



U.S. Department of the Interior

Bureau of Land Management
Rock Springs Field Office

June 2005



Environmental Assessment for the Bitter Creek Shallow Oil and Gas Project, Sweetwater County, Wyoming



LIST OF ABBREVIATIONS/ACRONYMS USED IN THIS DOCUMENT

°F	Degrees fahrenheit	MSDS	Material Safety Data Sheets
µg	Micrograms	NAAQS	National Ambient Air Quality Standards
µg/m ³	Micrograms per cubic meter	NEPA	<i>National Environmental Policy Act of 1969</i>
AACL	Acceptable Ambient Concentration Level	NHPA	<i>National Historic Preservation Act of 1966</i>
AAM	Annual arithmetic mean	NO ₂	Nitrogen dioxide
acre-ft	Acre-foot/feet	NOI	Notice of Intent
AJE	Annual job equivalent	NOS	Notice of Staking
ANC	Acid Neutralizing Capacity	NO _x	Nitrogen oxides
AO	BLM Authorized Officer	NPDES	National Pollutant Discharge Elimination System
APD	Application for Permit to Drill		
AQD	Air Quality Division	NRHP	National Register of Historic Places
AUM	Animal unit month	NWI	National Wetlands Inventory
BACT	Best Available Central Technology	Operators	Infinity Oil & Gas of Wyoming, Inc. and Yates Petroleum Corporation
BBCC	Black Butte Coal Company		
BLM	Bureau of Land Management	OSHA	Occupational Safety and Health Administration
BMP	Best Management Practices		
CD/GWII	Continental Divide/Greater Wamsutter II EIS	ppm	Parts per million
CEQ	Council on Environmental Quality	PSD	Prevention of Significant Deterioration
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>	R99W	Range 99 West
		RCRA	Resource Conservation and Recovery Act
CIAA	Cumulative Impact Assessment Area	REL	Reference Exposure Level
CFR	<i>Code of Federal Regulations</i>	RFC	Reference Concentration for Chronic Inhalation
CO	Carbon monoxide		
COA	Condition of Approval	ROD	Record of Decision
COE	U.S. Army Corps of Engineers	ROW	Right-of-way
DFE	Desolation Flats Final EIS	RSFO	Rock Springs Field Office
EA	Environmental assessment	SARA	<i>Superfund Amendments and Reauthorization Act of 1986</i>
EIS	Environmental impact statement		
EPA	U.S. Environmental Protection Agency	SHPO	State Historic Preservation Office
FLPMA	<i>Federal Land Policy and Management Act of 1976</i>	SHWD	Solid and Hazardous Waste Division
		SO ₂	Sulfur dioxide
FONSI	Finding of No Significant Impact	SCCD	Sweetwater County Conservation District
ft	Foot or feet	SPCCP	Spill Prevention Control and Countermeasure Plan
Green River	Record of Decision and Green River		
RMP	Resource Management Plan	T18N	Township 18 North
HAPs	Hazardous Air Pollutants	TCP	Traditional Cultural Properties
I-80	Interstate 80	TDS	Total dissolved solids
IDLH	Immediately dangerous to life or health	TEPC	Threatened, endangered, proposed, and candidate species
ID Team	Interdisciplinary Team		
IWAQM	Interagency Workgroup on Air Quality Monitoring	USDOC	U. S. Department of Commerce
		USFWS	U.S. Fish and Wildlife Service
LOP	Life-of-project	VOC	Volatile organic compounds
LQD	Land Quality Division	VRM	Visual Resource Management
MEI	Maximally Exposed Individual	WAAQS	Wyoming Ambient Air Quality Standards
mi	Mile(s)	WDEQ	Wyoming Department of Environmental Quality
MLE	Most Likely Exposure		
MLA	Mineral Leasing Act	WGFD	Wyoming Game and Fish Department
MMCF	Million cubic feet	WNDD	Wyoming Natural Diversity Database
mmscf	Million standard cubic feet	WOGCC	Wyoming Oil and Gas Conservation Commission
mph	Miles per hour	WQD	Water Quality Division

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.



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Rock Springs Field Office
280 Highway 191 North
Rock Springs, Wyoming 82901-3447



1792, 1310 (040)
Bitter Creek Shallow
Oil and Gas Project

June 24, 2005

Dear Reader:

The Bureau of Land Management (BLM) is providing you with a copy of the Environmental Assessment (EA), Finding of No Significant Impact (FONSI), and Decision Record (DR) for Infinity Oil & Gas of Wyoming, Inc. and Yates Petroleum Corporation (the Operators) for Bitter Creek Shallow Oil and Gas Project.

The EA has been prepared pursuant to the National Environmental Policy Act, and other regulations and statutes, to analyze and determine the possible adverse environmental impacts which could result from the Operator's proposal (Proposed Action and No Action Alternative) and to ensure that all reasonable mitigation measures have been identified. This EA is also intended to provide information to other regulatory agencies for use in their decision making process for other permits required for implementation of the project.

The DR identifies BLM's decision, explains the rationale for the reaching the decision, and includes the Operator's committed measures and additional mitigation requirements for the Bitter Creek Project Area.

The BLM released a scoping notice to the public on October 17, 2003 and 17 comment letters were received. BLM has provided responses to all comments received during that 30-day comment period. Comment letters received during public scoping have been considered and documented in the analysis and/or decision (Appendix A of decision record).

A copy of this EA and FONSI/DR has been sent to government entities, individuals, and organizations that commented on this project or have expressed an interest in mineral-related activities proposed on public lands. The BLM wishes to thank those individuals and organizations who provided input during this analysis process. If you should have any questions regarding this document, please contact

Darlene Horsey, Project Lead, at the address shown above or phone (307) 352-0335.

Sincerely,

Michael R. Holbert
Field Manager

Attachment

**ENVIRONMENTAL ASSESSMENT FOR THE
BITTER CREEK SHALLOW OIL AND GAS PROJECT,
SWEETWATER COUNTY, WYOMING**

**Bureau of Land Management
Rock Springs Field Office
Rock Springs, Wyoming**

June 2005

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CHAPTER 1.0

PURPOSE AND NEED FOR THE ACTION

1.0 PURPOSE OF AND NEED FOR THE ACTION

1.1 INTRODUCTION

Infinity Oil & Gas of Wyoming, Inc. and Yates Petroleum Corporation (the Operators) have submitted to Bureau of Land Management (BLM) a proposal to explore and potentially develop shallow oil and natural gas on federal lands administered by the BLM Rock Springs Field Office (RSFO). The proposed Bitter Creek Project area encompasses approximately 17,961 acres and is located in portions of Townships 18 and 19 North (T18-19N), Range 99 and 100 West (R99-100W) in central Sweetwater County between the communities of Bitter Creek and Point of Rocks. The Bitter Creek Project area is located immediately south of I-80 approximately 30 mi east of Rock Springs and approximately 75 mi west of Rawlins (Figure 1.1). The project area has had 64 oil and gas wells drilled in it since 1960, and surface coal mining has and is occurring within the Bitter Creek Project area.

The Operators propose to drill a maximum of 61 wells from 61 well pads on federal surface/federal minerals within the Bitter Creek Project area. The Bitter Creek Project area includes 11,768 acres (66%) of federal surface and minerals and approximately 6,193 acres (34%) of private surface and minerals (Figure 1.2). There are no state lands within the Bitter Creek Project area.

The Bitter Creek Project would be initiated upon approval by the BLM. All of the drilling would likely occur within 2-4 years, and the projected life-of-project (LOP) would be approximately 15-20 years. Up to four drilling rigs may be active at any one time within the Bitter Creek Project area. Each *Application for Permit to Drill* (APD) and right-of-way (ROW) application would be subject to further *National Environmental Policy Act* (NEPA) compliance as appropriate.

1.2 BRIEF DESCRIPTION OF THE PROPOSED ACTION

The Operators propose to drill a maximum of 61 wells from 61 well pads within the Bitter Creek Project area. These wells would be drilled on a 160-acre spacing pattern and would utilize as much of the existing infrastructure (e.g., access roads and pipelines) as possible. Well pads would be approximately 200 ft by 300 ft in size. A reserve pit would be constructed on each well pad to hold drilling fluids and cuttings and be approximately 75 ft by 110 ft in size. Reserve pits would be lined with a 12-mil reinforced

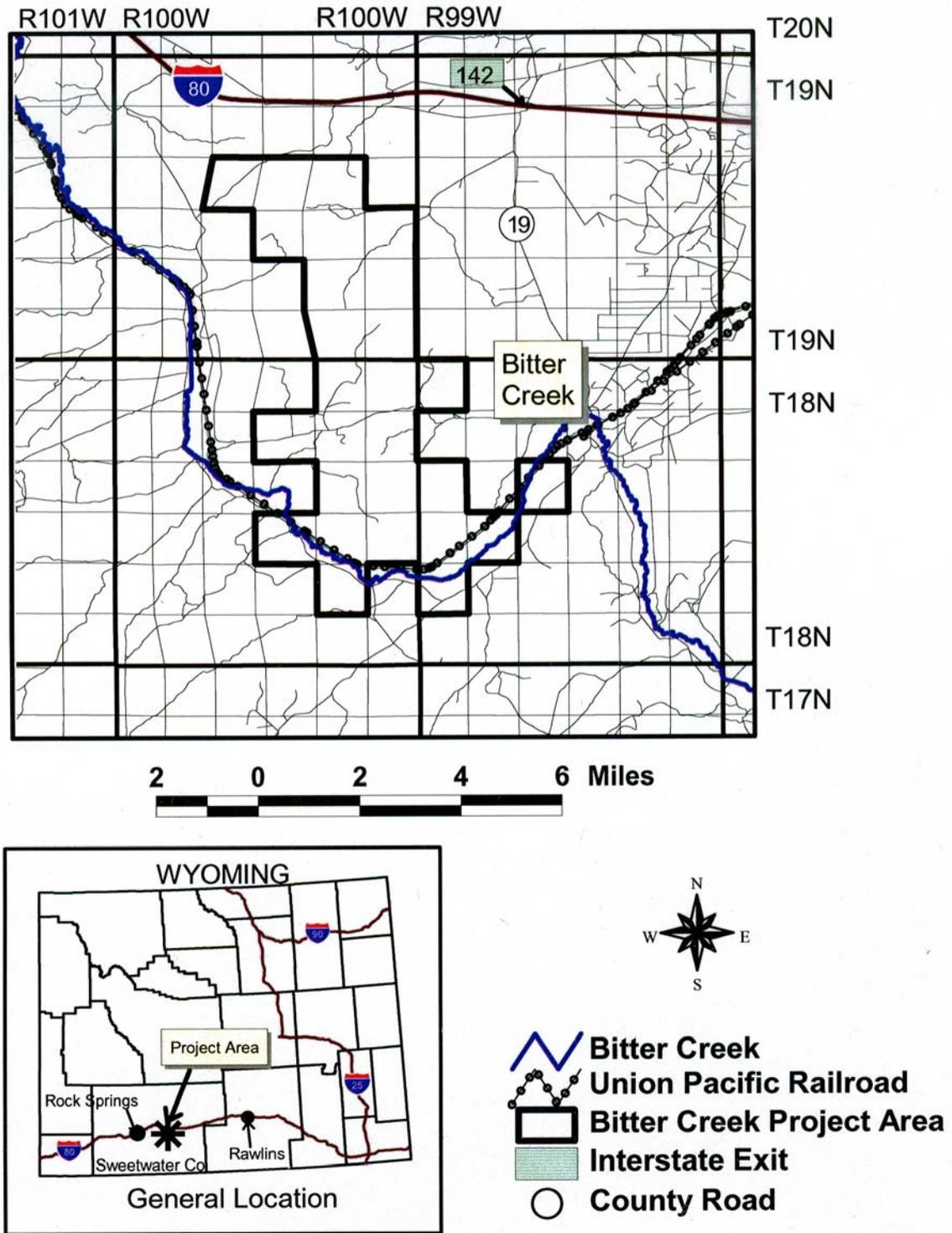


Figure 1.1 Project Location.

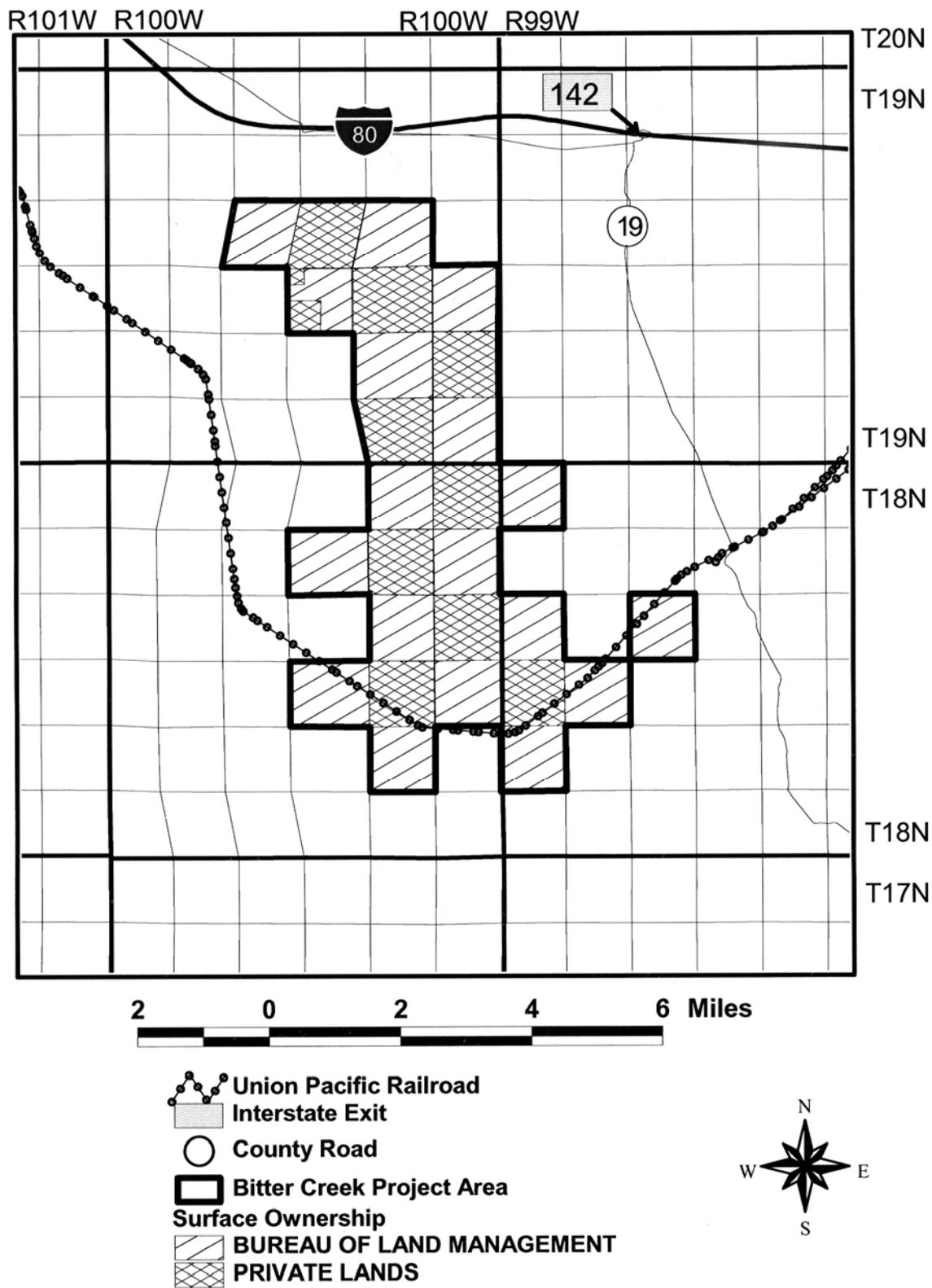


Figure 1.2 Surface Ownership in the Bitter Creek Project Area.

poly-liner to temporarily contain drilling fluids, cuttings and produced water. Drilling depths would vary, but would generally be 2,000-4,000 ft and would target oil and gas reserves in the Almond and Lance Formations. Water for use in drilling would be obtained from existing water wells owned by the Operators and located within the Bitter Creek Project area.

Each well would include a 3-inch water discharge line and 4-inch production line. Disposal of produced water would be via existing injection wells permitted and drilled to the Fox Hills Formation or through disposal at a commercial water disposal facility located in the general area. No surface disposal of produced water is proposed. A separator and storage tank with metering equipment would be placed at some or all of the new well locations.

Following drilling operations and completion operations, flowlines and gathering facilities would be installed. Production equipment would be powered either by electricity (where it is available), propane, or produced gas. Where required, gas lines would be connected with compressors located within the Bitter Creek Project area. No new compression is included in this proposal. Produced gas would be transported by both existing and new buried gathering lines and pipelines. New pipelines would be installed immediately adjacent to existing common corridors (e.g., roads, pipelines, and gathering lines) whenever possible.

Exploration and developmental drilling is expected to last for approximately 2-4 years, and the wells are anticipated to produce for 15-20 years. Non-producing or abandoned wells and roads, portions of producing well pads and roads that are not required during the production phase of the project, and buried pipelines would be reclaimed at the first seasonally appropriate time after disturbance.

1.3 PURPOSE AND NEED FOR THE ACTION

The purpose of the Proposed Action is to enable the Operators to efficiently recover federally-owned oil and natural gas pursuant to their rights under existing oil and gas leases issued by the BLM, and to prevent drainage of federal fluid minerals by adjacent wells on non-federal lands. This EA satisfies BLM's responsibility under NEPA for complete public disclosure of impacts to the human environment, ensures compliance with the *Green River Resource Management Plan* (Green River RMP) (BLM 1997), identifies all practicable means to avoid or minimize adverse environmental impacts, and provides the responsible official the information upon which to base an informed decision regarding the project.

1.4 PROJECT AREA DESCRIPTION

The Bitter Creek Project area includes approximately 17,961 acres in portions of T18-19N, R99-100W, 6th Principal Meridian, in central Sweetwater County between the communities of Bitter Creek and Point of Rocks. The Bitter Creek Project area is located immediately south of I-80 approximately 30 mi east of Rock Springs and approximately 75 mi west of Rawlins (see Figure 1.1). Approximately 55% of the Bitter Creek Project area is located within the permit boundary of the Black Butte Coal Company's (BBCC) Black Butte Mine (Figure 1.3). It is estimated that new roads (including pipelines installed in a common corridor, would disturb a total of 122.5 acres, including 91.5 acres for the LOP. The location of roads and pipelines would be determined in the APD for each individual well. The surface ownership pattern within and adjacent to the Bitter Creek Project area is checkerboard, where even-numbered sections are typically owned by the federal government, odd-numbered sections are typically privately owned, and select even-numbered sections are owned by the State of Wyoming.

The Bitter Creek Project area can be accessed by I-80 east of Rock Springs, Wyoming, abandoned County Road 84 south of Point of Rocks, County Road 19S south of I-80 toward Bitter Creek, and numerous unnamed dirt roads. Public access into the interior of the Bitter Creek Project area is available on numerous unnamed unpaved roads and two-track roads. Many of the roads located within the western portion of the Bitter Creek Project area are maintained by BBCC. However, where practical, the Operators would not use BBCC's haulroads or access roads to reach any of their valid drilling leases.

1.5 CONFORMANCE WITH APPLICABLE LAND USE PLANS

The proposed project is in compliance with the Green River Resource Management Plan (RMP), which states that "The objective for management of BLM-administered Federal minerals is to maintain or enhance opportunities for mineral exploration and development, while protecting other resource values" and "The objective for management of oil and gas resources is to provide for leasing, exploration, and development of oil and gas, while protecting other values."

All project-related activities would be conducted in full compliance with the terms and conditions of the applicable federal leases.

