet from the road edge (Gelhard and Belnap 2003; Baker and Dillon 2000).

Combining the degree of specific habitat loss, fragmentation, human activity, and increased noise from past, present, and the proposed Seminoe Road Project, the cumulative impacts to big game species would reduce the amount and access of crucial winter range available for these species. The WGFD (2004c) outlines the impact thresholds relative to oil and gas field development. As discussed in this EA, Section 4.8.1 for big game species, the thresholds developed by the state wildlife agency are based on two quantitative measures, well density and the cumulative acres of disturbance per a 640-acre area, using the density of well pads as a general index to well field development and activities. As densities of projects' wells, roads, pipeline and electric ROWs, compressor stations, and other facilities continue to increase and expand, habitat is not only lost in these specific areas, but the effectiveness of the adjacent habitats (i.e., zone of influence) also may decrease. Displacement of individuals forces animals into marginal habitats or they have to compete with animals already occupying the adjacent areas. Increased displacement and inter- and intra-species competition ultimately may lower survival rates during the winter, reproductive success, population numbers, and the range's carrying capacity to support a certain number of animals. In summary, the proposed Pilot Project's effects would incrementally add to the cumulative effects to big game species in this area of south-central Wyoming. The limited amount of crucial winter for both pronghorn and mule deer cumulatively affected within the established CIAA would aid in keeping these effects more isolated.

No potential water quality or water quantity effects were identified for terrestrial wildlife species for the proposed Seminoe Road Project, specifically the North Platte River located downstream of Seminoe Reservoir. Based on the water assessment for the Pilot Project, the potential for future water quality and water quantity impacts would parallel the analysis for the proposed Hanna Draw Pilot Project. Not all wildlife can be excluded from reserve pits; consequently, some cumulative impacts to wildlife may occur through their inadvertent access to pits during project operation. Additionally, the bioaccumulation potential to terrestrial wildlife from the permitted reservoir is low; however, without test results from the 15-blended well effluent for these additional potential bioaccumulates, the potential for these constituents cannot be definitively discounted and it is unknown if the potential for selenium to bioaccumulate would exist.

Cumulative issues for other terrestrial wildlife (e.g., waterfowl, water birds, raptors, passerines small- and medium-sized mammals, reptiles) would parallel the overall discussion on the anticipated habitat loss, fragmentation, some direct mortality (vehicle collisions, burrowing animals), and animal displacement in the short and long term. As discussed in Section 4.8, the BLM has developed applicable mitigation measures, and the applicants for past, present and reasonably foreseeable projects have committed to specific protection measure to minimize these effects.

Residual cumulative effects after these measures are applied would encompass a further incremental reduction in the amount of available cover, foraging opportunities, and breeding areas for a variety of trophic levels in both the short and long term. Additional development could potentially preclude animals from using areas of more intensive human activity. However, generally, the severity of the cumulative effects would depend on factors, such as species'

sensitivity, seasonal intensity of use, type and duration of projects activities, and physical parameters (e.g., topography, forage, thermal cover, slope, aspect).

Residual cumulative impacts from habitat loss and fragmentation would be important to certain bird species, such as neotropical migrants (e.g., Swainson's hawk, songbird species) that are currently experiencing additional population pressures from external factors outside of the project area, unrelated to mineral development. A combination of local, regional, and international issues is impacting these overall populations; however, the anticipated cumulative effects to these species would once again be considered to be isolated, incremental impacts to overall habitat availability.

In summary, the overall cumulative effects identified within the CIAAs delineated for terrestrial wildlife species would continue to contribute incremental direct, indirect, short-term, and long-term impacts to both resident and migratory species. Both protection and mitigation measures developed for the resource area and cumulative components would aid in minimizing impacts. However, residual impacts would remain that encompass overall habitat loss and fragmentation, some direct mortality, and some animal displacement, depending on a number of factors, including species' sensitivity, habitat availability, buffering factors, existing prey base, and type of project-related activities.

4.19.10 Aquatic Biology

Given that no discharge would occur from the existing reservoir to be used for storage of produced water and that no impacts to aquatic resources would be expected from the proposed project, no cumulative impacts from the Pilot Project would be anticipated.

4.19.11 Special Status Species

4.19.11.1 Special Status Plant Species

No cumulative impacts to threatened, endangered, or sensitive plant species, along with Wyoming plant species of concern, are anticipated. Suitable habitat is not present in the project area for the majority of the plant species listed as potentially occurring. Where marginally suitable habitat does exist for the Ute ladies'-tresses orchid and the Colorado butterfly plant, APC has committed to avoiding the vegetation type supporting these plant species, as discussed in Section 4.10.1. Limited habitat suitable for supporting persistent sepal yellow cress was investigated along the south bank of the Medicine Bow River. This habitat consisted of a notably narrow strip of mud bank adjacent to steeply sloping uplands. No individuals of this species were found to exist in this area. It is reasonable to assume that this proposed project would have no impact on the plant species of concern within the project area or within the CIAA, including a buffer zone of 0.5-mile surrounding the project area.

4.19.11.2 Special Status Animal Species

The CIAAs used to examine potential effects to special status animal species essentially encompassed the project area plus a 1-mile buffer. Exceptions included the greater sage-grouse, which used a 2-mile buffer around each lek within the project area; bald eagle, whose CIAA extended down the Medicine Bow River to Seminoe Reservoir; black-footed ferret, which encompassed the Seminoe Road Project; and small mammal species (e.g., Wyoming pocket gopher, spotted bat), where the CIAA extended only 0.5 mile beyond the project boundary. Because the long-billed curlew and white-faced ibis are both special status water

birds, they were included in the analysis of water discharge into the existing reservoir in Section 13 and the area applicable to the Seminoe Road Project.

Potential cumulative impacts to special status terrestrial wildlife species would parallel those discussed for general wildlife in Section 4.19.9. Potential cumulative impacts to the five special status raptor species, bald eagle, American peregrine falcon, ferruginous hawk, northern goshawk, and burrowing owl, would entail the incremental short- and long-term habitat loss and fragmentation in the overall region; effects to the small mammal prey base from the network of roads and associated project infrastructure; and increased human presence, resulting in bird displacement within potential foraging areas. In the case of the burrowing owl, there may be loss of potential burrow nest sites from cumulative construction projects within the CIAA delineated for area raptor species. The BLM requirements and applicant committed protection measures developed for raptor species would minimize the potential effects to breeding birds and active nest sites.

No water depletions in the North Platte River were identified for the Seminoe Road Project. As stated in that EIS, the BLM would continue to coordinate and consult with the USFWS on potential impacts to downstream threatened and endangered species, including the bald eagle, once the exact method of produced water discharge is established and before production from the Fox Hill/Medicine Bow formations to assess any water depletions in the North Platte River. Based on the assumption that water quality and water quantity issues would not result from implementation of the proposed Pilot Project, no cumulative impacts have been identified for special status species that could or do occur along the Medicine Bow River, at the Seminoe Reservoir, downstream of the reservoir along the North Platte River, or near the Hanna Draw reservoir site. This assumption and assessment encompass the federally endangered bald eagle and the applicable BLM sensitive species, the long-billed curlew and white-faced ibis.

Potential cumulative effects to the black-footed ferret, if present within the CIAA, would be low. As stated for the Seminoe Road Project area, white-tailed prairie dog colonies or complexes greater than 200 acres represent potential habitat for black-footed ferrets, and, if development within such habitat cannot be avoided, the USFWS requires ferret surveys within 1 year of planned development. If no ferrets are found, the prairie dog colony would be cleared for development for the next year. A large portion of the Seminoe Road Project is non-block cleared. No black-footed ferret surveys are required in areas that are block cleared. Additionally, ferret surveys conducted for the Seminoe Road Project were not located throughout the project area, but only in conjunction with the interconnect pipeline. Given a portion of the Seminoe Road Project area was surveyed, the block clearance for the Hanna Draw Pilot Project area, the requirement for future annual surveys and appropriate mitigation (avoidance if black-footed ferrets are found) outside of this block-cleared zone, and future requirements to protect ferrets if reintroduced into the project area, no cumulative impact issues were identified for the black-footed ferret.

Similarly to general wildlife species, the potential cumulative impacts to the other six special status mammal species would include direct and indirect effects. These six species include the white-tailed prairie dog, swift fox, pygmy rabbit, Wyoming pocket gopher, spotted bat, and Townsend's big-eared bat. Cumulative effects to burrowing mammals, such as the white-tailed prairie dog, swift fox, pygmy rabbit, and Wyoming pocket gopher could include direct mortality within the CIAA from surface clearance and project construction activities (e.g., well pads, roads), in addition to overall habitat loss and fragmentation. Under the BLM sensitive species policies, the agency often requires the applicant to locate development outside of active prairie dog colonies, when feasible. Although cumulative activities may result in some short-term

reduction in white-tailed prairie dog populations, this species have a high reproductive potential and should recover following concurrent and final reclamation activities.

The swift fox and pygmy rabbit are relatively rare. Although these species could be affected by cumulative actions, swift fox incidence would likely be rare and sporadic. No information is currently available on the presence and extent of the pygmy rabbit in the Hanna Draw Pilot Project area. It could be assumed the cumulative impacts anticipated for these two burrowing mammals would be similar to those effects described for the Proposed Action. Past and present actions occurring within the CIAA (project area plus 1-mile buffer) predominantly entail past CBNG exploration, coal mining, livestock grazing, and road development.

No cumulative impact issues were identified for the Wyoming pocket gopher, based on the low likelihood of its occurrence. The only cumulative issues delineated for the spotted bat and Townsend's big-eared bat would be the habitat loss and fragmentation for potential foraging sites within these species' CIAA. However, given the availability of other potential foraging habitats in and adjacent to the cumulative projects, impacts to these two bat species would be expected to be negligible.

Potential cumulative impacts to the five sensitive songbirds identified as potentially occurring in the project area (i.e., sage thrasher, Brewer's sparrow, sage sparrow, Baird's sparrow, and loggerhead shrike) would again primarily encompass incremental habitat loss and fragmentation, as discussed in Section 4.10.2.2. Given these songbirds are generally associated with upland habitats (e.g., shrublands and grasslands), the cumulative effects from past and present actions would predominantly entail vegetation removal from construction of the proposed Pilot Project. The proposed Seminoe Road Project occurs outside of the CIAAs identified for these songbirds; therefore, potential cumulative effects focused on the past ground disturbance from CBNG exploration, coal mining, livestock grazing, and road development. Displacement and habitat loss generally would extend both short- and long-term until reclamation has been completed and both herbaceous and shrubs have become re-established, respectively. A small amount of sagebrush and other shrublands would be lost in the long term from the proposed Hanna Draw Pilot Project over baseline conditions, which includes past actions.