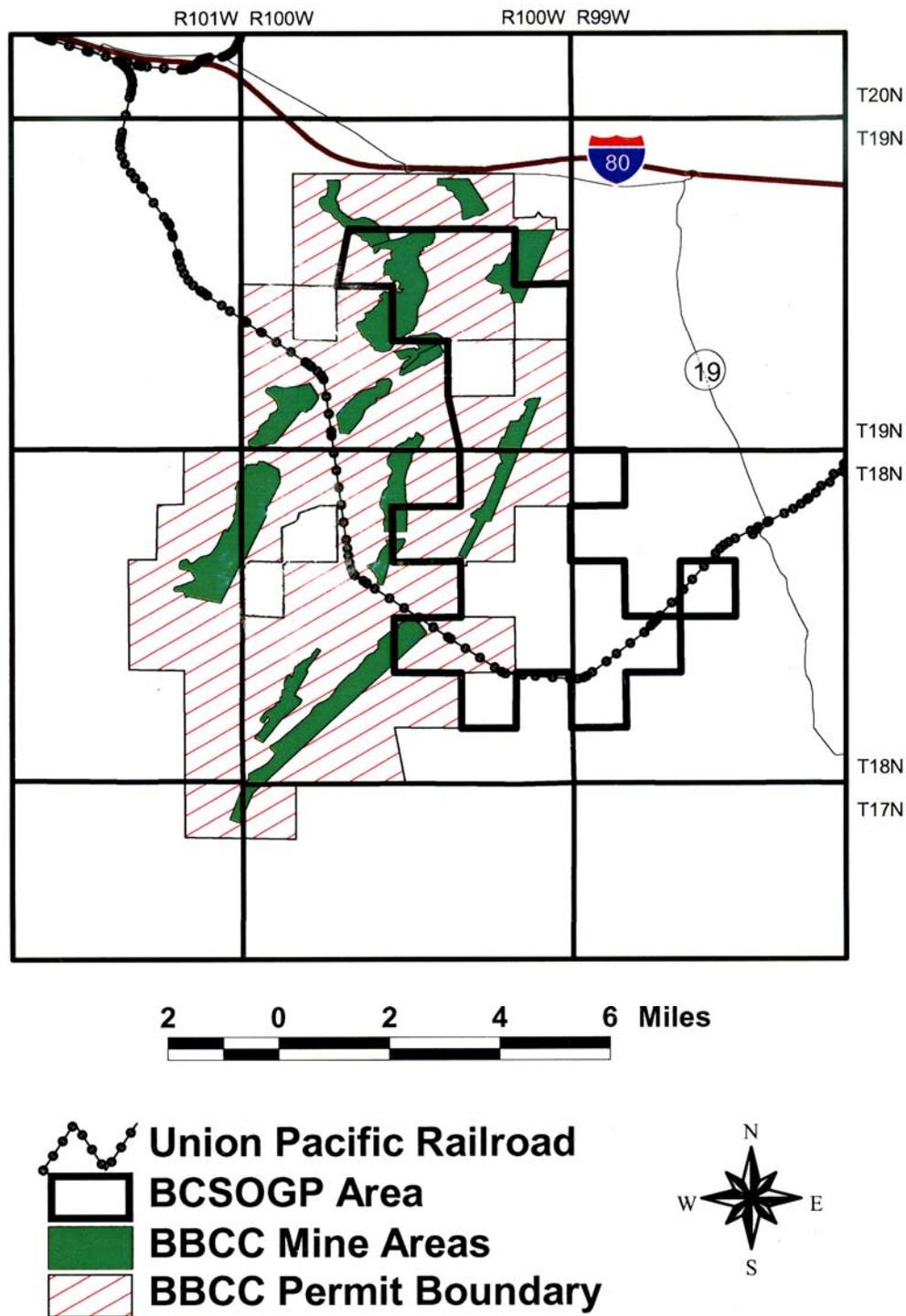


Figure 1.3 Black Butte Coal Company Permit Area and Pit Areas Within the Bitter Creek Project Area.

1.6 RELATIONSHIP TO STATUES, REGULATIONS, AND/OR OTHER PLANS

The development of federal oil and gas leases is an integral part of the BLM oil and gas leasing program under the authority of the *Mineral Leasing Act of 1920*, the *Federal Land Policy and Management Act of 1976*, the *Federal Onshore Oil and Gas Royalty Management Act of 1982*, and the *Federal Onshore Oil and Gas Leasing Reform Act of 1987*. The BLM's oil and gas leasing program is intended to encourage the development of domestic oil and gas reserves, thereby reducing national dependence on foreign energy supplies.

The regulatory framework that governs oil and gas drilling, production, and abandonment involves a number of policies, legislation, and regulations. The proposed project must be reviewed in accordance with requirements of *Onshore Oil and Gas Operations* (43 CFR 3160), *BLM Onshore Oil and Gas Order Nos. 1 through 7* (43 CFR 3164), NEPA and applicable regulations and guidelines (40 CFR 1500-1508), BLM Handbook H-1790 (BLM 1988), Department of Interior DM-516 (2004), and BLM *NEPA Process: Desktop Reference* (BLM 1999).

This EA is tiered to the Green River RMP (BLM 1997) and incorporates by reference the following documents:

- the Development Project EA for the Copper Ridge Shallow Gas Exploration and Development Project (BLM 2003),
- the Development of Coal Resources in Southwestern Wyoming (including the Black Butte Mine) (BLM 1978); and
- the Natural Gas Project Final EIS the Continental Divide/Wamsutter II Natural Gas Project Final EIS (BLM 1999a, 1999b).

Major federal, state, and local permits, approvals and authorizing actions that would apply to the Bitter Creek Project are presented in Table 1.1.

1.7 DECISION TO BE MADE

The decision to be made is whether implementation of the Proposed Action would result in significant impacts to the human environment. If significant impacts would occur, the No Action Alternative would be chosen and the Operators could either modify the Proposed Action to avoid significant impacts or

Table 1.1 Major Federal, State, and Local Permits, Approvals, and Authorizing Actions for the Bitter Creek Project, Sweetwater County, Wyoming, 2005.¹

Agency	Permit, Approval, or Action	Authority
Office of the President of the United States	Protection and enhancement of the cultural environment	Executive Order 11593
	Floodplains management	Executive Order 11988
	Protection of wetlands	Executive Order 11990
	Environmental Justice	Executive Order 12898
	Indian sacred sites	Executive Order 13007
	Invasive species	Executive Order 13112
	Protection of migratory birds	Executive Order 13186
	Trails for America in the 21st century	Executive Order 13195
Bureau of Land Management (BLM)	Preserve America	Executive Order 13287
	Permit to drill, deepen, or plug back on federal onshore lands (APD/Sundry process); authorization for flaring and venting of natural gas on federal lands; plugging and abandonment of a well on federal lands	<i>Mineral Leasing Act of 1920</i> (30 <i>United States Code</i> [USC] 181 et seq.); 43 CFR 3162
	Rights-of-way grants and temporary use clearances on federal lands	<i>Mineral Leasing Act of 1920</i> , as amended (30 USC 185); 43 CFR 3180; FLPMA (43 USC 1761 - 1771); 43 CFR 2800
	Antiquities and cultural resource clearances on BLM-managed land	<i>Antiquities Act of 1906</i> (16 USC Section 431-433); <i>Archaeological Resources Public Protection Act of 1979</i> (16 USC Sections 470aa - 470ll); 43 CFR 3; <i>National Historic Preservation Act of 1966</i> (NHPA) and Advisory Council Regulations (36 CFR 800); <i>American Indian Religious Freedom Act of 1978</i> , as amended (42 USC 1996 et seq.); <i>Native American Graves Protection and Repatriation of 1990</i> , as amended (25 USC 3001-3013); and implementing regulations
U.S. Army Corps of Engineers (COE)	Approval to dispose of produced water from BLM-managed land	<i>Mineral Leasing Act of 1920</i> (30 USC 181 et seq.); 43 CFR 3164; <i>Onshore Oil and Gas Order No. 7</i>
	Section 404 permits and coordination regarding placement of dredged or fill material in area waters and adjacent wetlands	Section 404 of the <i>Clean Water Act of 1972</i> (40 CFR 122 - 123, 230)
U.S. Fish and Wildlife Service (USFWS)	Coordination, consultation, and impact review on federally listed threatened and endangered (T&E) species and other federally protected species	<i>Fish and Wildlife Coordination Act</i> (16 USC Sec. 661 et seq.); Section 7 of the <i>Endangered Species Act of 1973</i> , as amended (16 USC et seq.); <i>Bald Eagle Protection Act</i> , as amended (16 USC 668-668dd); <i>Migratory Bird Treaty Act</i> (16 USC 704)
U.S. Environmental Protection Agency (EPA)	Spill Prevention Control and Countermeasure Plans (SPCCPs)	40 CFR 112
	Regulation of hazardous waste treatment, storage, and/or disposal	<i>Resource Conservation and Recovery Act</i> (42 USC Section 6901)
U.S. Department of Transportation	Control of pipeline maintenance and operation	49 CFR 191 and 192

Table 1.1 (Continued)

Agency	Permit, Approval, or Action	Authority
Wyoming Department of Environmental Quality - Water Quality Division (WDEQ-WQD)	Regulation of off-lease disposal of drilling fluids from abandoned reserve pits	<i>Wyoming Environmental Quality Act</i> (W.S. 35-11-301 through 35-11-311)
	National Pollutant Discharge Elimination System (NPDES) permits for discharging waste water and storm water runoff	WDEQ Rules and Regulations, Chapter 18. <i>Wyoming Environmental Quality Act</i> (W.S. 35-11-301 through 35-11-311); Section 405 of the <i>Clean Water Act</i> (40 CFR 122-124)
	Administrative approval for discharge of hydrostatic test water	<i>Wyoming Environmental Quality Act</i> (W.S. 35-11-301 through 35-11-311)
Wyoming Department of Environmental Quality - Solid Waste Division	Construction fill permits and industrial waste facility permits for solid waste disposal during construction and operations	<i>Wyoming Environmental Quality Act</i> (W.S. 35-11-501 through 35-11-520)
Wyoming Department of Transportation (WDOT)	Permits for oversize, overlength, and overweight loads	Chapters 17 and 20 of the Wyoming Highway Department Rules and Regulations
Wyoming Oil and Gas Conservation Commission (WOGCC)	Authorization for flaring or venting of gas	WOGCC Regulations (Section III; Rule 326)
	Permit for Class II underground injection wells	WOGCC Regulations (Section III; Rule 346)
	Well plugging and abandonment	40 CFR 146; 40 CFR 147.2551
	Permit to drill, deepen, or plug back (APD process)	WOGCC Regulations (Section III; Rule 315)
	Change in depletion plans	<i>Wyoming Oil and Gas Act</i> (W.S. 30-5-110)
	Minimum safety standards for oil and gas activities	WOGCC Regulations (Rules 320-A, 327, and 328)
Wyoming State Engineer's Office (WSEO)	Permits to appropriate groundwater (use, storage, wells, dewatering)	W.S. 41-121 through 147 (Form U.W.5)
Wyoming State Historic Preservation Office (SHPO)	Cultural resource protection, programmatic agreements, consultation	Section 106 of <i>National Historic Preservation Act</i> (NHPA) and Advisory Council Regulations (36 CFR 800)
Sweetwater County	County road crossing/access permits	Engineer's Department
	Small wastewater permits; mineral development permits	Planning and Zoning Department
	Hazardous material recordation and storage	Emergency Management Coordinator
	Zone changes	Planning Department
	Noxious weed control	Weed and Pest Department
	General review and comments	Conservation District

¹ This list is intended to provide an overview of the key regulatory requirements that would govern project implementation. Additional approvals, permits, and authorizing actions may be necessary.

prepare an environmental impact statement. If BLM determines that implementation of the Proposed Action would not result in significant impacts, BLM would prepare a *Finding of No Significant Impact* and *Decision Record*, the NEPA process would be satisfied, and the Operators could proceed with implementation of the Proposed Action pending any appeals. APDs and ROW applications would be subject to additional NEPA analysis at the time those site-specific applications are submitted to BLM.

1.8 SCOPING AND DEVELOPMENT OF ISSUES

A scoping notice was mailed to approximately 62 government agencies, companies, individuals, and organizations, requesting that comments be submitted to BLM by November 17, 2003 (30 days), to submit comments (Appendix A). Seventeen comment letters were received by the BLM: seven from government agencies; seven from private corporations; and three from non-government organizations. A more detailed analysis of comment letters is included in Section 5.1. Issues raised by the BLM interdisciplinary team and the public include:

- potential increased traffic and associated impacts to existing county, state, and BLM roads;
 - potential socio-economic impacts to the local communities;
 - potential impacts to air quality resources from emissions resulting from additional drilling and gas production activities;
 - potential impacts to surface water and groundwater resources, including wetland resources;
 - potential impacts to existing mine-related reclamation areas and the control of non-native invasive weeds;
 - potential impacts to prehistoric and historic resources;
 - potential impacts to wildlife habitat, including habitat for big game, greater sage-grouse, raptors and aquatic species found in Bitter Creek;
 - potential impacts to wild horses;
 - potential impacts to livestock grazing;
 - potential impacts to visual resources;
 - potential impacts to federally-listed threatened, endangered, candidate, and proposed species and BLM-sensitive species;
 - potential cumulative effects of drilling and production activities on lands adjacent to the Bitter Creek Project area; and
 - potential conflicts between oil and gas exploration and development and current coal mining activities.
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CHAPTER 2.0
PROPOSED ACTION AND ALTERNATIVES

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 ALTERNATIVE DEVELOPMENT PROCESS

The development of alternatives to the Proposed Action is critical to the complete and thorough implementation of NEPA and its accompanying regulations. In accordance with 40 CFR 1502.14(a), the BLM is required to sharply define issues and evaluate all reasonable alternatives. The Proposed Action calls for the exploratory drilling with the ultimate goal of developing oil and natural gas reserves from federal lands within the Bitter Creek Project area. There are numerous methods by which this goal could be reached, although all methods are not technically or economically feasible. Alternatives to the Proposed Action were based on input from the Operators, the BLM, and the public.

2.2 DESCRIPTION OF ALTERNATIVES

2.2.1 Proposed Action

2.2.1.1 Introduction

Under the Proposed Action, a maximum of 61 wells and 61 well pads would be drilled over a 2- to 4-year period on lands within the Bitter Creek Project area owned by the federal government. The surface ownership pattern within and adjacent to the Bitter Creek Project area is checkerboard, where even-numbered sections are typically owned by the federal government, odd-numbered sections are typically privately owned, and select even-numbered sections are owned by the State of Wyoming. These wells would be drilled on a 160-acre spacing pattern and would utilize as much of the existing infrastructure (e.g., access roads and pipelines) as possible. Drilling and associated development would be expected to result in 326 acres of total disturbance--234 acres of short-term (2-4 years) and 92 acres of LOP (15-20 years) disturbance (Table 2.1). Short-term disturbance is disturbance that would be reclaimed shortly after the disturbance occurs, as on areas not required for ongoing production operations, on pipeline rights-of-way (ROWs), and on well pads that prove non-productive (see Appendix B). Long-term disturbance would not undergo final reclamation until a specific well was abandoned and associated disturbance (e.g., well pad, access road, pipelines, etc.) was no longer required for production operations. Long-term disturbance areas would be reclaimed in accordance with reclamation procedures presented in Appendix B once the well was abandoned. All reclamation operations included in the Proposed Action would conform with BLM Best Management Practices.

Table 2.1 Projected Disturbance Associated with the Bitter Creek Project.¹

Facility	Total Disturbance (Acres)	LOP Disturbance (Acres)
Well Pads ²	183	61
Roads, Product Collection Pipelines, and Water Disposal Pipelines (common corridor) ³	122.5	91.5
Ancillary Facilities ⁴	20	0
Total	325.5	152.5

¹ Based on 61 well pads

² Based on a total of 3 acres of total disturbance per well (1 acre per well of LOP disturbance).

³ Based on a total of 2 acres of disturbance per well (1.5 acres per well of LOP disturbance).

⁴ Based on 20 acres of short-term disturbance for additional production pipeline not located in common corridors (6.6 mi long by 25 ft wide).

Once a well goes into production, the Operators would reclaim all disturbed areas that are not necessary for on-going production and maintenance operations. This would involve reduction of disturbance from the well pad and access road to the minimum necessary, removal and grading of any fill material, redistribution of available topsoil, and the seeding and mulching of the area at the first seasonal opportunity. All pipeline ROWs would be reclaimed and revegetated at the first seasonal opportunity (after October 15 to when the soil is frozen, or before May 15). If a well is plugged and abandoned immediately after being drilled, all disturbance (i.e., well pad and access road) would be reclaimed and revegetated at the first seasonal opportunity (after October 15 to when the soil is frozen, or before May 15). The Operators would minimize all unnecessary disturbance and would reclaim and revegetate as much short-term disturbance as practicable.

2.2.1.2 Preconstruction Activities

Development activities would be approved prior to initiation of construction through applicable permitting procedures including filing with BLM the appropriate *Application for Permit to Drill* (APD), *Notice of Staking* (NOS), or any necessary right-of-way application with an appropriate map.

A *Master Surface Use Plan* (MSUP), *Master Drilling Plan* (MDP), and an addendum to the *Master Surface Use Plan-Comprehensive Transportation Plan* and the project map have already been submitted to the BLM. These documents include site-specific plans describing the proposed development (i.e., drilling plans with casing/cementing program; surface use plans with road and drill pad construction detail; and site-specific reclamation plans, etc.). Approval of all planned operations would be obtained in accordance with authority prescribed in *Onshore Oil and Gas Order No. 1* (43 CFR 3160).

The proposed facilities would be staked by the Operators and inspected by an interdisciplinary team composed of officials from the BLM to ensure consistency with the approved RMP, oil and gas lease stipulations, and any mitigation measures that may be included in the *Decision Record* implementing the project. Should any discrepancies in the various applications be found, the Operators would revise the application as necessary. Prior to approval, the Operators would survey or clear the proposed construction area for cultural resources, protected wildlife species, paleontological resources, etc. If any of these resources are identified, appropriate mitigation measures would be implemented as specified in the *Decision Record*. The BLM would then grant an authorization with the appropriate *Conditions of Approval* (COA). The Operators would then have 1 year within which to commence the proposed activity.

In addition, the Operators would file all appropriate permit applications with the Wyoming Oil and Gas Conservation Commission (WOGCC). As more is learned about the gas resources in the Bitter Creek Project area, WOGCC specific spacing orders for the area could change and further development could be proposed.

2.2.1.3 Construction Activities

Well Pad. Under the Proposed Action, the Operators propose to utilize a traditional well pad design used in southwest Wyoming. Single well pads would be approximately 200 ft by 300 ft in size (approximately 1.4 acres). All available vegetation and topsoil would be salvaged and stockpiled for future reclamation operations. If less than 6 inches of topsoil are available, topsoil along with an appropriate quantity of other suitable spoil (with BLM approval) would be salvaged so that a minimum of 6 inches of plant growth material would be available for use during revegetation operations. The Operators would sample and analyze all suitable subsoil to ensure that it is suitable for revegetation purposes. Detailed soil sampling and stock piling procedures are presented in Appendix B of this EA. Topsoil and suitable

subsoil piles would be constructed so as to minimize erosion to local drainage channels. Appropriate signs would be placed on all topsoil and suitable subsoil stockpiles.

Well pads would be constructed and leveled using standard cut-and-fill construction techniques. Components of the well pad include a reserve pit and an emergency pit for emergency and development flaring. The reserve pit would be lined with a 12-mil reinforced poly-liner to temporarily contain drilling fluids, cuttings and produced water. The poly-liner would be impermeable (i.e., having a permeability of less than 10^{-7} cm/sec) and chemically compatible with all substances which may be placed in the pit. Venting of any gas produced would be over an unlined emergency pit. All pits would be constructed in accordance with BLM and WOGCC requirements. There are no potential environmental impacts due to the use of a reserve that would require pitless drilling techniques, where cuttings and fluids are stored in containers rather than in a reserve pit. Such techniques would add to the expense of drilling and would provide no environmental benefit.

Road Construction. The Operators would use existing crowned and ditched roads within the Bitter Creek Project area to the extent practicable, and construct new roads only where necessary to gain access to specific drill sites. It is estimated that new roads (including pipelines installed in a common corridor, would disturb a total of 122.5 acres, including 91.5 acres for the LOP. The location of roads and pipelines would be determined in the APD for each individual well. The Operators would construct any required access roads in accordance with standards presented in BLM Manual Section 9113 (1985; 1991).

Drilling Operations. Each well drilled would require the transportation of approximately 10-15 truckloads of drilling-related equipment and materials. This would include the drill rig, drill pipe, drilling fluid products, and related support equipment. Additional vehicle traffic would also be required for the transportation of personnel and expendable supplies such as fuel, drilling fluid additives, water, etc. The specific amount of vehicle traffic would vary, depending on the progress of drilling operations, but would likely not exceed 6-7 vehicle trips/day for each drill site during drilling operations. Drilling depths would vary within the project area; however, wells would typically be 2,000-4,000 ft deep. Drilling each well would require 5,000 bbl (210,000 gallons; 0.64 acre ft) of water. Water used for drilling would be purchased from an existing commercial water well owned by Anadarko. Drilling a well would typically take about 7 days.

Each well would be designed with a 3-inch water discharge line and 4-inch product line that would be placed within common road corridors to the extent practicable. Disposal of produced water would be via existing or new injection wells or through disposal at a commercial water disposal facility located in the

general area. Produced water would be injected into existing wells (see Figure 3.3) permitted and drilled to the Fox Hills Formation, which is located between the Lance and Almond Formations. Injection wells would be permitted by the WOGCC. Prior to issuing a permit, the WOGCC must have evidence and data to support a WOGCC finding that the proposed injection well will not endanger fresh water sources. Disposal wells shall be cased and the casing cemented in such a manner that damage will not be caused to oil, gas, or fresh water sources. The application to dispose of salt water, brackish water, or other water unfit for domestic, livestock, irrigation, or other general uses shall include, among other things, the names, description, and depth of the formation into which water is to be injected, including a mechanical log of the proposed disposal well or wells if one is available; a description of the casing in the disposal well or wells, or the proposed casing program and the proposed method for testing casing before use of the disposal well or wells; a statement specifying the source of water to be injected; the estimated minimum and maximum amount of water to be injected daily; the average and maximum disposal pressure; evidence and data to support a WOGCC finding that the proposed disposal well will not initiate fractures through the overlying strata or confining zone which could enable the injection fluid or formation fluid to enter the fresh water strata; and standard laboratory analysis of the water to be disposed and the water in the formation into which disposal is taking place. The mechanical integrity of a well must be established by the owner or operator of the well no less than once every 5 years. A mechanical integrity test of an injection well is a test designed to determine if there is a significant leak in the casing, tubing, or packer of the well, and if there is significant fluid movement into an underground source of drinking water through vertical channels adjacent to the wellbore. Numerous other standards must be met before an injection well is permitted (WOGCC Regulations Section III; Rule 315). No produced water would be disposed of via surface water drainages.

Exploration and developmental drilling for the Proposed Action is expected to last for approximately 2-4 years.

2.2.1.4 Completion, Testing, and Production

Well completion isolates aquifers with surface and production casing to prevent mixing condensates, oil, gas, and/or water between formations and to isolate production zones. All well casing and cementing operations on these wells would be conducted in accordance with applicable rules and guidance specified in BLM *Onshore Oil and Gas Order No. 2*. The well would be fractured in the productive zone using “fracing” fluids and proppants (usually sand) to hold open the fractures and allow gas to escape up the well bore. Fracing fluids would be recovered in the reserve pit. Pumping units would be used to withdraw condensate, oil, gas, and/or water. Pump units would run on electricity, propane, or portable diesel engine until natural gas begins to flow, after which they would run on the produced gas. All

operations would be conducted in accordance with application Wyoming Department of Environmental Quality/Air Quality Division (WDEQ/AQD) and WOGCC rules and regulations. Completion would require 3,000 bbl (126,000 gallons; 0.39 acre-ft) of water. The water would be purchased from Anadarko's commercial water well.

2.2.1.5 Pipeline Construction and Production

If testing indicates that a well would be commercially viable, flowlines and gathering lines would be installed. Production equipment would be powered either by propane, electricity, diesel engines, or produced gas. Where required, product lines would be connected with pumps/compressors that would be located within the Bitter Creek Project area. No additional compression is proposed. Oil and/or gas produced as a result of the proposed project would be transported by buried gathering lines and pipelines that would be installed adjacent to existing common corridors (e.g., roads, pipelines, and gathering lines) whenever practicable. The Operators predict that approximately 6.6 mi of gathering lines and pipelines would need to be constructed cross country (i.e., not in common corridors with roads). These pipeline ROWs would be a maximum of 50 ft wide and would utilize standard pipeline construction and environmental protection techniques.

Production and maintenance operations would occur on a year-round basis and would last for the LOP (15-20 years). Access roads to productive well sites would be maintained by the Operators to BLM standards, and would allow year-round access. Access roads would be inspected periodically by the Operators and BLM to minimize resource damage and ensure safe operating conditions. Production and maintenance operations would be conducted in accordance with industry standards for safe and efficient operations.

2.2.1.6 Abandonment and Reclamation

Prior to abandonment of a well, the Operator would prepare and submit an abandonment plan to BLM, and if acceptable, the BLM would approve and authorize activities through a *Sundry Notice*. All wells would be plugged in accordance with 43 CFR 3160 or WOGCC rules and regulations (WOGCC 1998). Site abandonment would include the removal and salvage of all aboveground facilities in accordance with the *Sundry Notice*, including production facilities and equipment, tanks, meters, etc. Reserve pit fluids would be allowed to dry by evaporation for approximately 1 year prior to reserve pit closure and drill site

reclamation. BLM regulations allow placement of production water in reserve pits for periods up to 90 days. When the pit is backfilled, cuttings and drilling muds would be covered to a depth of at least 3 ft. If drilling or production fluids remain in the pit after 1 year, alternate methods of drying, removal of the fluids, or other treatment measures would be implemented by the Operators in consultation with the BLM. Necessary permits would be acquired by the Operators if fluids are transported off-site for disposal.

Buried pipelines would be purged of combustible materials and abandoned in-place. Following site abandonment, all well sites and roads would be abandoned and reclaimed unless they are determined to be left in place by the authorizing agency or private landowner.

Reclamation operations would be conducted on all disturbed lands in compliance with the reclamation guidelines presented in Appendix B. Erosion control measures, site restoration, and re-vegetation plans would be prepared by the Operators on a site-specific basis as part of the APD process. The short-term goal of reclamation would be stabilize disturbed areas as rapidly as possible, whereas the long-term goal would be to return the land to conditions approximately equal to those that existed prior to disturbance. Reclamation would occur during two phases. If production facilities are installed, reclamation of all disturbed areas not required for production operations would be initiated. Reclamation of all disturbed surface areas along pipeline ROWs would also be initiated as soon as practicable.

Temporary reclamation would occur on areas that would be re-disturbed prior to final project abandonment (e.g., topsoil and suitable subsoil stockpiles). For well pad cut-and-fill slopes on producing wells, Operators may, after consulting with BLM, elect to conduct either temporary or permanent reclamation. However, Operators would not use temporary reclamation as a means to delay permanent reclamation on areas that would not be re-disturbed.

Temporary reclamation would include regrading and recontouring to slopes to a 3:1 ratio or less. Regraded surfaces would be ripped to a depth of 1 ft, if necessary, to reduce soil compaction. Temporary reclamation areas would then be seeded using the temporary seed mixture presented in Appendix B.

Upon completion of all production operations, reclamation of LOP disturbance would be initiated. Reclamation operations would generally include: (1) complete cleanup of the disturbed areas (drill sites, access roads, etc.); (2) restoration of the disturbed areas to the approximate ground contour that existed prior to construction; (3) ripping of compacted areas; (4) replacement of topsoil over all disturbed areas;

(5) seeding of reclaimed areas with the approved seed mixture; and (6) fertilizing, if considered necessary by the BLM Authorized Officer (AO). Specific reclamation guidelines for the Bitter Creek Project area are included in Appendix B. Reclamation measures would be included in the APD or ROW grant for each disturbed area in consultation with the BLM, and would be specific to each site and the conditions at that site. Temporary and permanent reclamation would occur in the first seasonal opportunity (i.e., after October 15 to when the soil is frozen, and before May 15). Spring seeding would be conducted only if fall seeding is not feasible.

The Operators and BBCC have an agreement in place to coordinate activities when the Operators drill or construct on reclaimed lands within the BBCC Mine Permit Boundary. The WDEQ/LQD views disturbances caused by oil and gas development to be non-mine related, and does not hold mine operators responsible for impacts caused by oil and gas operators. Therefore, the Operators would be responsible for reclaiming any disturbance they cause on lands within the BBCC Mine Permit Boundary.

2.2.1.7 Water Use

A total of 39 acre-ft of water would be required to drill the 61 proposed wells, and an additional 24 acre-ft of water would be required to complete the 61 proposed wells--a total of 85 acre-ft. These wells would be drilled over a 2- to 4-year period, resulting in an average annual water use of 42.5 to 21.25 acre-ft. An additional 1 acre-ft of water would be used annually for dust control. All water would be purchased from the Anadarko's Monel Water Supply Well #1 in Section 1, T18N, R99W. This well provides water from the Lance Formation at 2,126-2603 ft and from the Fox Hills at 3,142-3,571 ft. This water is not connected to the surface and would not constitute a surface depletion from the Upper Colorado River Basin (personal communication with Jeff Wright, Wyoming Professional Geologist #1486, Denver, Colorado).

2.2.1.8 Applicant-committed Environmental Protection Measures

The Operators propose to implement the following mitigation measures and procedures to avoid/reduce environmental impacts unless otherwise specified by the landowner. An exception to a mitigation measure and/or design feature may be approved on a case-by-case basis when deemed appropriate by the AO. The exception would only be approved after a thorough, site-specific analysis determined that the resource or land use for which the measure would be applied is not present or would not be significantly impacted. Best Management Practices (BMPs), as defined in this EA, include these applicant-committed

environmental protection measures, the reclamation plan (Appendix B), and all other practices described in Chapter 2.0.

Air Quality

- The Operators would not burn garbage, trash, or refuse at any location.
- The Operators would control fugitive dust. The BLM would approve the procedure (e.g., application of water and magnesium chloride) for dust abatement at facility construction sites as well as locations for use and application rates. If required for the Proposed Action, the Operators would obtain water from non-surface depleting sources permitted by the Wyoming State Engineers Office. Speed limits would be observed on roads to reduce the production of fugitive dust.

Cultural Resources

- The Operators would adhere to the determinations arrived at through the National Historic Preservation Act, Section 106 consultation process (see 36 CFR 800). The Operators would fund all appropriate cultural resources inventories and investigations for all lands considered within the scope of a federal undertaking. In those instances where previous adequate inventories exist, additional Class III (intensive) inventories may not be required by the BLM. All investigations completed in support of undertakings discussed in this EA would result in the submittal of reports meeting the current professional standards required by the BLM. The Operators would forego any ground disturbance until such a time as all the terms of the Section 106 consultation process have been completed and the BLM provides a written *Notice to Proceed*.
 - If the BLM and the Wyoming State Historic Preservation Office (SHPO) make a consensus determination that a cultural resource is eligible for consideration for inclusion in the National Register of Historic Places (NRHP), or if a listed property is identified, the Operators would use avoidance as the preferred method for reducing effects to said resource.
 - If the BLM and the Wyoming State Historic Preservation Office (SHPO) make a consensus determination that a cultural resource is eligible for consideration for inclusion in the National Register of Historic Places (NRHP), or if a listed property is identified, and the property cannot be avoided, the Operators would fund all measures deemed necessary to mitigate the effects to the historic property as determined by the BLM in
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consultation with the Wyoming SHPO and other consulting parties, as appropriate. The Operators would be responsible for funding any mitigation plans as well as the implementation of those plans once they are accepted by the BLM in consultation with the Wyoming SHPO and other consulting parties, as appropriate.

- In the event that any previously unknown or unanticipated cultural remains are encountered during construction, the Operators would cease all operations in the immediate area of the discovery and protect said area from further impacts. The BLM Authorized Officer (AO) would be notified immediately. The Operators would fund all investigations and measures necessary, as determined by the BLM in consultation with the Wyoming SHPO and other consulting parties, to assess, protect, and mitigate any discovered cultural items as appropriate. This may include funding and implementation of mitigation plans once they are accepted by the BLM in consultation with the Wyoming SHPO and other consulting parties, as appropriate. Development-related activities within the area of any discovery, including any protective buffer, would not resume until a written *Notice to Proceed* is issued by the AO.
- The Overland Trail would not be used as an access or for any commercial purposes.
- The Operators would follow BLM's best management practices for visual resource management.

Health and Safety

- The Operators would provide portable self-contained toilets for human waste disposal. All sewage and trash generated on-site would be routinely transported off-site to a WDEQ-approved waste disposal facility.
 - To minimize exposure to hazardous situations, the Operators would implement measures that would inform the public that they may be entering a hazardous work area (e.g., place warning signs alerting the public of heavy truck traffic).
 - During construction, and upon commencement of production operations, the Operators would maintain a chemical and/or hazardous substance inventory for all such items that may be stored or used at the site. The Operators would institute a Hazard Communication Program for its employees and would require subcontractor to implement appropriate programs in accordance with Occupational Safety and Health Administration (OSHA) regulations (refer to 29 CFR 1910.1200). These programs are designed to educate and protect the employees and subcontractors with respect to any chemicals or hazardous
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substances that may be present in the work place. It would be required that as every chemical or hazardous material is brought on location, a Material Safety Data Sheet (MSDS) would accompany that material and would become part of the file kept at the field office as required by 29 CFR 1910.1200. All employees would receive the proper training in storage, handling, and disposal of hazardous substances.

- The Operators would limit or eliminate the need for Extremely Hazardous substances as defined by RCRA. The Operators would also inventory and report chemical and hazardous materials in accordance with the *Superfund Amendments and Reauthorization Act (SARA) Title III* (40 CFR 335). The Operator would prepare and submit the appropriate forms to EPA if the threshold planning quantities of particular materials are produced or stored within the Bitter Creek Project area. The appropriate forms would also be submitted at the required times to the state and county emergency management coordinators and the local fire departments.
- The Operators would avoid the creation of hazardous wastes as defined by RCRA wherever possible. The Operators would ensure that any hazardous waste, as defined by the *Resource Conservation and Recovery Act (RCRA)*, that might be generated by the Operators would be transported and/or disposed of in accordance with all applicable federal, state, and local regulations.
- The Operators would put crews in appropriate safety clothing during big game seasons, and would request that their crews report any poaching they might observe.

Noise

- The Operators would ensure that mufflers on motorized equipment are maintained according to manufacturers' specifications.

Paleontology

- If directed by BLM, an on-the-ground survey of areas to be impacted would be performed by a qualified paleontologist holding a BLM Paleontological Resources Use Permit prior to approval of any surface disturbing activities. The need for an on-the-ground survey could be waived by the BLM during the APD process if it is determined that the proposed drilling site would not impact geologic outcrop areas, the area has
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previously been surveyed for paleontological resources, or the area has been previously disturbed. If a survey is conducted and significant fossils are discovered, BLM may require the proponent to alter the construction plan to avoid disturbing the locality or mitigate the site by either collecting a sample of the fossil material or fully excavating of the locality. The BLM may require, based on the paleontologist's recommendation, that construction activities be monitored for the presence of previously undocumented scientifically important fossils during surface disturbing activities.

- If paleontological resources are discovered during construction or drilling operations, the find would be reported immediately to the BLM AO and construction operations would be suspended within 250 ft of said find. An evaluation of the paleontological discovery would be made by a BLM-approved professional paleontologist within 5 working days, weather permitting, to determine the appropriate action(s) to prevent the potential loss of any significant paleontological value. Operations within 250 ft of such discovery would not be resumed until written authorization to proceed is issued by the BLM AO. The Operators would bear the cost of any required paleontological appraisals, surface collection of fossils, or salvage of any large conspicuous fossils or important scientific interest discovered during the operations.
- The Operators would inform all field personnel not to search for, scavenge, or remove any paleontological resources found in the Bitter Creek Project area.

Preconstruction Planning and Design Measures

- Prior to the initiation of construction, the Operators would stake the location of all proposed facilities (e.g., well sites, new access road, access road reconstruction, and pipeline alignment). The Operators and the BLM would then conduct an on-site interdisciplinary team inspection of each proposed well site so that site-specific recommendations and mitigation measures could be identified and developed.
 - The Operators would notify BBCC of proposed well pad and road sites located within the BBCC mine permit boundary and, if requested, the Operators would conduct an on-site inspection with representatives of BBCC prior to construction.
 - New road construction and maintenance would be in accordance with BLM Manual 9113 standards (BLM 1985; BLM 1991) unless private landowners specify otherwise.
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- Prior to initiation of construction on federal leases, the Operators would prepare and submit an APD to the BLM for review and approval. Prior to construction, the Operators or their contractors would submit a *Sundry Notice* and/or ROW application for each pipeline and access road located on federal leases. The APD would include a *Surface Use Plan* that would show the layout of the well pad over the existing topography, dimensions of the pad, volumes and cross sections of cut and fill, location and dimensions of reserve pit, and access road egress and ingress. The APD, *Sundry Notice*, and/or ROW application plan would also itemize project administration, time frames, and responsible parties, include a reclamation plan developed by the Operators, and be subject to site-specific NEA analysis.
 - The Operators would slope-stake construction activities when required by the BLM (e.g., steep and/or unstable slopes) and receive approval from the BLM prior to the initiation of construction.

Range Resources and Other Land Uses.

- The Operators would coordinate with the affected livestock operators to ensure that livestock control structures remain functional during drilling and production operations.
 - The Operators would use special care to minimize disturbance during the planning and construction of well pads and associated facilities located on sites that have been previously reclaimed and revegetated by BBCC.
 - To differentiate areas of responsibilities within the BBCC mine permit boundary, the Operators would install a fence around disturbed areas near each well pad that have been reclaimed and revegetated previously by BBCC. The Operators would be responsible for final reclamation and revegetation of newly disturbed area within the fenced property. However, no fences would be built that would interfere with big game movements. Upon the completion of construction operations, the Operators would provide BBCC with “as-built” maps of areas that were reclaimed by BBCC but have been re-disturbed as a result of the Proposed Action. These maps would show all site-specific surface disturbance created by the Operators, including the location of well pads, stockpiles, roads, pipelines, etc.
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Recreation

- The Operators would minimize conflicts between project-related vehicles and recreation traffic on area roads by posting appropriate warning signs, implementing operator safety training, and requiring project-related vehicles to adhere to the preferred design speed of 30 mph.

Socioeconomics

- The Operators would implement hiring policies that would encourage the use of local or regional workers that would not have to relocate to the general area.
- The Operators would coordinate project activities with ranching operations to minimize conflicts involving livestock movement or other ranch operations. This would include scheduling of project-related activities to minimize potential disturbance of large-scale livestock movements. The Operators would establish effective and frequent communication with affected ranchers to monitor and correct problems and coordinate scheduling.