Cumulative development also would result in a loss of potentially suitable habitat for the mountain plover parallel to those effects described for the Proposed Action. Active plover nests would be protected by the seasonal restrictions for surface use and human-related activities in mountain plover habitat from April 10 to July 10 for both future projects.

Cumulative impacts to the greater sage-grouse would be similar to that described for the Proposed Action. The CIAA extends 2 miles beyond active lek centers. The analysis for the proposed Pilot Project automatically includes this 2-mile buffer, given the BLM's existing protection measures required to protect breeding and nesting birds. Combining past and present actions with the Pilot Project, cumulative effects would primarily include overall habitat fragmentation, increased human presence, and noise. No additional increase in predation issues for adult birds, young, or eggs were identified, given lek locations relative to existing and proposed aboveground facilities. The additive degree of habitat fragmentation, increased human-related activities, and increased noise would be considered to be small over existing conditions and that identified for the Proposed Action.

4.19.11.3 Special Status Aquatic Species

Given that no impacts to special status aquatic species would be expected from the proposed project, no cumulative impacts to these resources from the Pilot Project would be anticipated.

4.19.12 Cultural Resources

The CIAA for cultural resources is the immediate project area. Only past and present actions would cumulatively add to the proposed Pilot Project. Past CBNG exploration and associated infrastructure could have impacted undiscovered cultural sites. However, the BLM's existing measures to minimize potential effects to prehistoric and historic sites would help to preserve and document any sites uncovered during project construction activities. No additional future cumulative actions have been identified within the boundaries of the project.

4.19.13 Range Resources and other Land Uses

4.19.13.1 Range Resources

The Proposed Action would result in the loss of 399 acres of rangeland. Approximately 410 acres of this disturbance would be short term, since utility corridors would be reclaimed soon after construction. The long-term loss of 30 acres would result in a loss of 5 AUMs within the Dana Block North Allotment (CIAA for range resources). These reductions in livestock carrying capacity would add to incremental losses in carrying capacity that have accrued from other CBNG exploration and coal mining. Reductions in livestock carrying capacity may be compensated somewhat by BLM range improvements to be implemented to treat decadent stands of sagebrush. The Seminoe Road project would not impact the Dana Block North Allotment.

4.19.13.2 Other Land Uses

Potential cumulative effects from development of the proposed Pilot Project would be expected to be small. The primary use of the area is livestock grazing, which is addressed above. The proposed project and other reasonably foreseeable activities in the CIAA are consistent with county ordinances and BLM plans for the area. Adverse effects on the amount of dispersed recreation in the area, if any, would be small.

4.19.14 Noise

There would be no cumulative noise effects expected from the proposed Pilot Project and other reasonably foreseeable activities in the CIAA. Noise levels from the proposed project would be relatively low and the distance between the proposed project and other reasonably foreseeable activities in the area is sufficiently large that anyone in a position to hear proposed project related activities, or within 2,000 feet of the Project Area, would not be able to hear noise from other projects under normal atmospheric conditions.

4.19.15 Recreation

Small increases in demand for recreation opportunities from population growth related to the proposed Seminoe Road Project may be felt in the vicinity of the proposed Pilot Project. Recreation resources in the project area are not extensive, however, and recreation opportunities are much greater elsewhere in the region. Consequently, any cumulative

recreation effects from increased demand and temporary displacement of dispersed recreation opportunities from the project area would be small.

4.19.16 Visual Resources

Cumulative visual effects from the proposed Pilot Project would be low to non-existent in the vicinity of the wellfield. The project-related electric distribution line and interconnect pipeline, if built, would be visible from CR 291, but terrain would block views of the reasonably foreseeable Seminoe Road Project from this viewpoint.

The southwestern extremity of the interconnect pipeline would be visible from U.S. 30/287 and some features of the Seminoe Road Project wellfield would be visible in the middle distance from this viewing perspective. The cumulative visual effects should comply with the VRM Class III Management Objective since the pipeline would be visually subordinate to the existing landscape character after successful reclamation. The wellfield activities, especially the roads, would introduce greater levels of visual contrast, but at a somewhat greater distance. Together, the visual contrast effects would be low to moderate and should not dominate the view.

4.19.17 Socioeconomics

Cumulative effects resulting from the proposed Pilot Project and the Seminoe Road Project would generally be positive and relatively small in the context of the Carbon County social and economic environment. There would be only a small percentage increase in employment, and thus population, from the cumulative activity. As a result, there would be a small increase in demand for public facilities and services, all of which have sufficient excess capacity to accommodate the growth. Public revenues at both the state and local level would increase from the cumulative activity due both to direct payments by the projects and to wages and salaries paid to workers. The net effect on the public sector would be positive.

Existing hotels, motels, mobile home parks and camping facilities in Rawlins and surrounding communities would be adequate to accommodate the expected small increase in demand for temporary housing. There would be some cumulative loss of grazing capacity on both public and private land in Carbon County for the life of the projects. There also would be some increase in purchases of goods and services from county businesses by the projects and their employees.

4.19.18 Transportation and Access

Most traffic effects from the proposed Pilot Project would be limited to CR 291 from its intersection with County Road 270 to Hanna and Highway 72 from Hanna to the I-80 interchange, including the Highway 30/287 intersection. There may be some additional traffic from the reasonably foreseeable Seminoe Road Project in this area. Some portion of project-related traffic would travel westerly via U.S. 30/287 and I-80 through Walcott Junction and Rawlins, where it would interact with traffic from the Seminoe Road Project. However, these roadways have ample capacity to accommodate the combined traffic with no effect on operational characteristics or safety. Consequently, there would be little, if any, cumulative effect on transportation.

4.19.19 Health and Safety

Cumulative health and safety impacts would be limited to those associated with past and present activities in the project area and the incremental impacts of the Pilot Project. Furthermore, no additional oil and gas activity or other development is anticipated in the future within the project area. Therefore, cumulative affects to public health and safety are expected to be low, the same as is anticipated for the Pilot Project.

CHAPTER 5

CONSULTATION AND COORDINATION

CHAPTER 5

Consultation and Coordination

5.1 PUBLIC PARTICIPATION

A Scoping Notice for the Hanna Draw Coalbed Natural Gas Pilot Project (Pilot Project) Environmental Assessment was issued on May 21, 2004 for a 30-day public comment period (May 21, 2004 to June 21, 2004). The purpose of the notice was to solicit input on potential issues regarding the proposed Pilot Project from government agencies and other interested organizations, groups, and individuals. The BLM received a total of 10 comment letters during the scoping process expressing both concern about specific resource issues, implementation of the NEPA process, other permitting requirements, as well as support for the project. The following groups and organizations submitted comment letters on the following topics:

- **Department of Interior, Bureau of Reclamation**: The Bureau of Reclamation expressed concern regarding the quality and quantity of both surface water and groundwater in the project area.

- **Southern Ute Indian Tribe**: The Tribe requested that NAPGRA statutes be adhered to and that they be notified of inadvertent discoveries of Native American sites, artifacts, or human remains.

- **Carbon County Economic Development Corporation**: The County expressed support for the proposed project and offered guidance for future oil and gas development.

- **Wyoming State Engineer's Office**: The State Engineer identified their statutory responsibility for permitting and administration of water in the state and applications must be filed for each well prior to construction.

- **Petroleum Association of Wyoming**: The association expressed support for the project and encouraged that the NEPA analysis of the project be completed in a timely manner.

- **U.S. Forest Service**: The Forest Service expressed concern over potential cumulative visibility impacts to nearby Class I wilderness areas and requested that the BLM evaluate these impacts in the EA, including consideration of potential off-site mitigation to improve the overall air quality in southwestern Wyoming.

- **Wyoming Department of Environmental Quality**: The WDEQ commented that as many as three water related permits from the Water Quality Division (WQD) may apply to the proposed project (Water Discharge, Storm Water Associated with Construction Activity, or Underground Injection Control)**.**

- **U.S. Fish and Wildlife Service**: The FWS provided comments in anticipation of section 7 consultations to be conducted under the Endangered Species Act. The comments also provided information on threatened, endangered, and candidate species, migratory birds, wetlands and riparian areas, and sensitive species in the area.

- **Wyoming Game and Fish Department**: The WGFD provided information on terrestrial and aquatic habitats and species to be evaluated in the EA, expressed concern over cumulative impacts (e.g., roads), and offered suggestions to minimize impacts to surface water.

- **Biodiversity Conservation Alliance**: The alliance expressed concern over potential impacts of the proposed project to water quality and quantity, soils, wildlife habitat (terrestrial and aquatic), threatened and endangered species, cultural/sacred site, toxic substances, earthquakes/subsidence, reclamation potential, and cumulative impacts.