Soils

- The Operators would reduce the area of disturbance to the absolute minimum necessary for construction and production operations while providing for safe operating conditions.
 - The Operators would also prohibit off-road vehicle traffic.
 - The Operators would not conduct any pre-construction, construction, or reclamation activities when soils are too wet to adequately support construction equipment. If construction equipment creates ruts greater than 4 inches deep, support would be deemed inadequate and construction activities would be discontinued until soil conditions improve or appropriate remedial action is taken to ensure operations could continue without deep rutting.
 - Whenever practicable, the Operators would bury all pipelines in common corridors to avoid creating additional areas of disturbance.
 - The Operators would avoid using frozen or saturated soils as construction material.
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- The Operators would minimize construction activities in areas of steep slopes, and apply special slope stabilizing structures if construction cannot be avoided in these areas.
 - The Operators would minimize cutslopes in order to enhance revegetation success.
 - The Operators would salvage and stockpile all available topsoil. The volume of topsoil or other suitable plant growth material to be salvaged, proposed topsoil replacement depth, and topsoil storage areas would be specified in the APD. If less than 6 inches of topsoil is available, an appropriate quantity of suitable subsoil would be salvaged (with BLM approval) so that a minimum of 6 inches of plant growth material (topsoil and suitable subsoil) would be available for use during revegetation operations. The Operators would sample and analyze all suitable subsoil to ensure that it is suitable for revegetation purposes. Only subsoil that tests suitable (see Table B-3.1 in Appendix B) would be salvaged and used for revegetation purposes. No unsuitable materials would be used for revegetation purposes. Any suitable subsoil that might be used for revegetation would be stockpiled separately and would not be mixed with topsoil. Signs with the words “topsoil” or “subsoil” would be placed on each appropriate topsoil and subsoil pile.
 - If topsoil or suitable subsoil is to be stockpiled for more than 2 years, the Operators would seed all topsoil and/or subsoil stockpiles with the appropriate seed mixture presented in Appendix B. Stockpiles would have a maximum slope of 5:1 or less on the long axis and a maximum of 1:1 on the side slopes. If a topsoil stockpile is located on or adjacent to ground that slopes 3:1 or more, runoff would be diverted around the stockpile via interceptor ditches. Interceptor ditches would be V-shaped--1-ft deep and 3-ft wide, with gently sloping sides--and would empty onto native, undisturbed vegetation. All stockpiles would be located so as not to affect existing drainage channels.
 - The Operators would minimize disturbance to vegetated cuts and fills on existing roads.
 - The Operators would identify contiguous biological soil crust areas during the APD process and would avoid disturbance to these areas where practicable.
 - The Operators would install culverts for all ephemeral or intermittent drainage crossings. Drainage crossing structures would be designed to carry the 25- to 50-year discharge event, or as otherwise directed by the BLM.
 - The Operators would adjust the layout of access roads to avoid steep slopes adjacent to ephemeral or intermittent drainage channels. The Operators would maintain a 100-ft wide buffer strip of natural vegetation between all construction areas and the inner gorge of ephemeral channels and a 500-ft buffer between construction and riparian areas.
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- The Operators would include adequate drainage control devices (e.g., road berms and drainage ditches, diversion ditches, cross drains, culverts, out-sloping, and energy dissipators) in all road designs. These devices would be located at sufficient intervals and intensities to adequately control and direct surface runoff above, below, and within the road environment to avoid erosive concentrated flows. In conjunction with surface runoff or drainage control measures, The Operators would use erosion control devices and measures such as temporary barriers, ditch blocks, erosion stops, mattes, mulches, and vegetative covers, and would conduct reclamation and revegetation operations on short-term and long-term disturbance as soon as possible to protect soil resources.
- Upon completion of construction activities, the Operators would restore topography to near pre-existing contours at well pads, along access roads and pipelines, and at other facilities sites. The Operators would replace all previously salvaged topsoil or suitable plant growth material and apply fertilizer (as required), seed, and mulch to all disturbed areas in accordance with Appendix B.

Transportation Systems

- To the extent practicable, the Operators would not use BBCC's haulroads or access roads to access any of their lease areas. However, if no other suitable access route is available, the Operators would notify BBCC and would only use those road segments agreed upon by the Operators and BBCC.
- If the Operators use BBCC's haulroads or access roads, the Operators would maintain such roads, ditches, and culverts in good working condition and would share the maintenance costs of said roads with BBCC.

Vegetation (including nonnative, invasive, and noxious weeds) and Wetlands

- The Operators would conduct all reclamation and revegetation operations in accordance with Appendix B.
 - The Operator would utilize only certified weed-free seed mixes and mulches for all reclamation operations.
 - The Operators would use one or more of the following weed control techniques: (1) cultural techniques such as plowing and reseeding; (2) physical techniques including
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hand-pulling/hoeing and mowing with weed cutting machines or tractor mower; and (3) chemical techniques including the use of herbicides or pesticides. The Operators would obtain BLM approval prior to implementing chemical treatments, and a licensed professional would complete all applications. The Operators would monitor the success of weed control as described in Section B-4.0 of Appendix B.

- The Operators would evaluate all project facilities for the potential occurrence of waters of the U.S., special aquatic sites, and jurisdictional wetlands. All project-related facilities would be located outside of these sensitive areas. If complete avoidance is not practicable, the Operators would minimize potential impacts to wetlands using project modifications and minor relocations. The Operators would coordinate all activities that involve dredge or fill of wetlands with the U.S. Army Corp of Engineers (COE).
- As directed by the BLM, the Operators would conduct site-specific surveys for plant species of concern and their habitats prior to initiation of any surface disturbance. If plant species of concern or their habitats are found, impacts to these plant species would be minimized by avoiding such habitat to the extent practicable. Minor adjustments to the location of project-related facilities would be made to avoid plant species of concern and/or their habitat. Copies of completed surveys would be provided to the BLM.

Visual Resources

- The Operators would utilize existing topography to screen roads, pipeline corridors, drilling rigs, well heads, and production facilities from view.
 - The Operators would paint all facilities with Carlsbad Canyon-colored paint (or any other color recommended by BLM to provide better camouflage) that would blend with the adjacent surrounding undisturbed terrain, except for facilities that require safety coloration in accordance with OSHA requirements.
 - The Operators would conduct reclamation operation on all disturbed areas as soon as practicable.
 - The Operators would follow BLM's best management practices for visual resource management.
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Water Resources

- The Operators would limit construction of drainage crossings to no-flow or low-flow periods.
 - The Operators would minimize the areas of disturbance within perennial, ephemeral and intermittent drainage channel environments.
 - The Operators would prohibit construction of well sites, access roads, and pipelines within 500 ft of surface water and/or riparian areas except where road and pipeline crossings are granted by the BLM and based on an environmental analysis and site-specific mitigation plans.
 - Where the Operators must cross drainage channels, the crossings would be designed to minimize changes in channel geometry and subsequent changes in flow hydraulics.
 - The Operators would design and construct all necessary interception ditches, sediment traps/silt fences, water bars, and silt fences.
 - The Operators would design and construct all channel crossings so that the buried pipelines would be a minimum of 4-ft below the channel bottom.
 - The Operators would regrade disturbed channel beds to their original geometric configurations with the same or similar channel materials.
 - To protect accessible high quality water aquifers, the Operators would case and cement all wells during drilling in accordance with BLM *Onshore Oil and Gas Order No. 2*. High quality water aquifers are defined as aquifers with known water quality of 10,000 ppm TDS or less. The Operators would utilize well casing and welding techniques of sufficient integrity to contain all fluids under high pressure during drilling and well completion. The Operators would ensure that all wells would adhere to the appropriate BLM cementing policy as specified in the APD.
 - The Operators would ensure that reserve pits would be constructed so that a minimum of ½ of the total depth is below the original ground surface at the lowest point within the pit. To prevent seepage of fluids, drilling mud gel or poly-liners would be utilized to line reserve pits in areas where subsurface material would not contain fluids. The poly-liners would be of sufficient strength and thickness to withstand normal installation and use. The poly-liner would be 12-mil reinforced and would be impermeable (i.e., having a permeability of less than 10 to the minus 7 cm/sec) and chemically compatible with all substances that may be put in the pit.
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- The Operators would maintain 2 ft of freeboard on all reserve pits to ensure the reserve pits are not in danger of overflowing. If leakage is found outside the pit, the Operators would shut down drilling operations until the problem is corrected.
 - The Operators would ensure that water used for hydrostatic test water for pipelines, and all water used for construction activities, is provided from sources permitted by the Wyoming State Engineers Office.
 - Produced water would be disposed into wells permitted and drilled into the Fox Hills Formation, which is located between the Lance and Almond Formations. No produced water would be released or disposed into surface water drainages or onto the surface.
 - The Operators would submit a *Notice of Intent* (NOI) to the Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD) to request coverage under the large construction general permit (WYR10-0000). This NOI is for construction projects that disturb 5 acres or more only. The Operators would develop a Storm Water Pollution Prevention Plan (SWPPP) in accordance with WDEQ/WQD regulations for all project activities to ensure that storm water runoff would not cause surface water pollution. The SWPPP would include measures to prevent and limit storm water pollution and provisions for periodic inspection of storm water pollution prevention devices and practices. The Operators would install and maintain all appropriate runoff and erosion control measures as described in the SWPPP, such as water bars, berms, and interceptor ditches. Copies of the SWPPP and inspection reports would be filed in the Operators appropriate offices.
 - The Operators would exercise stringent precautions to prevent pipeline breaks and other potential accidental discharges of petroleum and/or hazardous chemicals into stream channels. If liquid petroleum products storage capacity exceeds criteria contained in 40 CFR 112, the Operators would develop and implement a Spill Prevention Control and Countermeasures (SPCC) plan in accordance with 40 CFR 112.
 - The Operators would not construct any facilities within 600 ft of any seep or spring.
 - The Operators would avoid building in floodplains or, if they do build in or disturb floodplains or riparian areas, would obtain all appropriate approval and permits from the appropriate agencies (BLM, WDEQ, COE). This would include construction of pipeline crossings.
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- The Operators would maintain a 100-ft wide buffer strip of natural vegetation between all construction areas and the inner gorge of ephemeral channels and a 500-ft buffer between construction and riparian areas.

Wildlife (including special status species)

- The Operators would prohibit all unnecessary off-site activities by project personnel. The Operators would inform all project personnel of applicable wildlife laws and penalties associated with unlawful taking or harassment of wildlife.
 - The Operators would not conduct any project-related activities within crucial winter/yearlong range for pronghorn antelope from November 15 to April 30. However, the Operator may request an exception from the seasonal restriction stipulation from the BLM, and the BLM would evaluate the request on a case-by-case basis and would inform the Operator if the exception would be granted.
 - To facilitate big game movement and minimize the potential for injuries, the Operators would not fence any access roads.
 - The Operators would conduct raptor nest surveys (including for burrowing owls) during the raptor nesting period (February 1 through July 31) within 1.0 mi of any proposed drill site prior to the initiation of construction or drilling activities. If an active nest is identified, the Operators would restrict construction and drilling activities for active raptor nests located within 0.5 to 1.0 mi (1.0 mi for ferruginous hawk and bald eagle nests, 0.5 mi for other raptors) of a proposed well, road, or pipeline site. If an active nests is located, the BLM would be notified immediately and if necessary, a raptor mitigation plan would be developed and implemented with the concurrence of the BLM, USFWS, and the WGF. The raptor mitigation plan would identify appropriate mitigation techniques to be implemented as described in the *Raptor Mitigation Handbook* (Wyoming Cooperative Fishery and Wildlife Research Unit 1994) and the *Raptor Management Techniques Manual* (National Wildlife Federal 1987).
 - The Operators would minimize disturbance to all raptor nesting habitats (e.g., rock outcrops, bluffs, cliffs, etc).
 - The Operators would ensure that all project-related powerline structures would be constructed in accordance with *Suggested Practices for Raptor Protection on Powerlines: the State of the Art in 1994* (Avian Powerline Interaction Committee 1996).
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- If construction-related activities within potential mountain plover nesting habitat would be scheduled between March 15 through August 15, surveys for the presence of nesting mountain plovers would be conducted in accordance with current survey protocol. Survey results would be submitted the BLM for review and approval prior to the initiation of construction-related activities. Appropriate mitigation measures (i.e., seasonal avoidance) as directed by the BLM would be implemented if nesting mountain plovers are identified.
 - In order to protect flannelmouth sucker spawning, pipeline crossings of Bitter Creek would occur with proper mitigation or be bored , and no new road crossings would be built. Impacts to Bitter Creek would be avoided during the spawning season for flannelmouth sucker (May to July).

2.3 NO ACTION ALTERNATIVE

The No Action Alternative is required under the President’s Council on Environmental Quality (CEQ), 40 CFR 1502.14(d), and applicable BLM implementing regulations. The No Action Alternative provides a benchmark, enabling decision-makers to compare the magnitude of environmental effects of the action alternatives. Under the No Action Alternative, the BLM would reject the Operator’s proposal to explore and develop natural gas in the Bitter Creek area as described in the Proposed Action. Rejection of the Operator’s proposal would not be a rejection of all oil and gas development activities in the area. If the proposal is rejected the Operators would be welcome to submit another proposal for BLM’s consideration and NEPA analysis.

The No Action Alternative means that the Proposed Action would not be implemented and that existing land uses would continue within the Bitter Creek Project area.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

The Operators have evaluated the economic and technical and feasibility of drilling two or more wells from one pad using directional/horizontal drilling techniques, and determined that such techniques are not feasible. Economically, the cost of drilling two wells from one pad (one vertical well and one directional well) would increase the cost of the directional well by 50-75% over the cost of a vertical well from another well pad. This additional cost applies only to drilling the well. Additional costs would be

incurred in completing the directional well as compared to completing a vertical well. Costs and technical problems would be even higher if the pad would be located between the two downhole target locations and two directional wells were drilled from the same pad--one to each downhole target. In all cases, directional drilling would be complicated due to the shallow depths of the natural gas resources, the lenticular characteristics of the reservoirs, and poor downhole stability associated with horizontal drilling at shallow depths. Therefore, this alternative was eliminated from further analysis in this EA.

CHAPTER 3.0
THE AFFECTED ENVIRONMENT

3.0 THE AFFECTED ENVIRONMENT

3.1 LOCATION, SETTING, AND HISTORICAL USE

The Bitter Creek Project Area is located in central Sweetwater County on the eastern flank of the Rock Springs uplift within the Green River Basin physiographic province (Knight 1994). Eastward dipping sandstone beds of Cretaceous and Tertiary age form hogbacks located immediately west of the Bitter Creek Project area along Bitter Creek. Topography is relatively flat to rolling and dissected by ephemeral drainage channels; however, there are some areas of steep and rugged escarpments/hogbacks in the northern portion (BLM 1978).

Bitter Creek and its tributaries drain the Bitter Creek Project Area. Bitter Creek is a perennial stream that flow through the southern portion of the project area. Elevations range from a low of approximately 6,600 ft along Bitter Creek to approximately 7,000 ft in the northern portion of the property.

Climate is typical of high deserts of the intermountain west (Knight 1994). Record high and low temperatures at the Bitter Creek weather station (approximately 3 mi east of the Bitter Creek Project area) are 103⁰F and -46⁰F, respectively, with an average of approximately 5 days per year above 90⁰F. Summer temperatures range widely, typically with warm sunny days and cool nights. During winter nights, temperatures fall to 0⁰F or below an average of about 30 days per year, and there are approximately 100 frost-free days per year. The area receives approximately 6-8 inches of precipitation per year, and the prevailing winds are from the southwest with an average annual wind speed of approximately 12 mph (Martner 1986).

The Bitter Creek Project area has historically been used for surface coal mining, natural gas development, a railroad transportation corridor, livestock grazing, wildlife habitat, and recreational hunting, a wagon/stage/pack train transportation corridor, and Native American ceremonial/cultural practices. However, mineral development (e.g., surface coal mining and oil and gas exploration/production), Union Pacific Railroad Company's main line (transportation corridor), and livestock grazing have historically accounted for the most common land use within the Bitter Creek Project area. Approximately 55% of the Bitter Creek Project area overlaps the Black Butte Coal Company mine permit area (see Figure 1.3). All or portions of five active or reclaimed surface mine pits and associated facilities, and portions of two future mine pits are located within the Bitter Creek Project area. Since 1960, approximately 64 gas wells

have been drilled in the Bitter Creek Project area (38 on federal surface and 26 on private surface), and at the end of 2003 there were 24 producing gas wells, two water injection wells, nine wells in other forms of completion, and 29 wells that have been permanently abandoned (WOGCC 2004). A majority of the wells drilled in the Bitter Creek Project area since 2000 have been drilled by the Operators on lands with private surface and mineral ownership. An estimated 3,976 acres (22%) of the Bitter Creek Project area has been disturbed by roads, railroads, surface coal mining, and oil and gas. Of that total, approximately 1,294 acres (7%) of the Bitter Creek Project area have been reclaimed and are in some state of revegetation.

The Bitter Creek Project area provides limited winter grazing for cattle and sheep. Stocking rates are low primarily due to sparse vegetation (Soil Conservation Service [SCS] 1988).

3.2 CRITICAL ELEMENTS

Critical elements of the human environment as defined by the BLM (1988 and 1999c), their status in the proposed project area, and their potential to be affected by the Proposed Action or No Action alternative are presented in Table 3.1. BLM resource specialists have determined that six of the 14 critical elements of the human environment are not present in the area or would not be affected by the Proposed Action, and are not discussed further. Eight critical elements (air quality; cultural resources; Native American religious concerns; threatened, endangered, proposed, and candidate (TEPC) species; invasive species; wastes [hazardous and solid]; water quality; and wetlands/riparian areas) are present in the proposed project area, may be affected by the Proposed Action, and are discussed in detail in this EA.

Based on comments received from the public and existing information concerning the project area, BLM resource specialists have determined that this EA would also analyze potential impacts to geology and geologic hazards, minerals (solid and fluid), health and safety (transportation), land resources and use, rangeland and livestock grazing, recreation, socioeconomics, soil resources, special status flora and fauna, vegetation, visual resources, wild horses, and wildlife.

Based on the discussion presented above, and in accordance with BLM NEPA regulations and policies, the following resource area/topics will be addressed in this EA: air quality; cultural resources; geology and geologic hazards; health and safety (transportation); land resources and use; minerals (solid and

Table 3.1 Critical Elements of the Human Environment.¹

Element	Status	Analyzed in Detail in This EA
Air quality	Potentially affected	Yes
Areas of critical environmental concern	Not present	No
Cultural resources	Potentially affected	Yes
Environmental justice related issues	Not present	No
Farmlands (prime or unique)	Not present	No
Floodplains	Not present	No
Invasive, nonnative species	Potentially affected	Yes
Native American religious concerns	Potentially affected	Yes
Threatened and endangered species	Potentially affected	Yes
Wastes (hazardous and solid)	Potentially affected	Yes
Water quality	Potentially affected	Yes
Wetlands/riparian areas	Potentially affected	Yes
Wild and scenic rivers	Not present	No
Wilderness (wilderness study areas and wilderness areas)	Not present	No

¹ Adapted from the BLM NEPA Handbook H-1790-1 (BLM 1988; 1999c).

fluid); Native American religious concerns; paleontology; rangeland and livestock grazing; recreation; socioeconomic; soil resources; TEPC and BLM-sensitive species; vegetation (including invasive species); wastes (hazardous and solid); water resources; wetlands/riparian areas; wild horses; and wildlife.

The primary purpose of Chapter 3 of this EA is to provide a description of the existing resources in the Bitter Creek Project area that could be affected by the Proposed Action. In addition, the status of affected resources in the cumulative impact analysis area for each resource is described. The boundaries of each CIAA were determined based on the specific resource and the potential for impacts beyond the Bitter Creek Project area. Each CIAA is described in Chapter 3 under the specific resource being evaluated, and CIAAs vary in size from approximately 67,000 acres to 2,300,000 acres.

Existing disturbance within the vicinity of the Bitter Creek Project area includes major industrial facilities including the Black Butte surface coal mine, Jim Bridger Power Plant, Jim Bridger surface coal mine, and Leucite Hills surface coal mine as well as minor industrial facilities such as communication sites, electric

substations, ranches, small quarry sites. The area also includes various roads (I-80, state highways, county roads, unpaved roads, and two-track roads), Union Pacific Rail Road Company tracks, various oil and gas wells with associated, roads, and pipeline facilities, and communities (Superior, Point of Rocks, Rock Springs, Green River). Existing disturbance within each CIAA has been quantified and is discussed later in Chapter 3.

3.3 PHYSICAL RESOURCES

3.3.1 Air Quality Resources

The WDEQ/AQD has been authorized by the Environmental Protection Agency (EPA) to enforce national ambient air quality standards set forth in the *Clean Air Act*, as amended (42 USC §7401 et seq.) through Article 2 of the *Wyoming Environmental Quality Act* (W.S. 35-11-201 et seq.) and the Wyoming State Implementation Plan. The Wyoming and National Ambient Air Quality Standards (WAAQS and NAAQS) set upper limits for specific air pollutant concentrations at all locations where the public has access, expressed in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). The WAAQS and NAAQS are presented in Table 3.2. Wyoming Air Quality Standards and Regulations (WAQS&R) define ambient air as "that portion of the atmosphere, external to buildings, to which the general public has access" (WDEQ/LQD 2000b). Lands within an approved mine permit boundary are not usually accessible to the general public and are not subject to the state air quality standards. Rather, they are governed by federal Mine Safety and Health Administration respirable dust standards and regulations designed to protect worker safety (30 CFR 70, 72, 74, and 75 et seq.).

Ambient air concentration data collected at monitoring sites in the region provide an indication of existing air quality. Criteria pollutant monitoring has been performed in the region for particulate matter less than 10 microns in diameter (PM_{10}) at sites both displaced from and predominantly upwind of the Bitter Creek Project area. Both displaced and local upwind sites are considered "background" monitoring sites in this analysis, although local upwind monitoring sites may be impacted by local industrial operations under certain meteorological conditions. By considering local upwind sites as background sites, a conservative range of PM_{10} concentrations is reported to reflect existing air quality in the region. These conservative monitoring results indicate that PM_{10} concentrations in the study area are below applicable WAAQS and NAAQS.

Table 3.2 Selected National and Wyoming Air Quality Standards.

Air Pollutant	Averaging Time Period	Local and Regional Background Concentration ($\mu\text{g}/\text{m}^3$) ¹	NAAQS ($\mu\text{g}/\text{m}^3$) ²	WAAQS ($\mu\text{g}/\text{m}^3$) ³	Incremental Increase Above Legal Baseline	
					PSD Class I	PSD Class II
Particulate matter <10 microns in diameter (PM ₁₀)	24-hour	18-35	150	150	8	30
	AAM ⁴	8-10	50	50	4	17
Particulate matter <2.5 microns in diameter (PM _{2.5})	24-hour	nd ⁵	65	65	ns ⁶	ns
	AAM	nd	15	15	ns	ns
Ozone	1-hour	144	235	235	ns	ns
	8-hour	139	157	na	ns	ns
Nitrogen dioxide (NO ₂)	AAM	4	100	100	2.5	25
Sulfur dioxide (SO ₂)	3-hour	132	1,300 ⁷	1,300	25	512
	24-hour	43	365	260	5	91
	AAM	9	80	60	2	20
Carbon monoxide (CO)	1-hour	3,481	40,000	40,000	ns	ns
	8-hour	1,489	10,000	10,000	ns	ns

¹ Source of data: PM₁₀ - data collected at Bridger Power Plant, Site 901 from Jan. 1999 to Dec. 2000; Black Butte Mine, Site 863, from Jan. 1999 to Dec. 2000 (WDEQ/AQD 2000a); and Seedskaadee National Wildlife Refuge, 1989-2001 (personal communication, April 4, 2002, with Ken Rairigh and Bob Schick, WDEQ/AQD, Cheyenne, Wyoming). Ozone - data collected near Pinedale, Wyoming, from 1997 to 1999 (EPA 2002). NO_x - Green River Visibility Study, period of record 1996-1999 (personal communication, April 4, 2002, with Ken Rairigh, WDEQ/AQD, Cheyenne, Wyoming). SO₂ - data collected at LaBarge Study Area, Northwest Pipeline Craven Creek Site (personal communication, April 4, 2002, with Ken Rairigh, WDEQ/AQD, Cheyenne, Wyoming). CO (BLM 1983).

² NAAQS = National Ambient Air Quality Standards (adapted from 40 CFR 50.5-50.12). Primary standard unless otherwise noted. National Primary Standards establish the level of air quality necessary to protect public health from any known or anticipated effects of a pollutant, allowing a margin of safety to protect sensitive members of the population.

³ WAAQS = Wyoming Ambient Air Quality Standard (adapted from WDEQ/AQD [2000a]).

⁴ AAM = annual arithmetic mean.

⁵ nd = no data.

⁶ ns = no standard.

⁷ Secondary standard. National Secondary Standards establish the level of air quality to protect the public welfare by preventing injury to agricultural crops and livestock deterioration of materials and property and adverse impacts to the environment.

Ambient standards for particulate matter less than 2.5 microns in diameter (PM_{2.5}) have been defined in the WAQS&R; however, these standards would not be enforced at the state level until EPA has completed an ongoing review and has determined to retain and enforce these regulations. Regional monitoring-based background values for other criteria pollutants (carbon monoxide [CO], nitrogen dioxide [NO₂], ozone, and sulfur dioxide [SO₂]) have been collected at monitoring sites in Sweetwater County, Wyoming, and in northwest Colorado and are well below applicable WAAQS and NAAQS (see Table 3.2).

Site-specific particulate monitors located within the western portion of the Bitter Creek Project area (operated by Black Butte Coal Company) indicate compliance with applicable WAAQS and NAAQS. Based on calculated and measured emissions, the dominant air pollutants emitted in the CIAA are particulates (i.e., PM₁₀), SO₂, and NO_x. The largest contributors to PM₁₀ emissions in the CIAA are the three industrial operations in the area--the Black Butte Coal Mine, Jim Bridger Coal Mine and Leucite Hills Coal Mine, and the Jim Bridger Power Plant. Local traffic on unpaved roads also contributes to total PM₁₀ concentrations, as does wind erosion of exposed surfaces. However, it should be noted that some measured exceedances in the 24-hour concentrations of PM₁₀ did occur from 2000 through 2003 in the vicinity of Black Butte. Ambient concentrations of gaseous criteria pollutants (CO, NO₂, and SO₂) occur primarily from mobile sources (vehicles) and from the Jim Bridger Power Plant.

Table 3.2 presents the maximum increase of PM₁₀ allowed by the federal *Clean Air Act* under the Prevention of Significant Deterioration (PSD) regulations and adopted in Chapter 6 of the WAQS&R. These regulations are designed to prevent significant deterioration of existing air quality in pristine regions cleaner than the NAAQS. Under these regulations, the ambient levels of pollutants would be allowed to rise by specified increments. Prior to obtaining a permit to construct through the WDEQ/AQD, an emissions source must demonstrate that ambient concentrations from the proposed source plus selected regional sources are less than applicable Class I and Class II increments.

The CIAA for air quality resources is the same area utilized in the Atlantic Rim Natural Gas Project/Seminole Road Gas Development Project air quality study. The study analyzed cumulative impacts at Class I and Class II areas from emissions sources in southwest Wyoming, northeast Utah, southeast Idaho, and northwest Colorado (Figure 3.1). The Atlantic Rim Natural Gas Project analysis predicted potential increases to ambient concentrations and acid deposition in PSD Class I and Class II

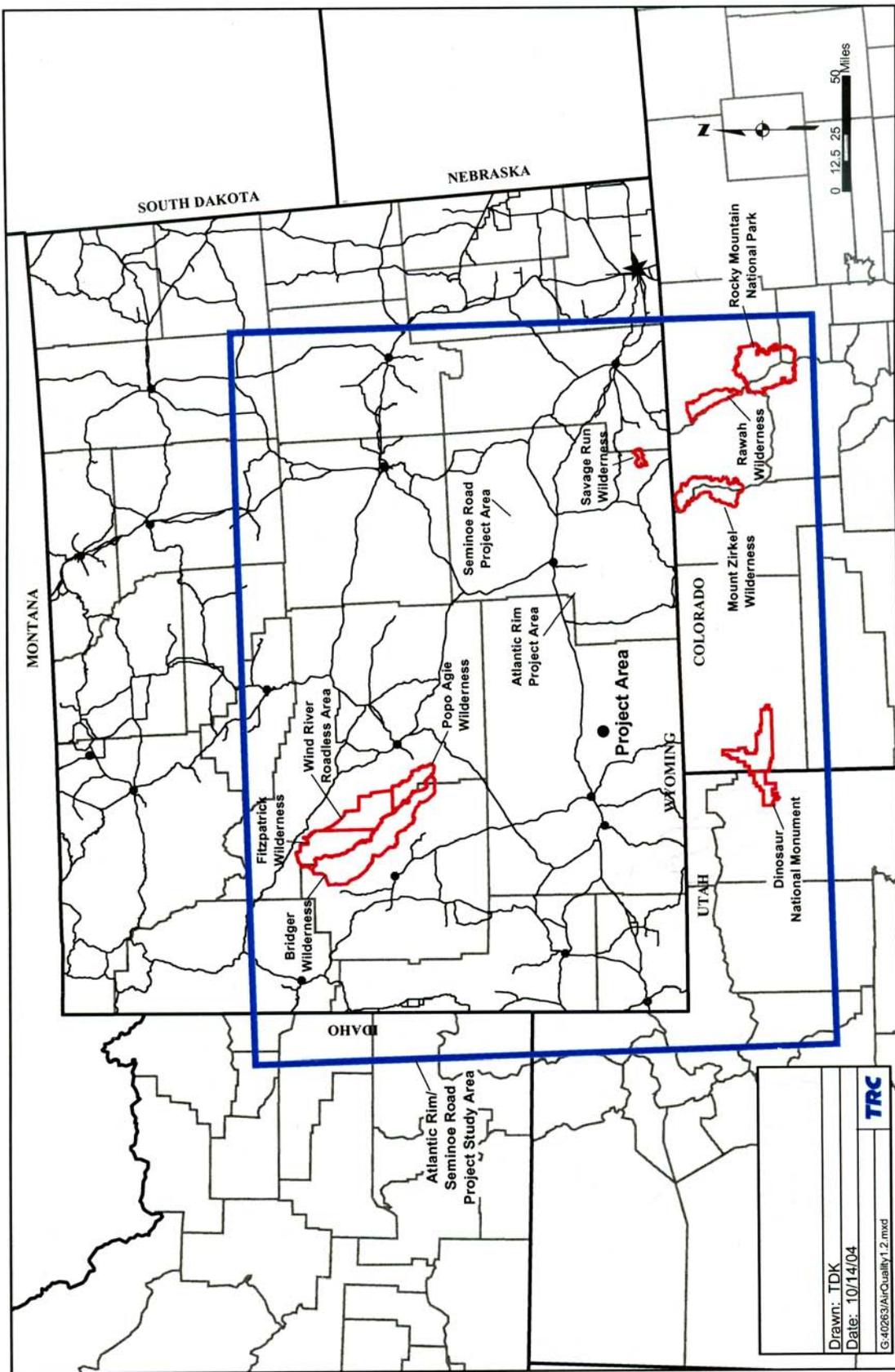


Figure 3.1 Air Quality CIAA.

areas, potential changes to lake acidity in sensitive lakes, and potential changes in visibility at PSD Class I and sensitive Class II areas.

Class I areas, which are allowed the smallest increment, include national parks and wilderness areas. The nearest Class I area within the CIAA is approximately 68 mi north of the Bitter Creek Project area at the Bridger Wilderness Area. All portions of Wyoming outside of Class I areas are designated as Class II areas. The Bitter Creek Project area is a Class II area and is not designated a non-attainment area for any pollutant by WDEQ/AQD. Comparison of potential concentrations with applicable PSD increments demonstrate that concentrations are within those increments, except for PM₁₀ 24 hour.

All *National Environmental Policy Act* (NEPA) analysis comparisons to PSD Class I and II increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD increment consumption analysis. The determination of PSD increment consumption is an air quality regulatory agency responsibility. Such an analysis would be conducted to determine minor source increment consumption or, for major sources, as part of the New Source Review process. The New Source Review process would include an evaluation of potential impacts to Air Quality-Related Values (AQRV) such as visibility, aquatic ecosystems, flora, fauna, etc., performed under the direction of federal land managers.

Chapter 6 of the WAQS&R requires WDEQ/AQD to review all plans for construction of any new or modified emissions sources prior to the issuance of construction permits. In order to obtain a construction permit, an emissions source must demonstrate compliance with emissions standards, NAAQS, WAAQS, PSD increments, and other applicable air quality regulatory requirements. If required by WDEQ/AQD, the demonstration must include air pollutant emissions from other nearby existing emissions sources to ensure that overall air quality is quantified as part of the permitting process.

3.3.2 Mineral Resources

The CIAA for all mineral resources is the Bitter Creek Project area and a 4-mi buffer, an area of 126,560 acres, 25.4% (32,168 acres) of which has been disturbed (Figure 3.2). A majority of the disturbance (nearly 22,000 acres) is the result of surface coal mining by BBCC. A total of 464 oil and gas wells occur in the CIAA, disturbing an estimated 2,320 acres. Many of the wells occur in the Bitter Creek Project area and in the Patrick Draw field to the north and east. The area also includes portions of the Continental Divide project area.

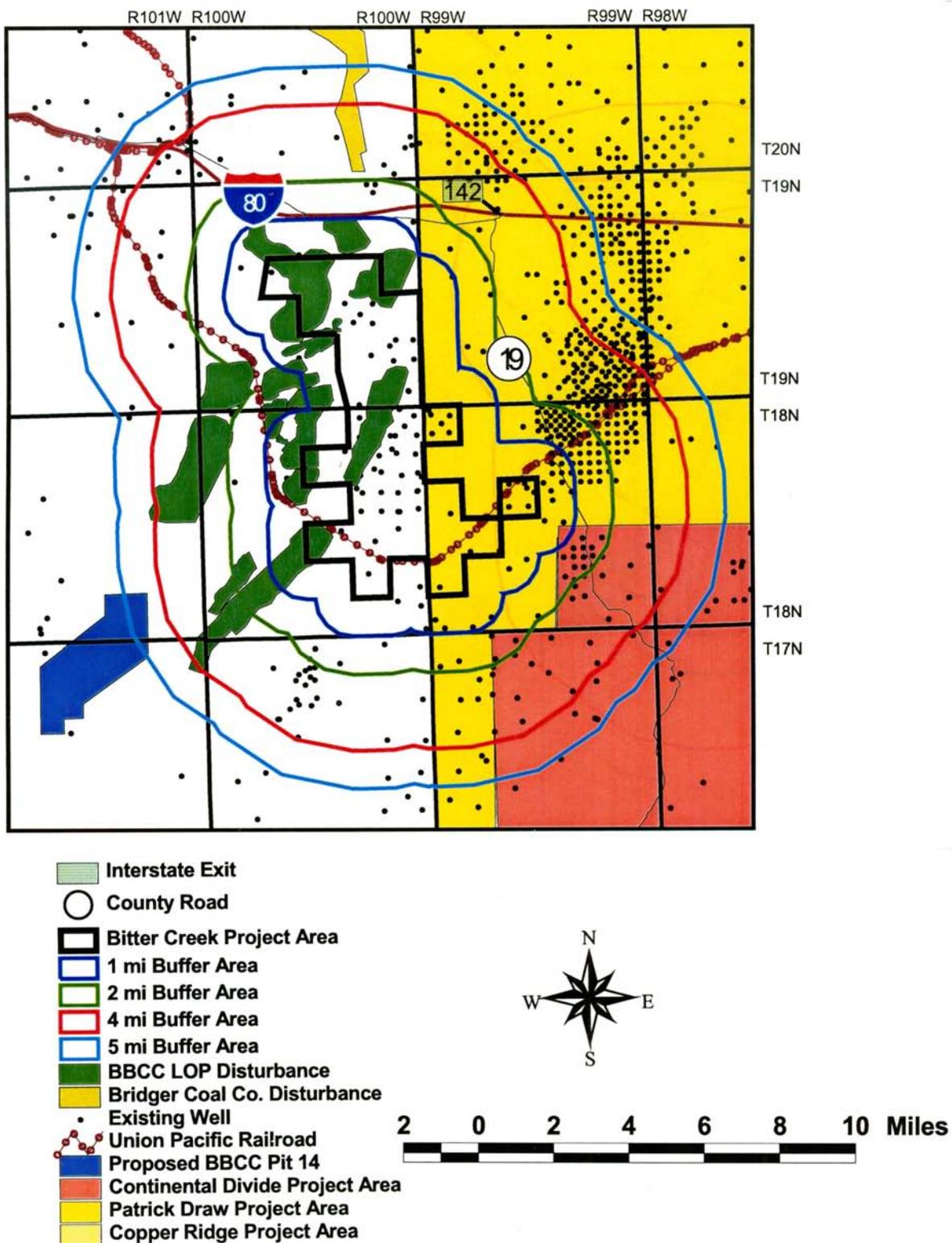


Figure 3.2 CIAAs for Minerals, Solid and Hazardous Wastes, Other Mammals, Other Birds, Landownership and Use, and Recreation.

3.3.2.1 Leasable Solid Minerals (Coal)

Mineable coal reserves in the Bitter Creek Project area are contained in the Fort Union and Lance Formations and are currently being surface-mined by BBCC. Mineable coal seams range from 4 to 25 ft in thickness (BBCC 2004a). Surface coal mining operations began in about 1980 in the southern portion of Bitter Creek Project area, and a vast majority of the mineable coal reserves within the Bitter Creek Project area have been removed except for coal in the southern portion of Pit 3 (Section 22 of T18N, R100W), all of Pit 7 (Sections 15, 16, and 22 of T19N, R100W), and eastern portion of Pit 10, (Sections 13 and 24 of T19N, R100W) (Figure 3.3). Mining within the Bitter Creek Project area is currently being conducted only in Pit 10 (BBCC 2004b). Within the CIAA, coal mining continues to be surface mined at the Black Butte Coal Mine, which mines coal from all of the seams discussed above. Approximately 2.2 million tons of coal were mined from the Black Butte Coal Mine during 2003 (BBCC 2004b).

3.3.2.2 Leasable Fluid Minerals (Oil, Gas, and Coalbed Methane)

There is a moderate to high potential for oil and gas development within the Bitter Creek Project area (Anderson et al. 1990) (Figure 3.3). The first well to be completed in the Bitter Creek Project area was drilled in 1960, and since that time approximately 64 gas wells have been drilled in the area. At the end of 2003 there were 24 producing gas wells, two water injection wells, 9 wells in other forms of completion, and 29 wells that have been permanently abandoned (Wyoming Oil and Gas Conservation Commission [WOGCC] 2003) (Figure 3.3). A majority of the wells drilled within the Bitter Creek Project area since 2000 have been drilled by the Operators on private surface and mineral ownership. Natural gas production is occurring from Cretaceous-aged materials in the Lance and Almond Formations. These materials are described as sand, coal, and shale sequences deposited during the small transgressive/regressive cycles within the overall transgressive sequence of deposition of coastal plains and shoreline sediments (Infinity Oil & Gas of Wyoming, Inc. 2001).