5.2 CONSULTATION AND COORDINATION

During the preparation of this EA, the BLM and consultant team contacted and received input from the following federal, state, and local agencies:

Federal Government Agencies

- Natural Resources Conservation Service
- U.S. Fish and Wildlife Service

State Government Agencies

- Colorado Division of Wildlife
- Wyoming Department of Environmental Quality, Air Quality Division
- Wyoming Game and Fish Department
- Wyoming Natural Diversity Database

County Government Agencies

- Carbon County Planning & Economic Development Department

Local Government Agencies

- Town of Hanna

5.3 LIST OF PREPARERS

This EA was prepared by a third-party contractor under the direction of the BLM Rawlins Field Office. The following individuals within the BLM's Rawlins Field Office (except where noted otherwise) contributed to the drafting and review of the document:

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- Cheryl Newberry, Rangeland Management Specialist; Rangeland Management
- Frank Blomquist, Botanist; Vegetation Resources, Special Status Species
- Mark Newman, Geologist; Geology/Paleontology
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- Susan Caplan, Air Quality Specialist; Air Quality (BLM Wyoming State Office)
- Michael Bower, Fisheries Biologist; Aquatic Biology, Special Status Species
- Heath Cline, Wildlife Biologist; Terrestrial and Aquatic Biology, Special Status Species
- Bill Falvey, Wildlife Biologist; Terrestrial and Aquatic Biology, Special Status Species

- Krystal Clair, Recreation Planner; Visual Resources/Recreation
- Patrick Walker, Archaeologist; Cultural Resources
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CHAPTER 6

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Appendix A

Master Surface Use Plan

MASTER SURFACE USE PLAN (MSUP)

Hanna Draw Coalbed Natural Gas (CBNG) Project
Anadarko E & P Company LP (AEPC)

Surface Use Program and Plan of Development for the subject wells listed below:

Lease WYW-148227 Locations

Well Name	Location	Footages				Q	Q	Sec	T	R
Hanna Draw Federal 2-1	SHL	1644	FNL	1220	FEL	SE/4	NW/4	2	23N	81W
Hanna Draw Federal 2-2	SHL	1582	FNL	2580	FWL	SE/4	NW/4	2	23N	81W
Hanna Draw Federal 2-3	SHL	1320	FNL	1320	FWL	C	NW/4	2	23N	81W
Hanna Draw Federal 2-4	SHL	2640	FNL	1320	FWL	C	W/2	2	23N	81W
Hanna Draw Federal 2-5	SHL	2640	FSL	2540	FEL	C	section	2	23N	81W
Hanna Draw Federal 2-6	SHL	2625	FSL	1320	FEL	C	E/2	2	23N	81W
Hanna Draw Federal 2-7	SHL	1320	FSL	1320	FEL	C	SE/4	2	23N	81W
Hanna Draw Federal 2-8	SHL	1320	FSL	2587	FWL	C	S/2	2	23N	81W
Hanna Draw Federal 2-9	SHL	1095	FSL	1220	FWL	SW/4	SW/4	2	23N	81W
Hanna Draw Federal 2-11	SHL	1036	FNL	310	FWL	NW/4	NW/4	2	23N	81W
Hanna Draw Federal 2-12	SHL	300	FSL	400	FEL	SE/4	SE/4	2	23N	81W
Hanna Draw Federal 2-21	SHL	505	FSL	1090	FWL	SW/4	SW/4	2	23N	81W
Hanna Draw Federal 2-22	SHL	520	FSL	1902	FWL	SE/4	SW/4	2	23N	81W
Hanna Draw Federal 2-23	SHL	707	FSL	2009	FEL	SW/4	SE/4	2	23N	81W
Hanna Draw Federal 2-24	SHL	2080	FSL	760	FEL	NE/4	SE/4	2	23N	81W
Hanna Draw Federal 2-25	SHL	1980	FNL	760	FEL	S/2	NE/4	2	23N	81W

BLM approved the Hanna Draw Federal 2-2 APD on May 26, 2005 so that AEPC could acquire water data for the Water Quality and potential treatment methods for the EA. This well spudded on October 16, 2005 and APC is conducting appropriate water treatment trials.

Plan of Development for the facilities listed below:

Proposed ROW (BLM surface ownership lands): Buried Electrical Utility, Water and Gas Lines in Section 2 & 34, T23N, R81W (all pipeline corridors within the field will parallel roads)

Proposed ROW (BLM surface ownership lands) Delivery Pipeline for Gas:
T23N R81W in Section 2

Proposed ROW (BLM surface ownership lands) access roads:
Section 34, T23N, R81W

The MSUP contains surface operating procedures for the Federal Applications for Permits to Drill (APDs), as required under Onshore Order No. 1. The enclosed **Project Map** shows all proposed drilling activities associated with the Hanna Draw CBNG Project. Additional information on each federal well is contained in the **BLM APD Form 3160-3** and **Well Survey Plat**.

This MSUP is intended to serve as the ROW application for the gas and water lines, and electric lines in the project. Gas-gathering and water-gathering lines will require a 20-foot right-of-way and electric lines a 10-foot right-of-way. The delivery pipeline will require a 100-foot construction right-of-way and 50-foot operational right-of-way. All ROWs located in the same corridor will overlap each other to the maximum extent possible, while maintaining sound construction and installation practices. Where ROW corridors are located along a road, working space for installation of facilities will be along the road. All flowlines and roads have been co-located where possible. Please refer to the schematic for the layout of pipelines and roads. The enclosed **Project Map** shows the location of all access routes, gatherings lines, and the delivery pipeline.

An allocation meter will be used to measure raw produced gas volumes for each well in the project. A sales meter will be located downstream of the final compressor and dehydration unit, at the compressor station, and will be used to measure dry salable-quality gas. A request for variance from Onshore Order No. 5, if needed, along with a description of the measurement equipment, will be submitted in a Sundry Notice if the wells are deemed producible.

During well testing associated with this project, natural gas, to the extent it is produced, will be vented or flared on-location in accordance with the applicable BLM Onshore Orders, Notices To Lessees, and WOGCC regulations, and authorized by the WOGCC and the BLM in Sundry Notices. During testing, produced water from the proposed wells will be discharged after appropriate treatment to the Medicine Bow River under a Wyoming Pollutant Discharge Elimination System (WYPDES) permit, in accordance with the Wyoming Department of Environmental Quality (WDEQ) and upon Onshore Order #7 approva by the BLM.

1. EXISTING ROADS AND TRAVELWAYS

The project area is accessible from Hanna, Wyoming, by traveling approximately 11.4 miles Northeast on Carbon County Road 291 (Hanna Draw Road). Turn right in Section 34, T24N R81W, and travel southeasterly for approximately 2 mile into Section 2, T23N, R81W. This road provides access into the project area.

Local roads are shown on the enclosed map of the project area. Existing roads and gates will be used when practical. As necessary, existing roads shall be brought up to minimum standards for a Resource Road as found in BLM Manual 9113.

Maintenance of the roads used to access the well locations will continue until final abandonment and reclamation of the well locations occur. A regular maintenance program will include, but is not limited to, blading, ditching, culvert installation and cleanout, and gravel surfacing where excessive rutting or erosion may occur.

Culverts (a minimum of 18-inches in diameter) will be placed in the existing BLM roads as the need arises or as directed by BLM's Authorized Officer.

When necessary, the use of traffic control and speed limits will be implemented to limit potential livestock conflicts.

2. PROPOSED ACCESS ROUTES

Well Access

New access roads will be sited to avoid sensitive resource areas, such as leks, and areas susceptible to increased resource damage from the proposed project, such as areas of steep terrain or poor vegetative cover. Every effort will be made to minimize the amount of cut-and-fill construction needed to maintain safe, environmentally sound, year-round access to the well sites. The special conditions of approval specified for this project by the BLM will be implemented.

Where possible existing two-tracks will be upgraded as specified by BLM to provide access to well sites. Newly constructed access roads will be crowned, ditched, and graveled, as specified by BLM. All equipment and vehicles will be confined to identify travel corridors and other areas specified in this MSUP and APDs. The access roads will be surfaced with an appropriate grade of aggregate or gravel to a depth of 4 inches before the drilling equipment or rig is moved onto the pad.

Unless otherwise exempted, free and unrestricted public access will be maintained on the access road. All construction work will be accomplished as specified by the landowner and the BLM. Access roads will be maintained in a safe and usable condition. A regular maintenance program will include, but is not limited to, blading, ditching, installing or cleaning culverts, and surfacing.

The access roads will be constructed to minimum standards for a BLM Resource Road, as outlined in BLM Manual 9113. The minimum travelway width of the road will be 14 feet with turnouts. No structure will be allowed to narrow the road top. The inside slope will be 4:1. The bottom of the ditch will be a smooth V with no vertical cut in the bottom. The outside slope will be 2:1 or shallower. Turnouts will be spaced at a maximum distance of 1,000 feet and will be visible.

Wing ditches will be constructed as deemed necessary to divert water from the road ditches. Wing ditches will be constructed at a slope of .5 percent to 1 percent.

Topsoil and vegetation will be windrowed to the side of the newly constructed access roads. After the roads are crowned and ditched, the topsoil will be pulled back onto the cut slopes of the road right-of-way so no berm is left at the top of the cut slope.

Drainage crossings on the access routes will be low water crossings or crossings using culverts. Culverts would be installed on smaller, steeper channel crossings. Rip-rap will be added at the outlet of each culvert to minimize erosion. Topsoil would be conserved before channel crossing construction occurs. Additional culverts would be placed as the need arises or as directed by the BLM's Authorized Officer.

Culverts will be covered with a minimum of 12 inches of fill or one-half the diameter of the pipe, whichever is greater. The inlet and outlet will be set flush with existing ground and lined up in the center of the draw. Before the area is backfilled, the bottom of the pipe will be

bedded on stable ground that does not contain expansive or clay soils, protruding rocks that would damage the pipe or unevenly sized material that would not form a good seat for the pipe. The site will be backfilled with unfrozen material and rocks no larger than 2 inches in diameter. Care will be exercised to thoroughly compact the backfill under the haunches of the conduit. The backfill will be brought up evenly in 6-inch layers on both sides of the conduit and thoroughly compacted. A permanent marker will be installed at both ends of the culvert to help keep traffic from running over the ends. Culverts will be installed in a manner that minimizes erosion or head-cutting and may include rip rapping or other measures as required. Additional culverts will be placed in the access road as the need arises or as directed by BLM's Authorized Officer.

The access roads will be winterized by providing a well-drained travelway to minimize erosion and other damage to the roadway or the surrounding public land. Construction activity or routine maintenance will not be conducted using frozen or saturated soil material or during periods when watershed damage is likely to occur.

No construction or routine maintenance activities will be performed during periods when the soil is too wet to adequately support construction equipment. If such equipment creates ruts in excess of 4 inches deep, the soil will be deemed too wet to adequately support construction equipment, and construction and maintenance will be temporarily suspended.

The written approval of the Authorized Officer will be obtained before snow removal is undertaken outside the new and existing roadways. If approval is given, equipment used for snow removal operations outside the road ditches will be equipped with shoes to keep the blade off the ground surface. Special precautions will be taken where the surface of the ground is uneven to ensure that equipment blades do not destroy the vegetation.

If drilling is productive, all access roads to the well site would remain in place for well servicing (such as maintenance and improvements). Portions of the drill location outside the well pad that are no longer needed would be reclaimed. The outside ditch cuts would be seeded and reclaimed.

3. LOCATION OF EXISTING WELLS

Water for use in well drilling would be obtained from existing gas wells completed in the coal seams of the Hanna Formation. Associated drilling activities also would require almost 100,000 gallons of water per well for preparation of cement or stimulation of the well, and dust control. Dust abatement measures would comply with all applicable Wyoming Oil and Gas Conservation Commission (WOGCC) requirements. Only water suitable for livestock use would be used for dust abatement.

The enclosed **Project Map** shows locations of drilling, producing, and abandoned oil and gas wells within the EA boundary of the Hanna Draw CBNG wells. The well locations were obtained by a search of the WOGCC website.

4. LOCATION OF EXISTING AND/OR PROPOSED FACILITIES, IF WELLS ARE PRODUCTIVE

On Well Pad

Wellhead facilities would be installed if the wells are productive. Natural gas and produced water would be collected and transported from the wellhead via buried pipelines. Gas and water would be measured as specified elsewhere in this MSUP.

The short-term surface disturbance at the location of each productive well would encompass an estimated 1.4 acres for each well pad, approximately 200 feet x 300 feet, covering, not including stockpiles and the cut and fill slopes. Typically, only the production facilities at the well site would be fenced or otherwise removed from existing uses. A loop road or a small, graveled pad area would provide a safe turnaround area for vehicles.

The wellhead facilities would be contained within an area covering approximately 15 feet by 15 feet. The surface equipment at each well will consist of the wellhead, a pump panel, and an insulated wellhead cover. Additionally, a vertical separator at some well sites would separate gas from the water stream. Each productive well is expected to require installation of an electric submersible pump below ground level, which will be used to produce water necessary to lower pressure within the coal seams.

AEPC will paint structures at wells and central facilities with flat colors that blend with the adjacent undisturbed terrain. The paint used will be the color Shale Green, color 5Y 4/2unless otherwise specified by the BLM. This measure does not apply to structures that require safety coloration in accordance with the requirements of the Occupational Safety and Health administration (OSHA).

Electricity would be used to power pumps during well development and to initiate and maintain production. A temporary generator would be centrally located and used until permanent electrical services are installed.

Water transfer pumping stations may be used during production operations to transfer produced water from the gas wells to the water handling facilities. The transfer pumping stations are needed in areas where differences in elevation require supplemental pumping to transfer the produced water. If transfer pumping stations were required, they will be placed on existing well pad and no new disturbance will occur, and would be authorized prior to construction by Sundry Notice.

Off Well Pad

Pipelines (Gathering Lines and Delivery Pipeline)/Compressor Station/ Water Handling and Disposal Facilities/Injection Wells/Tanks

Pipelines

The ROWs for the gathering systems will parallel access roads. ROWs located in the same corridor will overlap each other to the maximum extent possible, while maintaining sound

construction and installation practices. Where ROW corridors are located along a road, working space for installation of facilities will be along the road.

Trenches will be excavated to install the flowlines and electrical lines. In open pipeline trenches, plugs will be placed no more than 1,000 feet apart to allow livestock and wildlife to cross or escape the trench, if needed. Placement of plugs shall be determined in consultation with BLM and any affected landowner or livestock operator. Trenching will occur as close to the road as feasible. Trenches excavated for well gathering lines and electrical lines (which would require ROWs of 20 feet in width for gas lines and water lines, and 10 feet in width for electrical lines) would be reclaimed as soon as practical after trenching and backfilling are completed. Gathering line segments in the project area would total about 5 miles, with 4 miles located on BLM-administered lands and 1 mile located on private land.

A gas-gathering pipeline system (low pressure) would be constructed from the wellheads to the compressor station. This system would use high-density polyethylene (HDPE) pipe, starting with 4-inch diameter pipe at the wellhead and graduating up to 20-inch diameter pipe at the inlet to the compressor.

A produced water-gathering pipeline system (low pressure) would be constructed from the wellheads to the centralized facilities and from the centralized facilities to the surface discharge outfall. This network of water lines would use 4-inch through 12-inch diameter pipe made of steel.

A gas-delivery pipeline system (high pressure) would be constructed from the compressor station to an existing transmission pipeline. This pipeline would be constructed of 8-inch to 12-inch diameter steel pipe.

Top soil material will be stockpiled to the side and segregated. Top soil material will not be mixed or covered with subsurface material. After construction cut and fill slopes will be waterbarred or regraded to conform to the adjacent terrain as specified by BLM.

In order to minimize surface disturbance, the operator will use wheel trenchers (ditchers) or ditch witches, where possible, to construct all pipeline trenches associated with this project. Track hoes or other equipment will be used where topographic or other factors require their use.

Disposal of Produced Water

As part of the proposed Hanna Draw Pilot Project, up to 100,000 barrels (4,200,000 gallons) of produced water per day from the production operations would be discharged after treatment into the Medicine Bow River. Water quality would meet or exceed WYPDES and WDEQ standards. The project's Water Management Plan is attached. Produced water quality also would be monitored in accordance with WDEQ regulations.

5. LOCATION AND TYPE OF WATER SUPPLY FOR DRILLING

Water to drill the first well will come from the town of Hanna, following existing access roads, County Rd 291 into section 2-23N-81W. Thereafter, water produced from project wells will be

transported to nearby drilling locations and used to drill subsequent wells. As a contingency, water may be purchased from the city of Hanna and trucked to the location.

Water for use in drilling the wells would be obtained from existing wells completed in the coal seams of the Hanna Formation. Approximately 30,000 gallons would be needed to drill each well. The actual volume of water used in drilling operations would depend on the depth of the well and any losses that might occur during drilling. The proposed project also would require almost 70,000 gallons of water per well for preparation of cement and stimulation of the well (55,440 gallons) and control of dust (14,000 gallons). In all, nearly 100,000 gallons of water per well would be used.

Any changes in the water source or method of transportation must receive written approval from BLM's Authorized Officer before the changes take place.

6. CONSTRUCTION MATERIALS

Construction materials (mineral material aggregate suitable for surfacing material) will be purchased from a nearby private source or a local supplier having a permitted source of materials in the area. No construction materials will be removed from federal and/or Indian lands without prior approval from the BLM.

7. METHODS FOR HANDLING WASTE DISPOSAL

Drill cuttings (rock fragments generated during drilling) will be produced during drilling of the borehole. Cuttings will be buried in the reserve pit upon closure of the reserve pit.

No oil or other oil-based drilling additives, chromium/metals-based muds, or saline muds will be used during drilling of these wells. Only fresh water, biodegradable polymer soap, bentonite clay, and non-toxic additives will be used in the mud system. Details regarding the mud program are incorporated within the MDP. These wells will not produce oil or salt water typical of oil production. Furthermore, other liquid hydrocarbons are not anticipated. Should unexpected liquid petroleum hydrocarbons (crude oil or condensate) be encountered during drilling or well testing, all liquid petroleum hydrocarbons will be contained in test tanks on the well site.

Dust abatement using produced water would comply with all applicable WOGCC, WDEQ, or BLM requirements. Only water suitable for livestock use would be used for dust abatement. Only disturbed areas will be sprayed. Spraying will be done to reduce runoff and channelized flow.

A portable, self-contained chemical toilet will be provided on location during drilling and completion operations. Upon completion of operations, or as required, the contents of toilet holding tanks will be disposed of at an authorized sewage treatment and disposal facility. Disposal will be in accordance with State of Wyoming, Carbon County, and BLM requirements regarding sewage treatment and disposal. AEPC will comply with all state and local laws and regulations pertaining to disposal of human and solid wastes.

No trash will be placed in the reserve pit. All refuse (trash and other solid waste including cans, paper, cable, etc.) generated during construction, drilling, and well testing activities will be contained in an enclosed receptacle, removed from the drill locations promptly, and hauled to an authorized disposal site.

Immediately after removal of the drilling rig, all debris and other waste materials not contained within trash barrels will be cleaned up and removed from the well location. No potentially adverse materials or substances will be left on the drill locations.

Hazardous Materials Management

All project-related activities involving hazardous materials will be conducted in a manner that minimizes potential environmental impacts. An on-site file will be maintained containing current Material Safety Data Sheets (MSDS) for all chemicals, compounds, or substances that are used in the course of construction, drilling, completion, production, and reclamation operations. Netting will be placed over any pits that may contain hazardous substances (Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Section 101(14)), as determined by visual observation or testing. The mesh diameter shall be no larger than 1 inch.

No hazardous substance, as defined by CERCLA, will be used in the construction or drilling operations associated with these wells. No Resource Conservation and Recovery Act (RCRA) hazardous wastes will be generated by well-drilling operations. The term "hazardous materials" as used here means: (1) any substance, pollutant, or containment (regardless of quantity) listed as hazardous under CERCLA of 1980, as amended 42 U.S.C. 9601 et seq., and the regulations issued under CERCLA; (2) any hazardous waste as defined in RCRA of 1976, as amended; and (3) any nuclear or nuclear byproduct as defined by the Atomic Energy Act of 1954, as amended, 42 U.D.C. 2001 et seq. The operator will be required to provide a referenced list of hazardous materials that could be used, produced, transported, disposed of, or stored on the well location including a discussion on the management of the hazardous materials.

Any spills of oil, gas, or any other potentially hazardous substance will be reported immediately to the BLM, landowner, local authorities, and other responsible parties and will be mitigated immediately, as appropriate, through cleanup or removal to an approved disposal site.

8. ANCILLARY FACILITIES

AEPC would operate all wells, pipelines, and associated ancillary production facilities in a safe manner, as set forth in standard industry operating guidelines and procedures. Several self-contained travel-type trailers may be used onsite during drilling operations. Routine maintenance of producing wells would be necessary to maximize performance and detect potential difficulties with production operations. Each well location would be visited approximately every other day to ensure that operations are proceeding in an efficient and safe manner. The visits would include checking separators, gauges, valves, fittings, tanks, generators, and pumps. The equipment onsite also would be routinely maintained, as necessary. Additionally, all roads and well locations would be regularly inspected and maintained to minimize erosion and assure safe operating conditions.

9. WELL SITE LAYOUT

Information on each federal well is contained in the **BLM APD Form 3160-3, Well Survey Plat**, and **Drill Pad Cross Section** on file with BLM. The cross section shows the orientation of the drill pad with respect to the topographic features (cut and fill), facilities, and access to the pad.