The CIAA has a moderate to high potential for oil and gas development (Anderson et al. 1990) (Figure 3.4). According to WOGCC records, approximately 445 wells have been drilled, or are approved to be drilled, in the CIAA. At the end of 2003 there are 76 producing oil and gas wells, 9 water injection wells, 94 wells in other forms of completion or abandonment, 201 wells that have been permanently abandoned, and 65 wells that were waiting to be drilled (WOGCC 2003) (see Figure 3.4). The CIAA encompasses or

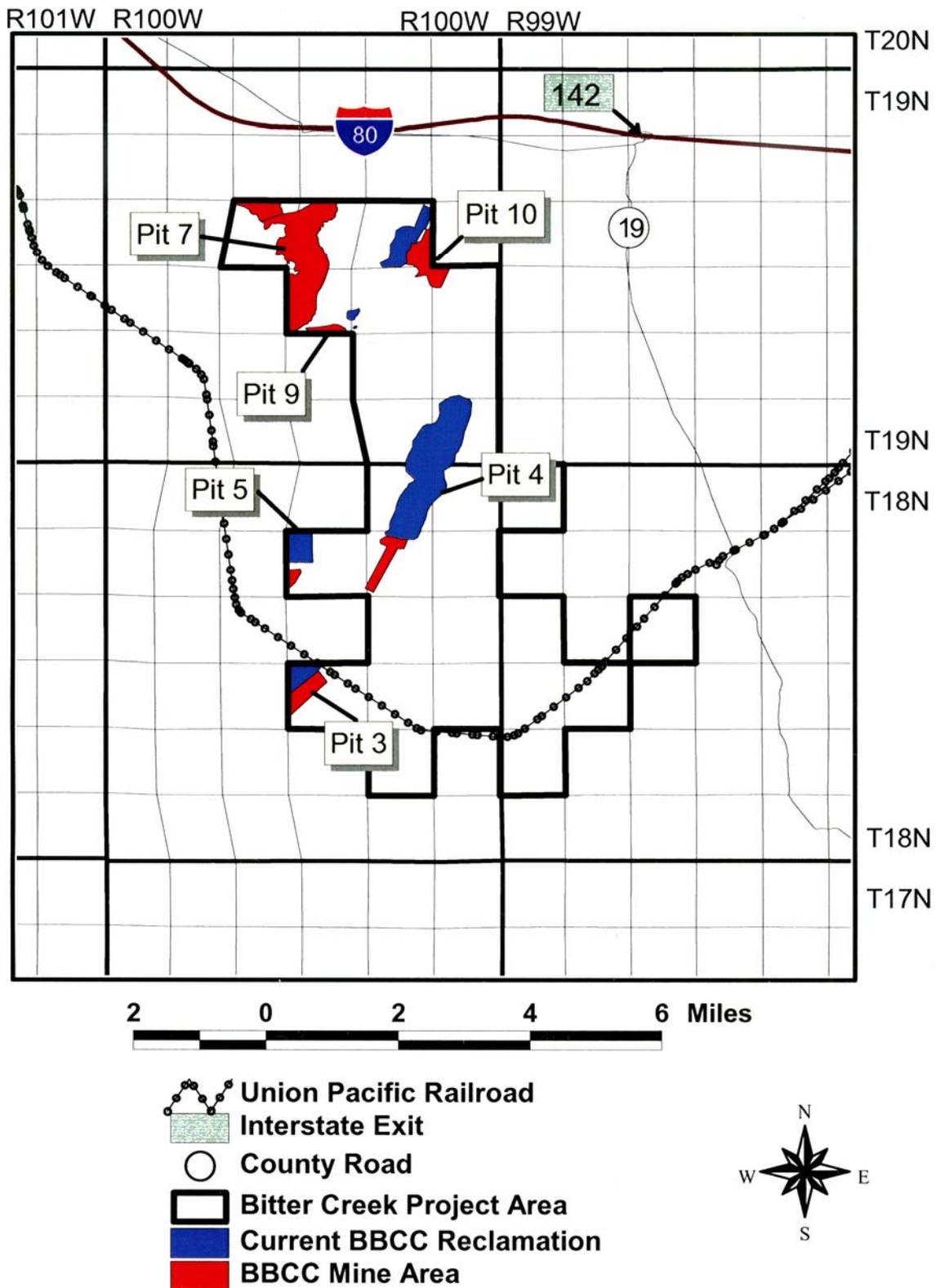


Figure 3.3 Surface Coal Mining Areas Within the Bitter Creek Project Area.

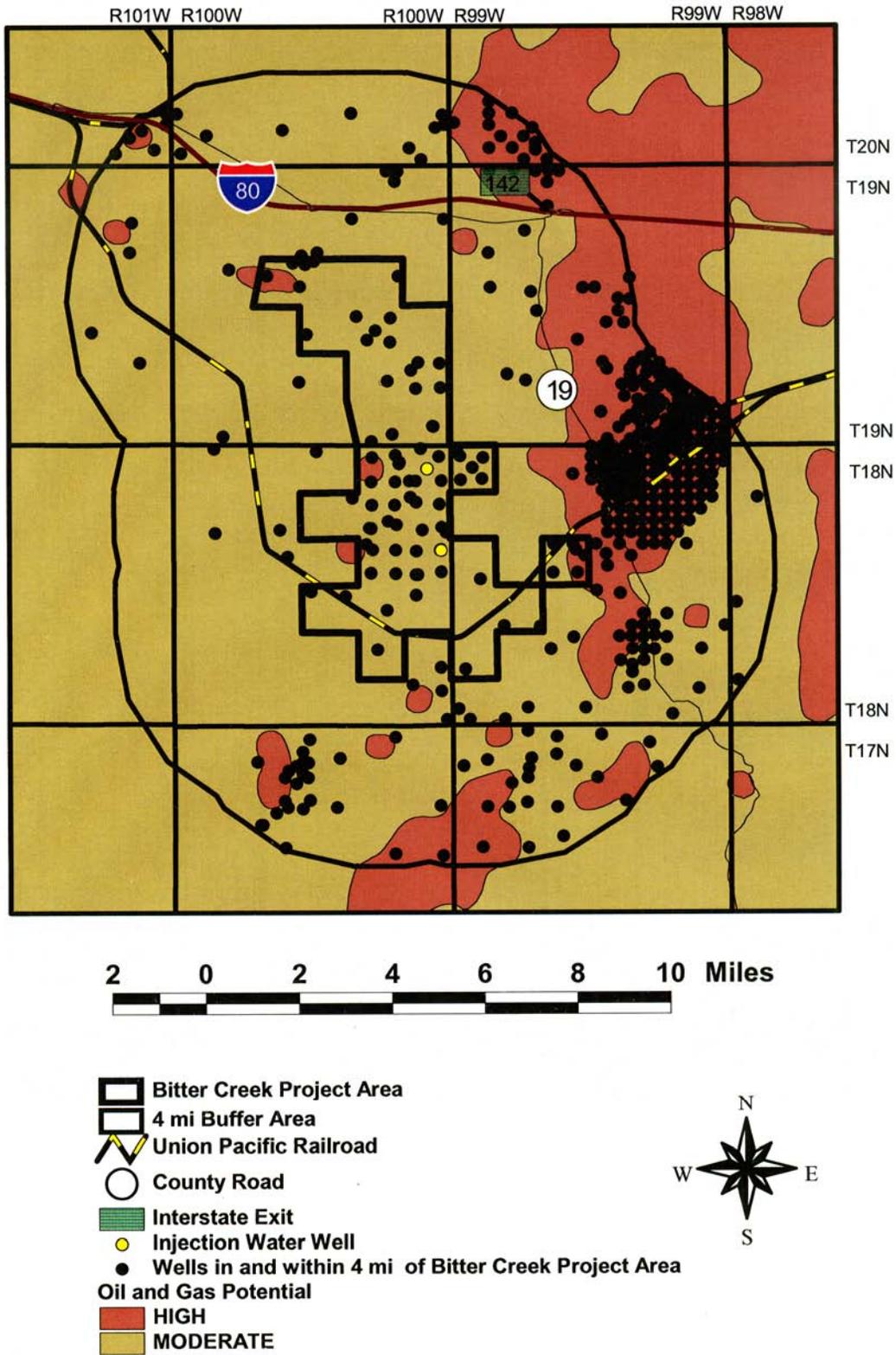


Figure 3.4 Oil and Gas Wells and Potential in the Bitter Creek Project Area and CIAA.

overlaps 16 oil and gas fields including the Antelope, Arch, Brady, Desert Springs, Desert Springs West, Hallville, Higgins, Patrick Draw, Pietra, Point of Rocks, Red Hill, Sand Butte, Stage Stop, Two Rim, WC, and Wild Rose Fields. Most of the existing wells are located in the Patrick Draw Field located approximately 0.5-3 mi east of the Bitter Creek Project area.

3.3.2.3 Locatable Minerals

There are no active locatable mineral (e.g., precious metals, bentonite, etc.) mines or economically recoverable deposits of locatable minerals known within the Bitter Creek Project area or the CIAA, and there are no leases or claims for locatable minerals in those same areas.

3.3.2.4 Salable Minerals

There are no active construction aggregate (sand, gravel, construction stone, etc.) quarries within the Bitter Creek Project area or the CIAA; however, the BLM has identified several sand and gravel deposits along the western boundary of the CIAA (BLM 1978).

3.3.3 Paleontological Resources

Paleontological resources in southwest Wyoming span the time from the late Cretaceous to early Tertiary, and include remains of dinosaurs, mammals, turtles, crocodiles, other reptiles, fish, snails, and plants. The Bitter Creek Project area is on the eastern flank of the Rock Springs Uplift and the Wasatch, Fort Union, Lance, and Almond Formations outcrop in the Bitter Creek Project Area. The Wasatch Formation is Eocene age, approximately 38-55 million years old, and contains lower vertebrate and mammal fossils. The Fort Union Formation is Paleocene in age, approximately 55-64 million years old, and contains mammal, fish, crocodile, turtle, petrified wood, and leaf fossils. The Lance and Almond Formations are Cretaceous in age, approximately 64-144 million years old, and contain various vertebrate, invertebrate, and plant fossils. BLM has determined that all vertebrate fossils, which include bones, teeth, turtle shells, and tracks, are scientifically significant. In rare cases, fossil plant remains, petrified wood, and invertebrate fossils can also be designated as significant (BLM 1996a).

The Wasatch and Lance Formations in Wyoming are generally highly fossiliferous geologic units that regularly and predictably produce vertebrate fossils and /or scientifically significant non-vertebrate fossils

that are at risk of natural degradation or human-caused adverse impacts. The BLM has determined that outcrops of these geologic units are of special interest and concerns and mitigation of ground-disturbing activities is required to prevent the loss of scientifically important fossils. The Fort Union and Almond Formations in Wyoming are fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence and have an unknown fossil potential. The BLM has determined that portions of the outcrops of these geologic units are also of special interest and concern and mitigation of ground-disturbing activities in some areas is required to prevent the loss of scientifically important fossils (BLM 2002).

Several paleontological surveys have been conducted by BBCC in the western portion of the Bitter Creek Project area and included portions of the Black Butte Mine that were going to be disturbed by future mining operations. As a result, numerous scientifically important fossil localities in the Fort Union, Lance, and Almond Formations have been identified and mitigated (BBCC 2004). Because of the high potential, it is probable that additional scientifically important fossils occur within the Bitter Creek Project area that have not been recorded. Finding fossils depends on being able to see bare, or nearly bare, exposures of the bedrock. Soil development or vegetation can obscure fossils, and may prevent locating them in some instances. Surveys performed in advance of surface disturbing activities may identify previously unknown fossil occurrences, but fossils could still be found during construction activities when they are uncovered by ground disturbing activities. Most of the significant fossils are small and difficult to see.

Much of the information important to scientific research includes the surrounding rock (the matrix) that contains the fossils. This matrix helps to explain the environment the animal or plant lived in, the mode of deposition, the age of the fossils, and correlations with other areas. Therefore, it is important to know exactly where a fossil came from, and in some cases, the exact position of each fossil in relation to nearby fossils.

The Bitter Creek Project area is the CIAA for paleontological resources. A total of 3,923 acres (21.8%) of the 17,961-acre CIAA has been disturbed, primarily by surface coal mining by BBCC (2,561 acres, 51% of which is in some state of reclamation) and by the 69 oil and gas wells, 29 of which have been permanently abandoned.

3.3.4 Soils Resources

The Bitter Creek Project area can be divided into four general geomorphic positions with accompanying differences in soil types that are closely related to the surficial geology (Natural Resources Conservation Service 1978). These positions include: 1) dissected residual uplands dominated by eastward dipping, interbedded sandstone, shale, and siltstone of the Cretaceous Fort Union Formation which form ridges; 2) narrow valleys with ephemeral drainages between the more resistant ridges; 3) east dipping backslopes of the ridges which grade into less broken topography of low ridges and alluvial fans; 4) the Quaternary floodplain of Bitter Creek; and 5) reclaimed soils associated with the Black Butte Coal Mine. Information on some of the common soils identified within the Bitter Creek Project area is presented below and in Table 3.3.

3.3.4.1 Residual Upland Ridges, 8-30% Slopes

The broken topography of dipping, interbedded rock outcrop accompanied by soils with bedrock less than 20 inches from the surface dominates the northern and western parts of the Bitter Creek Project area. Soil textures are commonly loam, fine sandy loam, and sandy loam. Rock fragments may be common throughout these soils. Drainages flowing off these ridges generally have deeper soils but with similar texture. These soils are characterized by medium to rapid runoff and moderate water erosion potential. Depth of potential topsoil is limited by bedrock, however, a minimum of 6 inches is usually salvageable. Vegetation is dominated by Gardner saltbush, thickspike wheatgrass, western wheatgrass, Indian ricegrass, bottlebrush squirreltail, needleandthread grass, and sagebrush. The deeper soils in drainages generally support more sagebrush as well as basin wildrye.

Scattered throughout the uplands are sandy areas, usually not more than 10 acres in size. These aeolian depositional areas are derived from local sandstone outcrop as is found in NE Section 36 of T19N, R100W; SE Section 2 of T18N, R100W; and SE Section 6 of T18N, R99W. Generally deeper than 60 inches to bedrock, these fine sand and loamy sand soils have a low runoff potential but a severe wind erosion potential. Vegetation is dominated by big sagebrush, spiny hopsage, needleandthread grass, Indian ricegrass, and basin wildrye. These soils are a good source for topsoil but have low bearing strength for road construction.

Table 3.3 Common Soils within the Bitter Creek Project Area.

Soil name	Horizon depth/in	Texture ¹	Hyd Grp ²	K ³	WEG ⁴	Site ⁵	% Clay	pH ⁶	EC ⁷	SAR ⁸	Perm ⁹	Unified ¹⁰	Aash to ¹¹
Residual Upland Ridges 8-30 % slopes													
Horsley	0-5	L, SIL, SICL	D	0.4	5	Shale	18-35	7.4-9.0	0 - 4	0 - 8	0.6-2	CL	A-6
Huguston	5-10	Soft shale											
	0-3	FSL, SL	D	0.3	3	Shallow Sandy	5-12	7.4-9.0	0 - 2	0 - 2	2-6	SM	A-2 A-4
Garsid	3-14	FSL, SL		0.4			5-12	7.9-9.0	0 - 2	0 - 5	2-6	S M	A-2 A-4
	10-20	Sandstone											
	0-3	L, CL	B	0.3	4L	Loamy	18-35	7.4-8.4	0 - 4	0 - 8	0.6-2	CL-ML CL	A-4 A-6 A-4 A-6
Haterton	3-28	L, CL		0.4			18-35	7.9-9.0	0 - 10	0 - 12	0.6-2	CL-ML CL	A-4 A-6
	20-40	Shale											
Haterton	0-3	L, SICL	D	0.4	4L	Shale	18-35	7.9-9.0	0 - 2	0 - 4	0.6-2	CL-ML	A-4
	3-12	L, SICL		0.4			10-35	7.9-9.0	0 - 5	0 - 5	0.6-2	CL-ML ML	A-4
Teagulf	10-20	Shale											
	0-10	FSL, SL	B	0.3	3	Sandy	5-18	7.4-8.4	0 - 2	0 - 2	2-6	SM SC-SM	A-2 A-4
Tasselman	10-35	FSL, SL		0.3			5-18	7.9-9.0	0 - 4	0 - 8	2-6	SM SC-SM	A-2 A-4
	20-40	Sandstone											
	0-3	SL	D	0.2	3	Shallow Loamy	5-18	7.4-9.0	0 - 4	0 - 5	2-6	SM	A-2
Kandaly	3-14	GR-SL		0.1			5-18	7.9-9.0	0 - 4	0 - 5	2-6	G M SM	A-1 A-2
	10-20	Sandstone											
	0-6	FS	A	0.3	1	Sands	0-7	7.4-8.4	0 - 2	0 - 5	6-2	SM SP-SM	A-2 A-3
Kandaly	6-60	FS		0.3			0-7	7.4-8.4	0 - 2	0 - 5	6-2	S M SP-SM	A-2 A-3
	Upland Side Drainages 1-6% slopes												
Thayer	0-7	FSL	B	0.3	3	Saline Upland	5-18	7.9-9.0	0 - 2	0 - 5	0.6-2	SM SC-SM	A-2 A-4
	7-60	FSL		0.4			5-18	7.9-9.0	0 - 4	0 - 5	0.6-2	S M SC-SM	A-2 A-4
Monte	0-12	L, SIL	B	0.4	5	Saline Upland	18-27	7.4-9.0	0 - 8	0 - 8	5-10	CL	A-6
Quealman	12-60	L, SICL		0.4			18-35	8.5-9.6	2 - 16	0 - 8	0.2-0.6	CL	A-6
	0-5	FSL, L	B	0.3	3	Saline Upland	5-27	7.9-9.0	0 - 4	0 - 4	2-6	SM	A-2 A-4
Quealman	5-60	SR FSL, L		0.4			5-27	7.9-9.0	4 - 16	2 - 8	0.6-2	SM	A-2 A-4

Table 3.3 (Continued)

Soil name	Horizon depth/in	Texture ¹	Hyd Grp ²	K ³	WEG ⁴	Site ⁵	% Clay	pH ⁶	EC ⁷	SAR ⁸	Perm ⁹	Unified ¹⁰	Aash to ¹¹
Backslope 1-10% slopes													
Garsid	0-3	L, CL, SIL	B	0.3	4L	Loamy	18-35	7.4-8.4	0 - 4	0 - 8	0.6-2	CL-ML CL	A-4
	3-28	L, CL, SIL		0.4			18-35	7.9-9.0	0 - 10	0 - 12	0.6-2	CL-ML CL	A-6 A-4 A-6
	20-40	Shale											
Haterton	0-3	L, SICL	D	0.4	4L	Shale	18-35	7.9-9.0	0 - 2	0 - 4	0.6-2	CL-ML	A-4
	3-12	L, SICL		0.4			10-35	7.9-9.0	0 - 5	0 - 5	0.6-2	CL-ML ML	A-4
Huguston	10-20	Shale											
	0-3	FSL, SL	D	0.3	3	Shallow Sandy	5-12	7.4-9.0	0 - 2	0 - 2	2-6	SM	A-2 A-4 A-4
Teagulf	3-14	FSL, SL		0.4			5-12	7.9-9.0	0 - 2	0 - 5	2-6	S M	A-2 A-4
	10-20	Sandstone											
	0-10	FSL, SL	B	0.3	3	Sandy	5-18	7.4-8.4	0 - 2	0 - 2	2-6	SM SC-SM	A-2 A-4 A-2 A-4
Quealman	10-35	FSL, SL		0.3			5-18	7.9-9.0	0 - 4	0 - 8	2-6	SM SC-SM	A-2 A-4
	20-40	Sandstone		0.0									
	0-5	FSL, L	B	0.3	3	Saline Upland	5-27	7.9-9.0	0 - 4	0 - 4	2-6	SM	A-2 A-4 A-2 A-4
Pepal	5-60	SR FSL, L		0.4			5-27	7.9-9.0	4 - 16	2 - 8	0.6-2	SM	A-2 A-4
	0-15	FSL	B	0.3	3	Sandy	5-18	7.4-8.4	0 - 2	0 - 0	2-6	SM	A-2
Kandaly	15-60	FSL		0.4			5-18	7.9-9.0	0 - 4	0 - 5	2-6	SM	A-2
	0-6	FS	A	0.3	1	Sands	0-7	7.4-8.4	0 - 2	0 - 5	6-2	SM SP-SM	A-2 A-3 A-2 A-3
Bitter Creek Floodplain 1-3% slope	6-60	FS		0.3			0-7	7.4-8.4	0 - 2	0 - 5	6-2	S M SP-SM	A-2 A-3
	0-7	SIC	D	0.4	4	Saline Upland	40-60	7.9-9.0	0 - 4	0-8	<0.6	CH	A-7
Dines	7-60	SIC		0.4			40-60	7.9-9.0	4 - 16	0 - 20	<0.6	CH	A-7
	0-10	SICL, SIL	B	0.4		Saline Lowland	17-35	7.9-9.0	0 - 8	0 - 2	0.2-0.6	CL	A-6
	10-60	SICL, SIL		0.4			17-35	8.5-9.0	16 - 32	2-16	0.2-0.6	CL	A-6