At each drill location, surface disturbance will be kept to a minimum. The areal extent of each drill pad is approximately 200 feet by 300 feet. Each drill pad will be leveled using cut and fill construction techniques where needed. Prior to constructing the drill pad the top 6 to 8 inches of soil (more if available) and associated vegetative material will be removed and stockpiled. Drainage ditches will be constructed to divert stormwater away from each pad. All surface disturbance related to drilling will be confined to each drill site.

AEPC plans to use one reserve pit at each drilling location. This pit will be designed and constructed according to WOGCC and BLM requirements.

A temporary reserve pit about 75 feet wide x 95 feet long x 8 feet deep would be excavated at each vertical drill location. Each pit will be excavated within the "cut area" of the drill site to minimize any potential for slope failure. Each pit will be designed to prevent collection of surface runoff and will be closely monitored to ensure no pit overflows occur. The reserve pit will be open for an estimated 6 - 12 months to allow for evaporation of pit fluids. During this time, the pit would be fenced on all sides with three-strand, barbed wire fencing to prevent access from livestock.

Each reserve pit will be constructed in a manner that minimizes the accumulation of surface precipitation runoff into the pit. This will be accomplished by appropriate placement of subsoil/topsoil storage areas or construction of berms or ditches.

In the event that water quality is determined to be potentially detrimental to wildlife (e.g.,oil deposition), AEPC would initiate dialog with the BLM to identify if any supplemental mitigation measures would be warranted in the short and long term. If netting is necessary over open production pits to eliminate any hazard to migratory birds or other wildlife, AEPC and the BLM would develop an appropriate monitoring program for netted areas. Monitoring frequency would depend on 1) pit location, 2) evaluated water quality, 3) estimated water residence time, and 4) frequency of well maintenance schedule. AEPC will monitor activities as part of project implementation and will notify the BLM in the event a wildlife injury or fatalities were found at one of the reserve pits. For the protection of livestock and wildlife, all pits and open cellars will include a modified fencing design, temporary covers, or other means acceptable to BLM or an affected landowner or livestock operator. Fence the reserve pit on three sides during drilling, and fence the working side immediately after the drilling rig is moved. The reserve pit shall remain fenced until reclamation is initiated.

A conventional drilling rig would be used to drill the gas wells. Additional equipment and materials needed for drilling operations would be trucked to the drill location. Depending on the location of the coal seam, each producing well would be drilled to a depth of 4,050 feet to 5,850 feet or deeper. Methane gas in the coal seam would be produced through perforations in

the casing. The well control system will be designed to meet the conditions likely to be encountered in the hole and will conform to BLM and State of Wyoming requirements.

The drilling and completion operation for a shallow gas well normally requires a maximum of 10 to 15 workers at a time, including personnel for logging and cementing. Each well would be drilled within 7 to 10 days. A mobile completion rig similar to the drill rig may be transported to the well site and used to complete each well. Completion operations are expected to average 2 to 5 days per well. Wells determined to be productive would be shut in until pipelines and other production facilities are constructed.

10. PROGRAMS FOR RECLAMATION OF THE SURFACE

BLM surface ownership lands that contain disturbed areas or facilities that are no longer needed would be reclaimed at the earliest opportunity in accordance with applicable regulations and agency guidance. Non-federal lands would be reclaimed in accordance with the requirements of the surface owner.

Roads, culverts, cattle guards, pipelines, stock water facilities, or other structures could be left in place at the end of the project for any beneficial use, as designated by the affected surface owners and BLM. Water wells and produced water would be available to the surface owners and BLM, provided that appropriations, diversions, and storage rights are properly filed with the WSEO.

As soon as practical after the conclusion of drilling and testing operations, unproductive drill holes will be plugged and abandoned and site reclamation will commence. The BLM will be notified prior to commencement of reclamation operations. A Notice of Intent to Abandon will be filed for final recommendations regarding surface reclamation.

Any areas, including the drilling locations, reserve pits, or access routes, that are disturbed by earthwork will be recontoured to a natural appearance as near to the original contour as possible as soon as practical after the conclusion of operations. Any flowline trenches that may be constructed will be backfilled completely.

Recontoured areas will graded to be outsloped, and waterbreaks will be constructed where needed to avoid concentrating surface waters and producing gullies. The land surface will be left “rough” after recontouring to ensure that the maximum surface area will be available to support the reestablishment of vegetative cover.

All topsoil conserved during earthwork will be redistributed evenly and left “rough” over these recontoured areas. BLM goals for vegetative cover will guide revegetation efforts. Common goals are erosion control, weed control, palatable and nutritious forage for livestock and wildlife, and visual aesthetics.

Revegetation efforts will comply with BLM specifications on all BLM surface ownership lands. If no specifications are provided, the following specifications will be used. Seeding is expected to occur in the fall after September, prior to ground frost, or in the spring after frost has left the ground. The seed mixture, including fertilizer and mulching requirements, seeding

depth, and seed drilling specifications, will be developed in consultation with the BLM. Seed will be drilled on the contour using a seed drill equipped with a depth regulator to ensure even depths of planting. Seed will be planted between one-quarter to one-half inch deep. The anticipated seed mix to be applied and rates of application are listed below. Soil material that will be stockpiled for 10 months or longer will be seeded according to BLM specifications, to the extent practicable. Prior to seeding, the stockpile will be protected from wind and water erosion by roughening the soil surface, covering the stockpile with vegetation that has been removed, and mulching, if necessary.

SEED MIX FOR RECLAMATION

Species	Rate of Application*
Grasses	
Slender wheatgrass	2 lbs./Acre
Thickspike wheatgrass	4 lbs./Acre
Western wheatgrass	2 lbs./Acre
Indian ricegrass	1 lb./Acre
Bottlebrush squirreltail	1 lb./Acre
Needle-and-thread	1 lb./Acre
Shrubs	
Gardner's saltbush	1 lbs./Acre

These rates of application apply to pure live seed (PLS) that is used for drill seeding. For broadcast seeding, the rates of application will be doubled.

11. SURFACE OWNERSHIP

U.S. Bureau of Land Management
Rawlins Field Office
1300 North Third
Rawlins, Wyoming 82301-2407
(307) 328-4200

12. OTHER INFORMATION

AEPC is the lessee or operator for the federal oil and gas leases associated with this MSUP and these APDs.

No slopes in excess of 25 percent would be affected by this proposal. No activities are planned near existing highways, railroads, pipelines, or powerlines. There are no occupied buildings or residences within one-quarter mile of the proposed drill sites.

Any road crossings of dry drainages, riparian, or other wetland areas will use appropriate Best Management Practices (BMP) to minimize impacts to these areas. Appropriate permits will be obtained from the US Army Corps of Engineers, if necessary.

The presence, distribution, and density of noxious weeds in the project area will be monitored. The well access roads and well pads will be inspected regularly to ensure that noxious weeds do not become established in newly disturbed areas. Control methods will be based on available technology, taking into consideration the weed species present. Methods of noxious weed control may include revegetation of disturbed areas to reduce the potential for and success of weed establishment, mowing, hand-pulling, or application of appropriate herbicides. All BLM requirements associated with the control of noxious weeds will be met.

A cultural/historical resource inventory has been conducted on the public lands by a qualified archaeologist permitted in Wyoming by the BLM. The findings have been submitted under separate cover. Any additional areas of potential effect identified subsequent to the completion of these reports will be inventoried as specified by the BLM, and a supplemental report will be prepared.

Landowner Notification

AEPC has obtained a surface use agreement with the landowner and will ensure that livestock control structures remain functional (as directed by the livestock operator) during drilling and production operations and coordinate timing of planned activities.

13. LESSEE'S REPRESENTATIVE AND CERTIFICATIONS

Representative for Anadarko E & P Company

Name:	Jennifer Kastner
Title:	Environmental and Regulatory Analyst II
Address:	1201 Lake Robbins Drive
City/State/Zip:	The Woodlands, Texas 77380
Phone:	(832) 636-3441

Bonding

BLM Nationwide Bond, WY 1280, $150,000

Certification

I hereby certify that I, or persons under my direct supervision, have inspected the proposed drill sites and access routes; that I am familiar with the conditions which currently exist; that the statements made in this plan are, to the best of my knowledge, true and correct; and that the work associated with the operations proposed herein will be performed by AEPC and its contractors and subcontractors in conformity with this plan and the terms and conditions under which it is approved. This statement is subject to the provisions of 18 U.S.C 1001 for the filing of a false statement.

I also certify that AEPC will comply with the provisions of the law or the regulations governing the Federal or Indian right of reentry to the surface under 43 CFR 3814.

I also certify that AEPC has reached or will reach an agreement with the surface owner(s) and surface lessee(s) regarding the requirements for the protection of surface resources and reclamation of disturbed areas and/or damages in lieu thereof, or if an agreement cannot be reached, will comply with the provisions of the law or the regulations governing Federal or Indian right of reentry to the surface under 43 CFR 3814.

I also certify that:

A. All potentially affected landowners having properly permitted water wells with the WSEO within each producible well's Circle of Influence (one-half mile radius) will be offered a Water Well Agreement; and

B. If a Water Well Agreement is not reached with the landowner, AEPC agrees to mitigate the impacts of its producible wells in accordance with State of Wyoming water laws; and

C. Permits to Appropriate Groundwater have been applied for from the Wyoming State Engineer's Office, concurrently with these Applications for Permits to Drill.

I also certify that AEPC shall use its best efforts to conduct its approved operations in a manner that avoids adverse effects on any properties which are listed, or may be eligible for listing, in the National Register of Historic Places (NRHP). If historic or archaeological materials are uncovered during construction, the operator will immediately stop work that might further disturb such materials, and contact the authorized officer (or his/her representative) at the BLM Rawlins Field Office. Any paleontological resources or fossils discovered as a result of operations associated with these wells will be brought to the attention of the authorized officer or his/her representative immediately. All activities in the vicinity of such discoveries will be suspended until notified to proceed by the Authorized Officer.

I also certify that AEPC shall use its best efforts to conduct its approved operations in accordance with the Project-wide Mitigation Measures and procedures outlined in Chapter 2 of the Environmental Assessment (EA) for this project.

By: _____ Date: _____

Jennifer Kastner
Environmental and Regulatory Analyst II
Anadarko E & P Company LP

Appendix B

Master Drilling Plan

MASTER DRILLING PROGRAM
Hanna Draw
OPERATOR: Anadarko E&P Company LP
Sections 2,T23N, R81W, 6th PM
Carbon County, Wyoming

Drilling Program for the subject wells listed below:

Hanna Draw Federal 2-1	**Hanna Draw Federal 2-9**
Hanna Draw Federal 2-2	**Hanna Draw Federal 2-11**
Hanna Draw Federal 2-3	**Hanna Draw Federal 2-12**
Hanna Draw Federal 2-4	**Hanna Draw Federal 2-21**
Hanna Draw Federal 2-5	**Hanna Draw Federal 2-22**
Hanna Draw Federal 2-6	**Hanna Draw Federal 2-23**
Hanna Draw Federal 2-7	**Hanna Draw Federal 2-24**
Hanna Draw Federal 2-8	**Hanna Draw Federal 2-25**

Table 1 contains formation tops and total well depths.

1. ESTIMATED TOPS OF IMPORTANT GEOLOGIC MARKERS

Formation	SS Depth	TMD Depth
Hanna 79	**3197'**	**3663'**
Hanna 78	**2877'**	**3983'**
Hanna 77	**2577'**	**4283'**
Hanna 2	**2350'**	**4510'**
TD	**1860'**	**4900'**

**** these depths are the shallowest to the deepest**

Table 1
Hanna Draw POD CBM Project Well Information

Well Information											Cementing Program			
No.	**Name**	**Number**	**Footages**	**Sec**	**Tns**	**Rng**	**Elevation**	**Formation**	**Subsea Depth**	**Depth**	**Casing**	**Hole**	**Depth**	**Cement (sx)**
1	**Hanna Draw Federal**	**2-1**	**1644'FNL 1220'FEL**	**2**	**23N**	**81W**	**6794' GL**	**Hanna 79**	**3197'**	**3583'**	**Surface**	**12 1/4"**	**550**	**225**
								Hanna 78	**2877'**	**3903'**	**Production**	**8 3/4"**	**4900**	**330**
								Hanna 77	**2577'**	**4203'**				
								Hanna 2	**2350'**	**4430'**				
								Total Depth	**1880'**	**4900'**				
2	**Hanna Draw Federal**	**2-2**	**1582'FNL 2580'FWL**	**2**	**23N**	**81W**	**6800' GL**	**Hanna 79**	**3197'**	**3603'**	**Surface**	**12 1/4"**	**550**	**225**
								Hanna 78	**2877'**	**3923'**	**Production**	**8 3/4"**	**4900**	**330**
								Hanna 77	**2577'**	**4223'**				
								Hanna 2	**2350'**	**4450'**				
								Total Depth	**1900'**	**4900'**				
3	**Hanna Draw Federal**	**2-3**	**1320'FNL 1320'FWL**	**2**	**23N**	**81W**	**6793' GL**	**Hanna 79**	**3197'**	**3603'**	**Surface**	**12 1/4"**	**550**	**225**
								Hanna 78	**2877'**	**3923'**	**Production**	**8 3/4"**	**4900**	**330**
								Hanna 77	**2577'**	**4223'**				
								Hanna 2	**2350'**	**4450'**				
								Total Depth	**1900'**	**4900'**				
4	**Hanna Draw Federal**	**2-4**	**2640'FNL 1320'FWL**	**2**	**23N**	**81W**	**6789' GL**	**Hanna 79**	**3197'**	**3583'**	**Surface**	**12 1/4"**	**550**	**225**
								Hanna 78	**2877'**	**3903'**	**Production**	**8 3/4"**	**4900**	**330**
								Hanna 77	**2577'**	**4203'**				
								Hanna 2	**2350'**	**4430'**				
								Total	**1880'**	**4900'**				

Table 1
Hanna Draw POD CBM Project Well Information

Well Information											Cementing Program			
No.	Name	Number	Footages	Sec	Tns	Rng	Elevation	Formation	Subsea Depth	Depth	Casing	Hole	Depth	Cement (sx)
								Depth						
5	Hanna Draw Federal	2-5	2640'FNL 2540'FWL	2	23N	81W	6856' GL	Hanna 79	3222'	3598'	Surface	12 1/4"	550	225
								Hanna 78	2902'	3918'	Production	8 3/4"	4900	330
								Hanna 77	2602'	4218'				
								Hanna 2	2375'	4445'				
								Total Depth	1920'	4900'				

Table 1
Hanna Draw POD CBM Project Well Information

Well Information											Cementing Program			
No.	Name	Number	Footages	Sec	Tns	Rng	Elevation	Formation	Subsea Depth	Depth	Casing	Hole	Depth	Cement (sx)
6	Hanna Draw Federal	2-6	2625'FSL 1320'FEL	2	23N	81W	6838' GL	Hanna 79	3222'	3598'	Surface	12 1/4"	550	225
								Hanna 78	2902'	3918'	Production	8 3/4"	4900	330
								Hanna 77	2602'	4218'				
								Hanna 2	2375'	4445'				
								Total Depth	1920'	4900'				
7	Hanna Draw Federal	2-7	1320'FSL 1320'FEL	2	23N	81W	6800' GL	Hanna 79	3222'	3648'	Surface	12 1/4"	550	225
								Hanna 78	2902'	3968'	Production	8 3/4"	4900	330
								Hanna 77	2602'	4268'				
								Hanna 2	2375'	4495'				
								Total Depth	1970'	4900'				
8	Hanna Draw Federal	2-8	1320'FSL 2587'FWL	2	23N	81W	6863' GL	Hanna 79	3222'	3658'	Surface	12 1/4"	550	225
								Hanna 78	2902'	3978'	Production	8 3/4"	4900	330
								Hanna 77	2602'	4278'				
								Hanna 2	2375'	4505'				

Table 1
Hanna Draw POD CBM Project Well Information

Well Information											Cementing Program			
No.	Name	Number	Footages	Sec	Tns	Rng	Elevation	Formation	Subsea Depth	Depth	Casing	Hole	Depth	Cement (sx)
								Total Depth	1980’	4900’				
9	Hanna Draw Federal	2-9	1095’FSL 1220’FWL	2	23N	81W	6849’ GL	Hanna 79	3197’	3663'	Surface	12 1/4”	550	225
								Hanna 78	2877’	3983’	Production	8 3/4”	4900	330
								Hanna 77	2577’	4283’				
								Hanna 2	2350’	4510’				
								Total Depth	1860’	4900’				
10	Hanna Draw Federal	2-21	506’FSL 1090’FWL	2	23N	81W	6846’ GL	Hanna 79	3222’	3608'	Surface	12 1/4”	550	225
								Hanna 78	2902’	3928’	Production	8 3/4”	4900	330
								Hanna 77	2602’	4228’				
								Hanna 2	2375’	4455’				
								Total Depth	1930’	4900’				

Table 1 Continued
Hanna Draw POD CBM Project Well Information

Well Information							"Well Information				Cementing Program			
No.	Name	Number	Footages	Sec	Tns	Rng	Elevation	Formation	Subsea Depth	Depth	Casing	Hole	Depth	Cement (sx)
11	Hanna Draw Federal	2-22	520’FSL 1920’FWL	2	23N	81W	6875’ GL	Hanna 79	3222’	3658’	Surface	12 1/4"	550	225
								Hanna 78	2902’	3978’	Production	8 3/4”	4900	330
								Hanna 77	2602’	4278’				
								Hanna 2	2375’	4405’				
								Total	1880’	4900’				

Table 1 Continued
Hanna Draw POD CBM Project Well Information

Well Information							"Well Information				Cementing Program			
No.	Name	Number	Footages	Sec	Tns	Rng	Elevation	Formation	Subsea Depth	Depth	Casing	Hole	Depth	Cement (sx)
								Depth						
12	Hanna Draw Federal	2-23	707'FSL 2009'FEL	2	23N	81W	6852' GL	Hanna 79	3222'	3658'	Surface	12 1/4"	550	225
								Hanna 78	2902'	3978'	Production	8 3/4"	4900	330
								Hanna 77	2602'	4278'				
								Hanna 2	2375'	4405'				
								Total Depth	1880'	4900'				
13	Hanna Draw Federal	2-24	2080'FSL 760'FEL	2	23N	81W	6845' GL	Hanna 79	3222'	3618'	Surface	12 1/4"	550	225
								Hanna 78	2902'	3938'	Production	8 3/4"	4900	330
								Hanna 77	2602'	4238'				
								Hanna 2	2375'	4465'				
								Total Depth	1940'	4900'				
14	Hanna Draw Federal	2-25	1980'FNL 760'FEL	2	23N	81W	6799' GL	Hanna 79	3197'	3593'	Surface	12 1/4"	550	225
								Hanna 78	2877'	3913'	Production	8 3/4"	4900	330
								Hanna 77	2577'	4213'				
								Hanna 2	2350'	4440'				
								Total Depth	1890'	4900'				
15	Hanna Draw Federal	2-11	1036'FNL 310' FWL	2	23N	81W	6800' GL	Hanna 79	3197'	3623'	Surface	12 1/4"	550	225
								Hanna 78	2877'	3943'	Production	8 3/4"	4900	330

Table 1 Continued
Hanna Draw POD CBM Project Well Information

Well Information							"Well Information				Cementing Program			
No.	Name	Number	Footages	Sec	Tns	Rng	Elevation	Formation	Subsea Depth	Depth	Casing	Hole	Depth	Cement (sx)
								Hanna 77	2577’	4243’				
								Hanna 2	2350’	4440’				
								Total Depth	1900’	4570’				
16	Hanna Draw Federal	2-12	296’FSL 415’FEL	2	23N	81W	6793’ GL	Hanna 79	3197’	3663'	Surface	12 1/4”	550	225
								Hanna 78	2877’	3983’	Production	8 3/4”	4900	330
								Hanna 77	2577’	4283’				
								Hanna 2	2350’	4510’				
								Total Depth	2250’	4610’				

2. ESTIMATED DEPTH OF ANTICIPATED WATER, OIL, GAS OR MINERAL FORMATIONS

Hanna Formation Methane gas

Several coal seams may be tested for gas producing formations to total depth. All shallow water zones will be protected with casing and cement. Cement will be brought to surface to isolate all Mesa Verde formations.

Planned Objective: Hanna Formations

3. Minimum BOP Requirements: - refer to attached BOP schematics

The BOPE shall be closed whenever the well is unattended.
The BOPE shall be pressure tested when initially installed, whenever any seal subject to pressure testing is broken, after repairs, or every 30 days.