¹ L = loam
SIL = silty loam
SIC = silty clay
FSL = fine sandy loam
SL = sandy loam
CL = clay loam
SICL = silty clay loam
GR-SL = gravelly sandy loam
FS = fine sand
SR FSL

Table 3.3 (Continued)

- ² Hyd Grp = Hydrologic group
 Group A = Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
 Group B = Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
 Group D = Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.
- ³ Erosion factor K = Indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4%) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.
- ⁴ WEG = wind erodibility group
 1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
 3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
 4L. = Calcareous loamy soils that are less than 35 % clay and more than 5% finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.
 4. Clays, silty clays, clay loams, and silty clay loams that are more than 35% clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.
 5. Loamy soils that are less than 18% clay and less than 5% finely divided calcium carbonate and sand clay loam and sandy clays that are less than 5% finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.
- ⁵ Site. = Range site; a area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.
- ⁶ pH = A measure of acidity or alkalinity of a soil. Extremely acid soils have a pH below 4.5. Soils with a pH of 9.1 or higher are considered very strongly alkaline. Neutral soils have a pH of 7.0.
- ⁷ EC = electrical conductivity; a measure of salinity when the soil is saturated.
- ⁸ SAR = sodium adsorption ratio; a measure of sodicity, the degree to which a soil is affected by exchangeable sodium. If the SAR is less than 13:1, the soil is slightly sodic; if SAR is 13:1 to 30:1, the soil is moderately sodic; if the SAR is more than 30:1, the soil is strongly sodic.
- ⁹ Perm = Permeability.
- ¹⁰ Unified = Unified Soil Classification System classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, AND SC; silty and clayey soils as ML, CL, OL, MH, CH, AND OH; and highly organic soils as PT. Soils exhibiting engineering properties of the two groups can have a dual classification, for example, CL-ML.
- ¹¹ AASHTO = The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

3.3.4.2 Upland Side Drainages, 1-6% Slopes

The main side drainages to Bitter Creek, which separate the broken uplands, generally trend northeast/southwest, and are dominated by fine sandy loam, loam, and silt loam soils with bedrock greater than 40 inches from the surface. These soils are characterized by medium runoff and moderate water and wind erosion potential. Depth of potential topsoil may be limited by salinity in subsurface horizons but usually a minimum of 6-12 inches is salvageable. These soils may have low bearing strength for roads which tend to lose their shape and become pulverized with heavy traffic. Vegetation is dominated by Gardner saltbush, Indian ricegrass, Sandberg bluegrass, bottlebrush squirreltail, western wheatgrass, and sagebrush or greasewood.

3.3.4.3 Backslope, 1-10% Slopes

The backslope of the residual uplands dip eastward and are found in the southeast portion of the Bitter Creek Project area such as in Sections 6, 7, and 18, of T18N R99W. Soils are generally greater than 20 inches to bedrock with textures of fine sandy loam, silt loam, and loam. Soils with bedrock less than 20 inches from the surface and sandstone rock outcrop can be found throughout this unit. Scattered, low, vegetated sand dunes are found in this unit. Runoff is medium and the hazard of water and wind erosion is moderate to severe. Some of these soils are subject to seepage and piping when used as backfill. They are easily pulverized by vehicular traffic. The upper 12 inches can be saved for topsoil salvage.

Vegetation is dominated by sagebrush, needle-and-thread grass, Indian ricegrass, thickspike wheatgrass, Gardner saltbush, and shadscale.

3.3.4.4 Bitter Creek Floodplain, 1-3% Slopes

The floodplain of Bitter Creek traverses the southern boundary of the Bitter Creek Project area and is dominated by strongly saline and/or alkaline loam, silt loam, silty clay loam, and silty clay alluvial soils. Permeability of these soils is slow, runoff is slow to medium, and the hazard of water and wind erosion is slight to moderate. However, concentrated flows from road culverts or wing ditches could cause accelerated erosion. Depth of potential topsoil is limited by high levels of salinity and/or alkalinity in subsurface horizons; however, a minimum of 6 inches is usually salvageable. These soils have a high shrink/swell potential. Vegetation is dominated by Gardner saltbush, Indian ricegrass, Sandberg bluegrass, bottlebrush squirreltail, alkali sacaton, basin wildrye, and greasewood.

3.3.4.5 Reclaimed Land

Portions of pits 1, 3, 4, 5, and 10 of the Black Butte Coal Mine have been disturbed by surface coal mining operations, have been permanently reclaimed by Black Butte Coal Company, and overlap with the Bitter Creek Project area. As of the end of 2003, Black Butte Coal Company had permanently reclaimed approximately 1,294 acres of mine related disturbance within the Bitter Creek Project area. These reclaimed areas have been backfilled, regraded, recontoured, retopsoiled and revegetated and support reclaimed native vegetation. Soils in these areas have been mixed as a result of topsoil salvage and replacement operations. The depth of replaced topsoil varies based on the depth of topsoil that was available in each pit and the depth of replaced topsoil varies between 7 and 14 inches. Runoff is medium and the hazard of water and wind erosion is moderate. These soils are easily pulverized by vehicular traffic. If necessary, available topsoil could be salvaged for future disturbance.

3.3.4.6 Biological Soil Crusts

Biological soil crusts, also known as cryptogamic, cryptobiotic, microbiotic, or microphytic soil crusts, are a mosaic of bacteria, algae, lichens, mosses, and microfungi that weave through the top few centimeters of soil, gluing loose particles together and forming a matrix that stabilizes and protects soil surfaces from erosive forces. On rangelands, soil crusts function as living mulch by retaining moisture, discouraging annual weed growth, reducing water and wind erosion, fixing atmospheric nitrogen, and contributing to soil organic matter. These crusts, when not disturbed, tend to occupy the nutrient-poor zones between vegetation clumps (Belnap et al. 2001). However, in southwest Wyoming, possibly due to disturbance from heavy and/or sustained livestock grazing, or the wind, biological soil crusts are more frequently found in protected areas such as under sagebrush or among rock outcrop (personal communication, June 2002, with Jayne Belnap, U.S. Geological Survey, Moab, Utah). Crusts are well adapted to severe growing conditions, but poorly adapted to compaction-type disturbances.

Livestock grazing, off-road recreational activities, and surface disturbing activities such as oil and gas operations and surface mining can damage and destroy biological soil crusts that may be present. Full recovery of biological soil crusts from disturbances is generally considered a slow process. Studies have indicated that visual recovery can be complete in 1-5 years, while crust thickness may take up to 50 years. It is speculated by some researchers that it may take up to 250 years for some biological soil crusts to full recovery. Recovery can be enhanced by limiting the size of disturbance so that contiguous soil crusts can

act as a source of inoculant (Belnap et al. 2001). Some scattered and isolated soil crusts have been observed in the Bitter Creek Project area.

3.3.4.7 CIAA

The CIAA for soil resources includes the four 6th-level watersheds that occur in the Bitter Creek Project area (Figure 3.5). Approximately 36.3% (24,636 acres) of the 67,815-acre CIAA has been disturbed, primarily by the BBCC surface coal mine. A total of 199 oil and gas wells occur in the area, disturbing an estimated 995 acres. The other disturbance is associated with roads, the railroad, and miscellaneous sources.

3.3.5 Water Resources

3.3.5.1 Groundwater Resources

Groundwater resources within the Bitter Creek Project area include both deep and shallow aquifers that are both confined and unconfined. Transmissivities and hydraulic conductivities for the shallow aquifers (i.e., Bitter Creek alluvium, Fort Union Formation, Lance Formation, Almond Formation and Ericson Sandstone) within the Black Butte Coal Mine permit boundary have been estimated to be typical of values found in other alluvium, Fort Union, Lance Formation, and Almond Formation materials. However, transmissivities and hydraulic conductivities for the formation that would be impacted by the Proposed Action have not been estimated but are likely consistent with values found in other Lance, Fox Hills, and Almond Formation materials. There are no known seeps or springs within the Bitter Creek Project area.

According to Wyoming State Engineer's Office records, approximately 79 water wells have been drilled in the Bitter Creek Project area. Forty are associated with natural gas production, 36 are monitor wells associated with the Black Butte Coal Mine, and 2 are production water wells associated with the Black Butte Coal Mine. The water wells associated with natural gas are 1,500 to 4,000 ft deep and completed in the Lance and Almond Formation (Wyoming State Engineer's Office 2004). Water disposal injection wells have been completed in the Fox Hills Formation, a shallow marine sequence of sand and shale, with the sandstone intervals exceeding 20% porosity within the Bitter Creek Project area (Infinity Oil & Gas of Wyoming, Inc. 2001). Most of the Black Butte Coal Mine monitor wells are typically less than a few

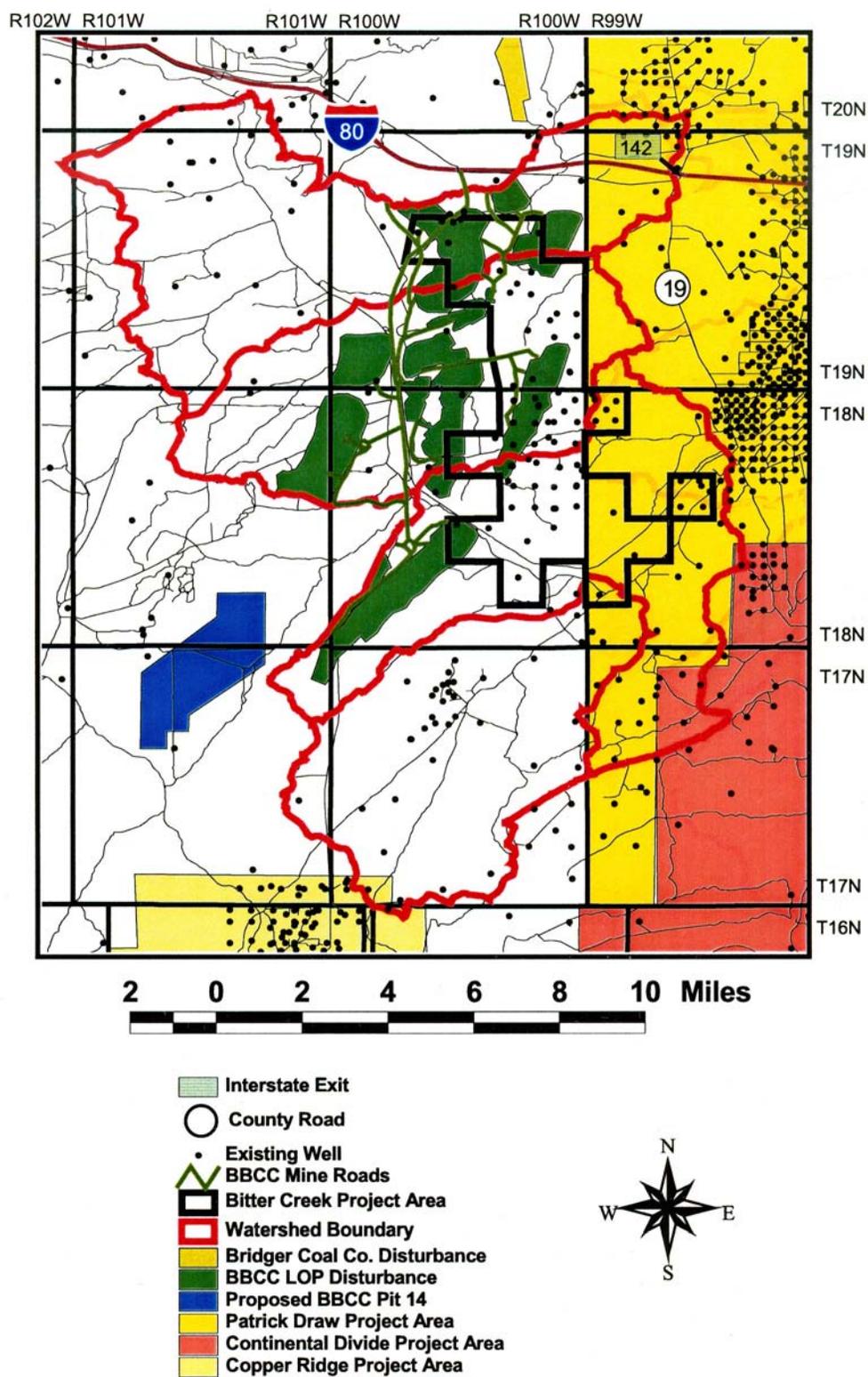


Figure 3.5 Boundaries of Four 6th-Level Watersheds, CIAAs for Soils, Surface Water, Vegetation, Wetlands/Riparian Areas, and Reptiles and Amphibians.

hundred feet deep and are typically used to monitor static water levels and water quality near the outcrop and mining areas of the Fort Union, Lance, and Almond Formations (BBCC 2004a).

Site-specific groundwater quality data are available for the Bitter Creek Project area. Groundwater quality is highly variable and is related to the depth of the specific aquifer and type of rock or saturation zone. Water quality from shallow aquifer water wells varies from Class I (suitable for domestic use) to Class III (suitable only for livestock use) (BBCC 2004a). Water samples collected from the existing gas wells completed into aquifers that would be affected by the Proposed Action (i.e., Lance and Almond Formations) indicate that the water quality would not meet Class I (domestic), II (agricultural), or III (livestock) water quality standards. For example, levels of chloride, sodium, and TDS in Lance Formation wells are documented as exceeding Class III water quality standards by a factor of two, and levels of chloride, sodium, and total dissolved solids in Almond Formation wells are documented as exceeding Class III water quality standards by a factor of 5-10 (Infinity Gas & Oil of Wyoming, Inc. 2001).

Ogle and Wood (2004) report that ground water in the area that includes the Black Butte coal mine follows the dip of the geological beds to the east and northeast towards the Great Divide Basin, and that water quality is generally poor but usually meets livestock standards. In some cases, particularly in the alluvial aquifer in the vicinity of Bitter Creek, water quality exceeds livestock standards.

3.3.5.2 Surface Water Resources

The entire Bitter Creek Project area is located within the Bitter Creek drainage basin. Bitter Creek is a tributary of the Green River and the Colorado River. Bitter Creek is the only perennial drainage channel within the Bitter Creek Project area, and approximately 5.5 mi of Bitter Creek runs through the southern portion of the area. The remaining unnamed drainage channels are ephemeral and flow only in response to a direct precipitation or snowmelt events.

Surface water runoff from the western 1/3 of the Bitter Creek Project area is controlled by approximately 14 sediment control ponds that have been constructed and are maintained by Black Butte Coal Company in accordance with applicable federal and state laws and regulations. These sediment control ponds are required to prevent untreated runoff from disturbed lands from entering downstream receiving waters.

Waters collected in these ponds are eventually discharged into Bitter Creek once they meet effluent standards established by the WDEQ/WQD (BBCC 2004a).

The only surface water quality data available for Bitter Creek in the Bitter Creek Project area is a monitoring station located on Bitter Creek (BBCC 2004a). Water quality is highly variable depending upon the nature and intensity of the runoff event and the nature of the affected soil. A comparison of water quality from the Bitter Creek monitoring station to WDEQ/WQD Chapter 8 water class standards (WDEQ/WQD 2000) indicates that surface water quality would typically meet Class III (livestock class of use) criteria (BBCC 2004a). The portion of Bitter Creek that flows through the Bitter Creek Project area is designated as having Class 3B surface water quality as defined by the WDEQ/WQD. The Class 3B designation means that these waters are not known to support game fish populations or drinking water supplies and those uses are not attainable. Waters with the Class 3B designation can support and sustain some communities of aquatic life including non-game fish, invertebrates, and/or amphibians (WDEQ/WQD 2001). Portions of Bitter Creek do support non-game fish, including spawning runs of flannelmouth suckers (see Section 3.4.1.3). Bitter Creek was listed on the 2000 WDEQ/WQD 303(d) list of water bodies with water quality impairments because of elevated levels of fecal coliform/e-coli bacteria and total dissolved chlorides detected by the WDEQ/WQD and the U. S. Geological Survey. The Sweetwater County Conservation District (SCCD) has initiated a planning effort to develop an effective watershed plan. The final plan developed by the SCCD will be submitted to the WDEQ/WQD by June 30, 2006 (personal communication, March 22, 2005, with Roberta Maestas, SCCD, Rock Springs, Wyoming).

The remaining drainage channels within the Bitter Creek Project area have been designated as having Class 4B surface water quality as defined by the WDEQ/WQD. The Class 4B designation means that these waters cannot support and sustain aquatic life (WDEQ/WQD 2001). None of the drainage channels or reservoirs are included in the WDEQ/WQD 2000 303(d) list of water bodies with water quality impairments (WDEQ/WQD 2000).

The CIAA for surface water resources is the four 6th-level watersheds that drain the Bitter Creek Project area and have a combined drainage area of 67,815 acres (see Figure 3.4). The CIAA includes approximately 20.84 mi of perennial channel (Bitter Creek) and approximately 179 mi of ephemeral streams. Approximately 36.3% of the CIAA (24,636 acres) has been disturbed, primarily by the BBCC surface coal mine. A total of 199 oil and gas wells occur in the area, disturbing an estimated 995 acres.

The other disturbance is associated with roads, the railroad, and miscellaneous disturbances. Disturbance associated with the coal mine is carefully regulated to ensure that surface runoff is controlled to minimize adverse impacts. The CIAA for ground water is the area affected by the three coal mines in the area.

3.3.6 Wastes (Solid and Hazardous)

There are no known solid or hazardous wastes present within the Bitter Creek Project area; however, limited quantities of hazardous and solid waste may be produced by industrial activities. Areas or activities that could possibly produce hazardous or solid waste include the ongoing oil and gas exploration and development activities and surface coal mining operations. Hazardous and solid wastes generated by the oil and gas operators and Black Butte Coal Company within the Bitter Creek Project area are disposed of in accordance with applicable regulations. Natural gas operators within the Bitter Creek Project area are typically designated as small quantity generators under the *Resources Conservation and Recovery Act* (RCRA) regulations, and Black Butte Coal Company is designated as a conditionally exempt small quantity generator under RCRA. There are no known hazardous or solid waste disposal sites within the Bitter Creek Project area (WDEQ/SHWD 2004).

The CIAA for solid and hazardous wastes is the Bitter Creek Project area and a 4-mi buffer, an area of 126,560 acres, 25.4% (32,168 acres) of which has been disturbed. A majority of the disturbance (nearly 22,000 acres) is the result of surface coal mining by BBCC. A total of 464 oil and gas wells and associated roads and facilities occur in the CIAA, disturbing an estimated 2,320 acres. Many of the wells occur in the Bitter Creek Project area and in the Patrick Draw field to the north and east.

3.4 BIOLOGICAL RESOURCES

3.4.1 Special Status Plant and Animal Species

3.4.1.1 Introduction

The federal *Endangered Species Act* (16 USC 1531-1543) protects listed threatened and endangered plant and animal species and their critical habitats. A list of federally listed threatened, endangered, proposed, and candidate (TEPC) species that may occur in the Bitter Creek Project area was compiled from

information provided by the Wyoming State Office of the USFWS (2004) and the Wyoming Natural Diversity Database (WNDD) (2004) (Table 3.4).