4. Supplementary Information:

The primary objective of this project is to drill, stimulate, and produce coalbed methane gas from the coal seams of the Mesa Verde Group Formations.

Anadarko proposes to test the coal formations between 1,600' and 4,800'. Stimulation of the perforated coal seams will be done by hydraulic fracturing. Fresh water, gelled water, and/or foam fracturing techniques will be used.

The drilling operations for this well will be conducted in accordance with the Onshore Oil and Gas Order #2 as provided for in 43 CFR 3164.1. This includes the well control equipment and its testing, the mud system and associated equipment, and the casing and cementing.

5. Casing Program:

Hole Size	Casing Size	Casing Weight	Grade	Joint	Depth Set	New/Used	Range
12 1/4"	9 5/8"	40#	J-55	LT&C	0-550	New	3
8 3/4"	7"	23#	J-55	LT&C	0-TD	New	3

Surface Casing:	9 5/8"	40 ppf.	J-55	LTC	Collapse	Burst	Tension
				Ratings:	2570	3950	520,000

A. Burst = 0.052 * MW * TVD(shoe)
= 0.052 * 10.0 ppg * 550'
= 286 psi
Safety Factor = Rating/Burst
= 3950/286
= 13.8

B. Collapse = [0.052 * MW * TVD(shoe)] - [Gas Gradient * TVD]
= [.052 * 10.0 ppg * 550'] - [0.1 * 550']
= 231 psi
Safety Factor = Rating/Collapse
= 2570/231
= 11.1

C. Tension = Weight * TVD * [1 – (MW/65.5ppg)]
= 40 * 550' * [1 - 10.0/65.5]
= 18,641 lbs.
Safety Factor = Rating/Tension
= 520,000/18,641
= 27.9

Surface casing shall have centralizers on the bottom 3 joints of the casing, starting with the shoe joint.

Production Casing:	**7"**	**23 ppf.**	**J-55**	**LTC**	**Collapse**	**Burst**	**Tension**
				Ratings:	**3270**	**4360**	**313,000**

A. Burst = 0.052 * 10ppg * 4900'
= 2,548 psi
Safety Factor = Rating/Burst
= 4360/2548
= 1.71

B. Collapse = [0.052 * 10ppg * 4900'] – [0.1psi/ft * 4900']
= 1,988 psi
Safety Factor = Rating/Collapse
= 3270/1988
= 1.64

C. Tension weight = 23lbs./ft * 4900' * [1 – (10ppg/65.5ppg)]
= 23lbs./ft * 4900' * .8473
= 95,490 lbs.
Safety Factor = Rating/Tension
= 313,000/95,490
= 3.28

6. Mud Program:

Drilling mud will be used as the circulation medium. A fresh water, polymer, gel drilling mud will be used and visual monitoring will be done from spud to total depth. The anticipated mud weight will be between 8.5 – 10 ppg. Sufficient quantities of mud, lost circulation material and barite will be available at the well site at all times for the purpose of assuring well control.

7. Cementing Program

The following is the proposed procedure for cementing the 9 5/8" surface casing and 7" long string:

Surface Casing:

Lead: Type III Cement with 2% CaCl2 and .25/sk cello-flake, mixed at 14 ppg, 1.54 cuft/sk yield with 100% excess. 1550 psi compressive strength in 24 hours at 83° F.

The surface casing shall be cemented back to surface. In the event cement does not circulate to surface or fall back of the cement column occurs, remedial cementing shall be done to cement the casing back to surface.

Long String:

Lead: 160 sacks Premium Lite Plus Cement with 1% CaCl2 and .25/sk cello-flake, mixed at 11 ppg, 3.18 cuft/sk yield, caliper volume plus 10%. 350 psi compressive strength in 48 hours at 114° F.

Tail: 170 sacks Premium Lite II High Strength Cement, mixed at 13 ppg, 1.89 cuft/sk yield, caliper volume plus 10%. 3700 psi compressive strength in 48 hours at 114° F.

Volumes calculated to circulate cement from TD to surface.

8. Logging Program

Cores: Rotary Cores will be taken as needed to evaluate the coal seams.

DSTs: None Planned

Logs: Induction, GR, SP, Density, Neutron and Caliper – From surface to TD
Cement Bond Log – From 9 5/8"casing shoe TD
Mud Logger – As Needed.

9. Pressure Data, Potential Hazards

Bottom hole pressures anticipated @ 1000 – 1100 psi.
There is no history of hydrogen sulfide gas in the area and none is anticipated.

10. ANTICIPATED STARTING DATES AND NOTIFICATION OF OPERATIONS

A. Anticipated Starting Dates:

Anticipated Commencement Date	**- Fall 2004, or upon approval**
Drilling Days	**- Approximately 7 Days/Per Well**
Completion Days	**- Approximately 2 Days/Per Well**
Testing Days	**- Approximately 7-14 Days/Per Well**

Note: Drilling operations will commence as soon as practical after approval of all necessary permits including the APDs.

B. Notification of Operations:

Rawlins Field Office, BLM
1300 North Third
Rawlins, Wyoming 82301
(307) 328-4200

WOGCC
777 West First Street
Casper, WY 82602
(307) 234-7147

Appendix C

List of Permitted Wells

Permit #	Priority	Status	Township	Tns Suffix	Range	Rng Suffix	Section	Qtrqtr	Lots	Applicant	Facility Name	Uses	Yld Act	Well Depth	Static Depth	Mwbz Top	Mwbz Bottom	Well Log	Chemical Analysis	County
P169546W	6/23/2005	GSI	23	N	81	W	2	SENW		ANADARKO PETROLEUM CORP.	HANNA DRAW FEDERAL 2-2	CBM						No		Carbon
P137145W	3/26/2001	CAN	23	N	81	W	11	SWSE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 28	CBM						No		Carbon
P128226W	8/21/2000	CAN	23	N	81	W	13	SESW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #11	CBM						No		Carbon
P128227W	8/21/2000	GST	23	N	81	W	13	NWSW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #9	CBM	11	3576	400	3385	3425	Yes	Yes	Carbon
P128229W	8/21/2000	GST	23	N	81	W	13	NESW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #10	CBM	2	3720	300	3485	3530	Yes	Yes	Carbon
P128419W	8/21/2000	CAN	23	N	81	W	13	NWNW		BARRETT RESOURCES CORP	HANNA DRAW UNIT #16-13	CBM	4	4090	201	3895	3965	Yes	Yes	Carbon
P128228W	8/21/2000	CAN	23	N	81	W	14	SESE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #5	CBM						No		Carbon
P128230W	8/21/2000	CAN	23	N	81	W	23	NENE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #12	CBM						No		Carbon
P128231W	8/21/2000	CAN	23	N	81	W	24	NWNW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #7	CBM						No		Carbon
P128418W	8/21/2000	CAN	24	N	81	W	35	SWNW		BARRETT RESOURCES CORP	HANNA DRAW UNIT #14-35	CBM	1	4648	350	4235	4305	Yes	Yes	Carbon
P137141W	3/26/2001	CAN	23	N	80	W	7	SWSW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 20	CBM,RES						No		Carbon
P137144W	3/26/2001	CAN	23	N	81	W	11	NESE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 27	CBM,RES						No		Carbon
P137146W	3/26/2001	CAN	23	N	81	W	11	SESW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 29	CBM,RES						No		Carbon
P137160W	6/22/2001	CAN	23	N	81	W	11	SWNE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #36	CBM,RES						No		Carbon
P137161W	6/22/2001	CAN	23	N	81	W	11	SWSW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #30	CBM,RES						No		Carbon
P137164W	6/22/2001	CAN	23	N	81	W	11	NENE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #37	CBM,RES						No		Carbon
P137165W	6/22/2001	CAN	23	N	81	W	11	NENW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #39	CBM,RES						No		Carbon
P137153W	3/26/2001	CAN	23	N	81	W	12	SWSE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 24	CBM,RES						No		Carbon
P137154W	3/26/2001	CAN	23	N	81	W	12	NESW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 25	CBM,RES						No		Carbon
P137155W	3/26/2001	CAN	23	N	81	W	12	SWSW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 26	CBM,RES						No		Carbon
P137159W	6/22/2001	CAN	23	N	81	W	12	NENW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #87	CBM,RES						No		Carbon
P137162W	6/22/2001	CAN	23	N	81	W	12	SWNE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #88	CBM,RES						No		Carbon
P137163W	6/22/2001	CAN	23	N	81	W	12	SWNW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #86	CBM,RES						No		Carbon
P137142W	3/26/2001	GST	23	N	81	W	13	NENE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 21	CBM,RES	2	4313	300	4044	4088	Yes	Yes	Carbon
P137143W	3/26/2001	GST	23	N	81	W	13	SWNE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 22	CBM,RES	7	4095	589	3875	3920	Yes	No	Carbon
P137156W	3/26/2001	CAN	23	N	81	W	14	NENE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 31	CBM,RES						No		Carbon
P137157W	3/26/2001	CAN	23	N	81	W	14	SWNE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 32	CBM,RES						No		Carbon
P137158W	3/26/2001	CAN	23	N	81	W	14	NENW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 33	CBM,RES						No		Carbon
P137152W	3/26/2001	CAN	24	N	81	W	33	SWSE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 46	CBM,RES						No		Carbon
P137147W	3/26/2001	CAN	24	N	81	W	35	SESW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 41	CBM,RES						No		Carbon
P137148W	3/26/2001	CAN	24	N	81	W	35	SESE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 42	CBM,RES						No		Carbon
P137149W	3/26/2001	CAN	24	N	81	W	35	NWSE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 44	CBM,RES						No		Carbon
P137150W	3/26/2001	CAN	24	N	81	W	35	SENE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 45	CBM,RES						No		Carbon
P137151W	3/26/2001	CAN	24	N	81	W	35	NWNE		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT # 43	CBM,RES						No		Carbon
P119325W	9/27/1999	GST	23	N	81	W	13	SWSW		WILLIAMS PRODUCTION RMT, COMPANY	Hanna Draw Unit 31	CBM,STO	8	3600	400	3165	3205	Yes	Yes	Carbon
P130596W	9/8/2000	GST	23	N	81	W	13	NENW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #18	CBM,STO	2	4260	300	4060	4125	Yes	Yes	Carbon
P130597W	9/8/2000	GST	23	N	81	W	13	SENW		WILLIAMS PRODUCTION RMT, COMPANY	HANNA DRAW UNIT #19	CBM,STO	7	3905	300	3695	3760	Yes	Yes	Carbon
P52030W	1/30/1980	ABA	23	N	81	W	17	NWNW		ARCH MINERAL CORPORATION	S2 79	DEW,RES,MIS	150	120	-1	Unknown	Unknown	No	No	Carbon
P108935W	10/1/1997	UNA	23	N	80	W	18	SESE		USDI, BLM** HI ALLEN RANCH	DIXIE DRAW WELL #1	MIS	15	150	15	Unknown	Unknown	No	No	Carbon
P43960W	6/16/1978	CAN	23	N	81	W	8	SWSE		ARCH MINERAL CORP.	S2-81	MIS						No		Carbon
P59441W	10/26/1981	CAN	23	N	81	W	10	SWSE		ARCH MINERAL CORP.**USDI, BLM	9853	MIS						No		Carbon
P59440W	10/26/1981	CAN	23	N	81	W	14	NESE		ARCH MINERAL CORP.**USDI, BLM	9852	MIS						No		Carbon
P44546W	8/7/1978		23	N	81	W	16	SWSW		CARBON COUNTY COAL COMPANY	P-4	MIS	0	19.5	5.6	2	19	Yes	Yes	Carbon
P69193W	9/4/1984		23	N	81	W	16	NWSW		WY BOARD OF LAND COMMISSIONERS** ARCH MINERAL CORP.	PIT 79	MIS	650	110	66.9	Unknown	Unknown	No	No	Carbon
P44543W	8/7/1978	UNA	23	N	81	W	21	NWNE		RAG SHOSHONE COAL CORPORATION	P-1	MIS	0	783	701	741	783	Yes	No	Carbon
P44544W	8/7/1978	UNA	23	N	81	W	21	NWNE		RAG SHOSHONE COAL CORPORATION	P-2	MIS	0	711	165	685	710	Yes	Yes	Carbon
P44545W	8/7/1978		23	N	81	W	21	NWNE		CARBON COUNTY COAL COMPANY	P-3	MIS	0	498	167.7	478	498	Yes	Yes	Carbon
P66273W	12/22/1983	CAN	23	N	81	W	22	SWSE		ROSEBUD COAL SALES COMPANY**USDI, BLM	OPEN PIT #10	MIS						No		Carbon
P37151W	11/1/1976	GST	23	N	81	W	9	NWSW		ARCH MINERAL CORP.	S2W-3	MON	0	300	42	Unknown	Unknown	Yes	Yes	Carbon
P37152W	11/1/1976	GST	23	N	81	W	9	NWSW		ARCH MINERAL CORP.	S2W-4	MON	0	200	9	Unknown	Unknown	Yes	Yes	Carbon
P37153W	11/1/1976	GST	23	N	81	W	9	NESW		ARCH MINERAL CORP.	S2W-5	MON	0	200	18	Unknown	Unknown	Yes	No	Carbon
P156289W	2/13/2004	GST	23	N	81	W	12	SENE		USDI, BUREAU OF LAND MANAGEMENT** THE SHIPLEY GROUP	PL-12	MON	0	21	-7	Unknown	Unknown	Yes	No	Carbon
P75768W	10/26/1987	GST	23	N	81	W	16	SWNW		ARCH OF WYOMING INC.	S2 1679D	MON	0	60	35.16	Unknown	Unknown	Yes	No	Carbon
P59645W	3/4/1982	GST	23	N	81	W	17	SESW		ARCH MINERAL SEMINOE #1	S2W-20	MON	0	125	117.3	Unknown	Unknown	Yes	No	Carbon
P59646W	3/4/1982	GST	23	N	81	W	17	NESW		ARCH MINERAL SEMINOE #1	S2W-21	MON	0	200	159.5	Unknown	Unknown	Yes	No	Carbon
P59647W	3/4/1982	GST	23	N	81	W	17	NESW		ARCH MINERAL SEMINOE #1	S2W-22	MON	0	210	150.1	Unknown	Unknown	Yes	No	Carbon
P59648W	3/4/1982	GST	23	N	81	W	17	SWSE		ARCH MINERAL SEMINOE #1	S2W-23	MON	0	200	260	Unknown	Unknown	Yes	No	Carbon
P73273W	9/3/1986	GST	23	N	81	W	17	NWNW		ARCH OF WYOMING INC.	17 79 A	MON	0	97	-7	Unknown	Unknown	Yes	No	Carbon
P75997W	11/23/1987	GST	23	N	81	W	17	NENW		ARCH OF WYOMING INC.	S2 1779B	MON	0	60	45	Unknown	Unknown	Yes	No	Carbon
P37037W	3/23/1977	GST	23	N	81	W	21	SENW		PETER KIEWIT SONS CO.	HANNA #9003	MON	0	247	26	216	243	Yes	Yes	Carbon
P37038W	3/23/1977	GST	23	N	81	W	21	NESW		PETER KIEWIT SONS CO.	HANNA #9004	MON	0	139	48	70	85	Yes	No	Carbon
P55288W	1/6/1981	GST	23	N	81	W	22	NESW		ROSEBUD COAL SALES COMPANY	WW9019	MON	0	235	98.9	Unknown	Unknown	Yes	No	Carbon
P55289W	1/6/1981	GST	23	N	81	W	22	NESW		ROSEBUD COAL SALES COMPANY	WW9018	MON	0	240	105.1	Unknown	Unknown	Yes	No	Carbon
P55290W	1/6/1981	GST	23	N	81	W	22	SESE		ROSEBUD COAL SALES COMPANY	WW9017	MON	0	280	61.2	Unknown	Unknown	Yes	No	Carbon
P55291W	1/6/1981	GST	23	N	81	W	22	SESE		ROSEBUD COAL SALES COMPANY	WW9016	MON	0	300	62	260	267	Yes	No	Carbon
P62558W	11/18/1982	GST	23	N	81	W	22	SENW		ROSEBUD COAL SALES CO.	R-9018A	MON	0	221	192	167	216	Yes	No	Carbon
P94258W	12/16/1993	GST	23	N	81	W	22	SESE		RAG SHOSHONE COAL CORPORATION	TG-3	MON	0	46	27.1	15	46	Yes	No	Carbon
P94261W	12/16/1993	GST	23	N	81	W	22	SESE		RAG SHOSHONE COAL CORPORATION	TS-1	MON	0	104	81.1	80	95	Yes	No	Carbon
P106061W	5/23/1997	GST	23	N	81	W	23	SENE		RAG SHOSHONE COAL CORPORATION	BS-1-SS	MON	0	1927	257	1778	1948	Yes	No	Carbon
P106062W	5/23/1997	GST	23	N	81	W	23	SENE		RAG SHOSHONE COAL CORPORATION	BS-1-U1	MON	0	2298	300	2261	2296	Yes	No	Carbon
P106063W	5/23/1997	GST	23	N	81	W	23	SENE		RAG SHOSHONE COAL CORPORATION	BS-1-80	MON	0	2209	287	2195	2216	Yes	No	Carbon
P106064W	5/23/1997	GST	23	N	81	W	23	SENE		RAG SHOSHONE COAL CORPORATION	BS-1-80B	MON	0	2252	280	2236	2249	Yes	No	Carbon
P107331W	8/29/1997	GST	23	N	81	W	23	NWSW		RAG SHOSHONE COAL CORPORATION	BS-2-SS	MON	0	1137.2	187	1072	1149	Yes	No	Carbon
P107332W	8/29/1997	GST	23	N	81	W	23	NWSW		RAG SHOSHONE COAL CORPORATION	BS-2-80	MON	0	1419	10	1407	1423	Yes	No	Carbon
P107333W	8/29/1997	GST	23	N	81	W	23	NWSW		RAG SHOSHONE COAL CORPORATION	BS-2-U1	MON	0	1524.7	279	1496	1530	Yes	No	Carbon
P94257W	12/16/1993	GST	23	N	81	W	23	SWSW		RAG SHOSHONE COAL CORPORATION	TG-2	MON	0	43	24.5	25	43	Yes	No	Carbon
P37149W	11/1/1976	GST	24	N	81	W	33	SWNE		ARCH MINERAL CORP.	S2W-1	MON	0	200	73	Unknown	Unknown	No	Yes	Carbon
P37150W	11/1/1976	GST	24	N	81	W	35	NESE		ARCH MINERAL CORP.	S2W-2	MON	0	300	190	Unknown	Unknown	Yes	Yes	Carbon
P52028W	1/30/1980	CAN	23	N	81	W	8	SWSE		ARCH MINERAL CORPORATION	S2 81	RES,MIS						No		Carbon
P61634W	4/9/1982	CAN	23	N	81	W	17	NWNW		ARCH MINERAL CORP.	S2SR	RES,MIS						No		Carbon
P83080W	7/27/1990	GST	23	N	80	W	17	NENW		BURT PALM	CHACE #1	STO	5	140	60	125	Unknown	Yes	No	Carbon
P83081W	7/27/1990	GST	23	N	80	W	17	NENW		BURT PALM	CHACE #2	STO	5	160	105	145	Unknown	Yes	No	Carbon
P108933W	10/1/1997	GST	23	N	80	W	20	NENW		USDI, BLM** HI ALLEN RANCH	MISSOURI JOHN WELL #1	STO	15	170	12	Unknown	Unknown	No	No	Carbon
P108934W	10/1/1997	GST	23	N	80	W	20	NENW		USDI, BLM** HI ALLEN RANCH	MISSOURI JOHN WELL #2	STO	10	80	12	Unknown	Unknown	No	No	Carbon
P11207W	12/1/1971	GST	24	N	81	W	26	SESE		ROBERT J. KORKOW	KORKOW #2	STO	10	800	-1	Unknown	Unknown	No	No	Carbon
P17385W	12/27/1972	GST	24	N	81	W	34	NWNE		U.S.A./BUREAU OF LAND MANAGEMENT	MEDICINE BOW (INDEX #4266)	STO	8	800	340	Unknown	Unknown	No	No	Carbon
P3817W	12/18/1969	GST	24	N	81	W	34	NWNE		ROBERT J. KORKOW	KORKOW #1	STO	8	800	300			No		Carbon
P43959W	6/16/1978	CAN	23	N	81	W	17	NENW		ARCH MINERAL CORP.	MIS							No		Carbon