TEPC species are those that have been specifically designated as such by the USFWS. Endangered species are those that are in danger of extinction throughout all or a significant portion of their range. Threatened species are those that are likely to become endangered in the foreseeable future throughout all or a significant portion of their range. Proposed species are those for which the USFWS has published proposed rules in the *Federal Register* for listing of the species but for which a final rule has not been adopted. Candidate species are those for which the USFWS has sufficient data to list as threatened or endangered but for which proposed rules have not yet been issued. BLM-sensitive species are those that may warrant future designation as candidate species but available data are not sufficient for the USFWS to make such a designation decision; however, these species have been designated as BLM-sensitive species by the BLM.

3.4.1.2 Federally Listed Animal and Plant Species

Federally listed threatened and endangered animal species that may occur in the vicinity of the Bitter Creek Project area include black-footed ferret and bald eagle (Table 3.4). Yellow-billed cuckoo is a candidate for listing. The threatened Ute ladies'-tresses is the only federally listed plant species with the potential to occur within or in the vicinity of the Bitter Creek Project area. Several species of endangered fish (specifically the bonytail, Colorado pikeminnow, humpback chub, and razorback sucker) are found in the Upper Colorado River drainage basin and would be affected by water depletions within the drainage basin.

The USFWS is currently evaluating petitions for the possible listing of the pygmy rabbit under the *Endangered Species Act*. A decision by the USFWS not to list the mountain plover is currently under review, and a decision not to list the greater sage-grouse has been issued. At this time, none of these three species are officially protected under the *Endangered Species Act*.

Black-footed Ferret. The black-footed ferret, a federally endangered species, was once distributed throughout the high plains of the Rocky Mountain and western Great Plains regions (Clark and Stromberg

Table 3.4 Federal Threatened, Endangered, Proposed, and Candidate Species and Their Potential Occurrence within the Proposed Project Area (USFWS 2003).

Common Name	Scientific Name	Federal Status ¹	Potential Occurrence Within the Proposed Project Area ²
Mammals			
Black-footed ferret	<i>Mustela nigripes</i>	E	X
Birds			
Bald eagle ³	<i>Haliaeetus leucocephalus</i>	T	O
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	C	R
Plants			
Ute ladies'-tresses	<i>Spiranthes diluvialis</i>	T	X
Fish⁴			
Bonytail	<i>Gila elegans</i>	E	CO
Colorado pikeminnow	<i>Ptychocheilus lucius</i>	E	CO
Humpback chub	<i>Gila cypha</i>	E	CO
Razorback sucker	<i>Xyrauchen texanus</i>	E	CO

¹ Federal status:

E = listed as federally endangered.

T = listed as federally threatened.

C = candidate for listing.

² Species occurrence:

O = occasional; this species may occur in the project area during specific times of the year and may be locally common when suitable food is available; generally not present for extended periods.

R = rare; species may be in the project area for just a few days or hours (e.g., stopping over during migration), or the species has only occasionally or rarely been sighted in the project area. Encounters during the proposed action are very unlikely.

X = unlikely; there has been no recent historical record of the species' occurrence in the project area; probability of encountering the species during the Proposed Action is very unlikely.

CO = Colorado River species. This species would not occur within the project area but it could be affected by water depletions resulting from the Proposed Action.

³ Proposed for removal from federal listing.

⁴ The Colorado pikeminnow, razorback sucker, humpback chub, and bonytail are endangered fish species found in the upper Colorado River and could be adversely impacted by the withdrawal of groundwater associated with the Proposed Action. Formal consultation with the USFWS will determine if any impacts would occur and an appropriate discussion will be included in the final EA.

1987; Forrest et al. 1985). Prairie dogs are the main food of black-footed ferrets (Sheets et al. 1972), although historically a few black-footed ferrets have been collected away from prairie dog towns (Forrest et al. 1985). The last known wild population of black-footed ferrets was discovered in 1981 in the Pitchfork area near Meeteetse in northwest Wyoming. Due to the fear that canine distemper would wipe out this population, all remaining black-footed ferrets were captured from the Pitchfork area in 1985 and placed into a captive breeding program (WGFD 1997). The breeding program was designed with the objective of reintroducing the species into suitable habitats in the wild. The nearest black-footed ferret reintroduction area is approximately 55 mi south of the Bitter Creek Project Area in the Little Snake Black-footed Ferret Management Area, Moffat County, Colorado.

The *Black-footed Ferret Survey Guidelines for Compliance with the Endangered Species Act* (USFWS 1989) defines potential black-footed ferret habitat as any white-tailed prairie dog towns or complexes greater than 200 acres in size. Some prairie dogs are known to occur within the Bitter Creek Project area; however, prairie dog towns in the area have not been delineated. Potential black-footed ferret habitat may occur within the Bitter Creek Project area; however, the area is outside any area requiring black-footed ferret surveys (USFWS 2004). No recent black-footed ferret observations have been recorded in the vicinity of the Bitter Creek Project area (WNDD 2004). It is unlikely that any black-footed ferrets occur in the Bitter Creek Project area; therefore, there would be no effect to the species and it is not discussed further in this EA.

Bald Eagle. The bald eagle is a federally listed threatened species (downlisted from endangered and now proposed for removal from federal listing) that requires cliffs, large trees, or sheltered canyons associated with concentrated food sources (e.g., fisheries or waterfowl concentration areas) for nesting and/or roosting areas (Edwards 1969; Snow 1973; Call 1978; Steenhof 1978; Peterson 1986). Bald eagles forage over wide areas during the non-nesting season (i.e., fall and winter) and scavenge on animal carcasses such as pronghorn, deer, and elk.

No bald eagle nests or winter roosts are known to occur in the Bitter Creek Project area, and the lack of suitable nesting or winter roosting habitat likely precludes its use for such activities by bald eagles. The Green River, Flaming Gorge Reservoir, Big Sandy Reservoir, and Seedskadee National Wildlife Refuge provide the nearest favorable nesting, roosting, and foraging habitat for bald eagles. The nearest of these areas is the Green River, approximately 50 mi west of the Bitter Creek Project area. Searches of the

WNDD revealed no records of bald eagles in the vicinity of the Bitter Creek Project area, including the Jim Bridger Reservoir located approximately 10 mi to the north (WNDD 2004); however, it is possible that individual bald eagles occasionally forage in or fly over the area.

Yellow-billed cuckoo. The yellow-billed cuckoo is a federal candidate species and a BLM-sensitive species. In Wyoming, the yellow-billed cuckoo is a rare summer breeder that arrives from wintering grounds in South America in late May and departs in September to October. The yellow-billed cuckoo is found primarily in open streamside deciduous woodlands with low, scrubby vegetation undergrowth bordering the Bighorn, Powder, North Platte, Henry's Fork, and Black's Fork Rivers. Cottonwood stands and willow thickets are preferred for nesting and foraging (WNDD 2004). The yellow-billed cuckoo has been identified as potentially occurring in the riparian areas west of the Continental Divide; however, it is highly unlikely that the species occurs in the Bitter Creek Project area because suitable riparian habitat is not present. Furthermore, no observations have been recorded in the vicinity (WNDD 2004). The nearest potential yellow-billed cuckoo habitat is likely located along the Green River approximately 45 mi to the west of the Bitter Creek Project area. For these reasons, the Bitter Creek Project would not affect yellow-billed cuckoo, and the species is not discussed further in this EA.

Ute ladies'-tresses. Ute ladies'-tresses, a federally-listed threatened species, is a perennial plant belonging to the orchid family that inhabits moist streambanks, wet meadows, and abandoned stream channels at elevations of 4,500-6,800 ft (Fertig 1994; Spackman et al. 1997). Where it occurs in ephemeral drainages, groundwater is typically shallow (within approximately 18 inches of the ground surface) (personal communication, March 16, 2000, with Pat Deibert, USFWS; personal communication, March 22, 2000, with Walt Fertig, WNDD). The species has been documented in Goshen, Converse, and Niobrara Counties in Wyoming (Fertig 1994) and along the Front Range in northern and central Colorado (Spackman et al. 1997), and has been reported below the dam at Flaming Gorge Reservoir approximately 50 mi southwest of the Bitter Creek Project area (personal communication, March 22, 2000, with Walt Fertig, WNDD). Much time in recent years has been devoted to determining areas in Wyoming where the species occurs. It has not been documented within the Bitter Creek Project area, the general project area, or anywhere in Sweetwater County (WNDD 2004). Based on visual observation of the Bitter Creek Project area, and descriptions for vegetation communities in the area, no suitable habitat for Ute ladies' tresses is present. Therefore, the Bitter Creek Project would have no effect on Ute ladies'-tresses, and the species is not discussed further in this EA.

Colorado River Endangered Fish Species. The *Recovery and Implementation Program for Endangered Species in the Upper Colorado River Basin* was initiated in January 1988 as a reasonable and prudent approach for projects to avoid jeopardizing the continued existence of the four species of Colorado River endangered fish--bonytail, Colorado pikeminnow, humpback chub, and razorback sucker. Under the program, any depletions of water from tributaries within the Colorado River drainage system (which includes the Bitter Creek Project area) are considered by the USFWS to jeopardize the continued existence of these species. No such surface water depletions would occur (see Section 2.2.1.7).

3.4.1.3 BLM-sensitive Animal and Plant Species

Based on habitat preference and geographic location, numerous BLM-sensitive species potentially occur in the Bitter Creek Project area (Table 3.5). Sixteen BLM-sensitive animal or plant species that may occur within the Bitter Creek Project area include white-tailed prairie dog, pygmy rabbit, white-faced ibis, ferruginous hawk, greater sage-grouse, long-billed curlew, burrowing owl, sage thrasher, Brewer's sparrow, loggerhead shrike, mountain plover, northern leopard frog, Great Basin spadefoot, flannelmouth sucker, mystery wormwood, and Nelson's milkvetch (WNDD 2004). Seven of the 16 BLM-sensitive species are known to occur within the Bitter Creek Project area and include white-tailed prairie dog, ferruginous hawk, greater sage-grouse, sage thrasher, Brewer's sparrow, flannelmouth sucker, and mountain plover (BBCC 2004; WNDD 2004).

Seven white-tailed prairie dog colonies occur in the Bitter Creek Project area.

Pygmy rabbits are limited to areas of dense and tall big sagebrush in predominantly sandy soils (Clark and Stromberg 1987). Burrows are typically located in areas with greater cover, higher shrub density, taller vegetation, and greater forb density (Ulmschneider 2004). No pygmy rabbits have been documented within 6 mi of the Bitter Creek Project area (WNDD 2004); however, large and dense stands of Wyoming big sagebrush do occur and it is possible that pygmy rabbits also occur.

The mountain plover nests over much of Wyoming, but its preferred breeding habitat is limited to bare and sparsely vegetated habitats (WGFD 2004). Mountain plover have been observed in the Bitter Creek Project area.

Table 3.5 Wyoming BLM-sensitive Species and Habitat Preference, Bitter Creek Project Area, 2004.

Species			
Common Name	Scientific Name	Habitat	Occurrence in Project Area ¹
Mammals			
Long-eared Myotis	<i>Myotis evotis</i>	Conifer and deciduous forests, caves and mines	
Fringed Myotis	<i>Myotis thysanodes</i>	Conifer forests, woodland-chaparral, caves and mine	
Spotted Bat	<i>Euderma maculatum</i>	Cliffs over perennial water, basin-prairie shrub	
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	Forests, basin-prairie shrub, caves and mines	
Pygmy Rabbit	<i>Brachylagus idahoensis</i>	Basin-prairie and riparian shrub	L
White-tailed Prairie Dog	<i>Cynomys leucurus</i>	Basin-prairie shrub, grasslands	K
Wyoming Pocket Gopher	<i>Thomomys clusius</i>	Meadows with loose soil	
Idaho Pocket Gopher	<i>Thomomys idahoensis</i>	Shallow stony soils	
Swift Fox	<i>Vulpes velox</i>	Grasslands	
Birds			
White-faced Ibis	<i>Plegadis chihi</i>	Marshes, wet meadows	L
Trumpeter Swan	<i>Cygnus buccinator</i>	Lakes, ponds, rivers	
Northern Goshawk	<i>Accipter gentilis</i>	Conifer and deciduous forests	
Ferruginous Hawk	<i>Buteo regalis</i>	Basin-prairie shrub, grassland, rock outcrops	K
Greater Sage-grouse	<i>Centrocercus urophasianus</i>	Basin-prairie shrub, mountain-foothill shrub	K
Long-billed Curlew	<i>Numenius americanus</i>	Grasslands, plains, foothills, wet meadows	L
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Open woodlands, streamside willow and alder groves	
Burrowing Owl	<i>Athene cunicularia</i>	Grasslands, basin-prairie shrub	L
Sage Thrasher	<i>Oreoscoptes montanus</i>	Basin-prairie shrub, mountain-foothill shrub	K
Loggerhead Shrike	<i>Lanius ludovicianus</i>	Basin-prairie shrub, mountain-foothill shrub	L
Brewer's Sparrow	<i>Spizella breweri</i>	Basin-prairie shrub	K
Mountain Plover	<i>Charadrius montanus</i>	Shortgrass, great basin-foothills grassland, and sagebrush-grasslands	K
Fish			
Roundtail Chub	<i>Gila robusta</i>	Colorado River drainage, mostly large rivers, also streams and lakes	
Leatherside Chub	<i>Gila copei</i>	Bear, Snake and Green drainages, clear, cool streams and pools	
Bluehead Sucker	<i>Catostomus discobolus</i>	Bear, Snake and Green drainages, all waters	
Flannelmouth Sucker	<i>Catostomus latipinnis</i>	Colorado River drainage, large rivers, streams and lakes	K
Colorado River Cutthroat Trout	<i>Oncorhynchus clarki pleuriticus</i>	Colorado River drainage, clear mountain streams	
Reptiles			
Midget Faded Rattlesnake	<i>Crotalus viridis concolor</i>	Mountain foothills shrub, rock outcrop	
Amphibians			
Northern Leopard Frog	<i>Rana pipiens</i>	Beaver ponds, permanent water in plains and foothills	L
Great Basin Spadefoot	<i>Spea intermontana</i>	Spring seeps, permanent and temporary waters	L

Table 3.5 (Continued)

Species		Habitat	Occurrence in Project Area ¹
Common Name	Scientific Name		
Boreal (Northern Rocky Mountain population) Toad	<i>Bufo boreas boreas</i>	Pond margins, wet meadows, riparian areas	
Spotted Frog	<i>Ranus pretiosa (lutiventris)</i>	Ponds, sloughs, small streams	
Plants			
Meadow Pussytoes	<i>Antennaria arcuata</i>	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands 4,950-7,900 ft	
Small Rock Cress	<i>Arabis pusilla</i>	Cracks/Crevices in sparsely vegetated granite/pegmatite outcrops w/in sage/grasslands 8,000-8,100 ft	
Mystery Wormwood	<i>Artemisia biennis</i> var. <i>diffusa</i>	Clay flats and playas 6,500 ft	L
Nelson's Milkvetch	<i>Astragalus nelsonianus</i> -or- <i>Astragalus pectinatus</i> var. <i>platyphyllus</i>	Alkaline clay flats, shale bluffs and gullies, pebbly slopes, and volcanic cinders in sparsely vegetated sagebrush, juniper, and cushion plant communities at 5,200-7,600 ft	L
Precocious Milkvetch	<i>Astragalus proimanthus</i>	Cushion plant communities on rocky, clay soils mixed with shale on summits and slopes of white shale hills 6,800-7,200 ft	
Cedar Rim Thistle	<i>Cirsium aridum</i>	Barren, chalky hills, gravelly slopes, and fine textured, sandy-shaley draws 6,700-7,200 ft	
Ownbey's Thistle	<i>Cirsium ownbeyi</i>	Sparsely vegetated shaley slopes in sage and juniper communities 6,440-8,400 ft	
Wyoming Tansymustard	<i>Descurainia torulosa</i>	Sparsely vegetated sandy slopes at base of cliffs of volcanic breccia or sandstone 8,300-10,000 ft	
Large-fruited Bladderpod	<i>Lesquerella macrocarpa</i>	Gypsum-clay hills and benches, clay flats, and barren hills 7,200-7,700 ft	
Stemless Beardtongue	<i>Penstemon acaulis</i> var. <i>acaulis</i>	Cushion plant or Black sage grassland communities on semi-barren rocky ridges, knolls, and slopes at 5,900-8,200 ft	
Beaver Rim Phlox	<i>Phlox pungens</i>	Sparsely vegetated slopes on sandstone, siltstone, or limestone substrates 6,000-7,400 ft	
Tufted Twinpod	<i>Physaria condensata</i>	Sparsely vegetated shale slopes and ridges 6,500-7,000 ft	
Green River Greenthread	<i>Thelesperma caespitosum</i>	White shale slopes and ridges of Green River Formation 6,300 ft	
Uinta Greenthread	<i>Thelesperma pubescens</i>	Sparsely vegetated benches and ridges on coarse, cobbly soils of Bishop Conglomerate 8,200-8,900 ft	
Cedar Mountain Easter Daisy	<i>Townsendia microcephala</i>	Rocky slopes of Bishop Conglomerate 8,500 ft	

¹ Likely to occur in or in the vicinity of the Bitter Creek Project area based on habitat, BBCC (2004) data, and WNDD (2004) data.

There are no greater sage-grouse leks within the Bitter Creek Project area; however, one abandoned lek is located approximately 0.4 mi to the south. The BLM and WGFD define an abandoned lek as any lek that has not been active in any year during a consecutive ten-year period. Data collected by BBCC indicates that this lek has not been occupied for the past 15 years (BBCC 2004b). There are no other leks within 2 mi of the Bitter Creek Project area; however, four leks are located within 8 mi of the Bitter Creek Project area. The Bitter Creek Project area does, however, contain potential greater sage-grouse nesting habitat. The CIAA for greater sage-grouse includes the Bitter Creek Project area and a 30-mi area around it (Figure 3.6). The CIAA encompasses approximately 2,306,342 acres and includes portions of Upland Game Management Areas 6, 7, 9, and 10 (WGFD 2004c) and the Lower Green River Basin Sage Grouse Conservation Planning Area (WGFD 2003a). The CIAA contains 42 known greater sage-grouse leks (WGFD 2003b). Approximately 3.7% (84,795 acres) of the CIAA for greater sage-grouse has been disturbed or has been authorized to be disturbed by various projects (see Figure 3.6). Major sources of disturbance include three coal mines, the communities of Rock Springs, Point of Rocks, and Superior, roads, railroads, and 3,401 oil and gas wells. All or portions of Patrick Draw, Continental Divide/Greater Wamsutter, Mulligan Draw, Copper Ridge, Pacific Rim, and Vermillion Basin oil and gas project areas occur in the CIAA.

Great Basin spadefoot (*Spea intermontana*). This species is found in springs, seeps and both permanent and temporary waters.

Northern leopard frog (*Rana pipiens*). The Northern leopard frog inhabits beaver ponds and other permanent waters in the plains and foothills.

Flannelmouth sucker (*Catostomus latipinnis*). The flannelmouth sucker has been observed spawning in Bitter Creek in the late spring.

Brewer's sparrow (*Spizella breweri*). Brewer's sparrow is found in basin prairie shrub habitat, and has been observed in the Bitter Creek Project area.

Sage thrasher (*Oreoscoptes montanus*). Sage thrashers are sagebrush obligates, and have been observed in the Bitter Creek Project area.

Burrowing owl (*Athene cunicularia*). Burrowing owls are found in grasslands and Basin-prairie shrub. They are often found in association with prairie dog colonies, which do occur in the Bitter Creek Project area.

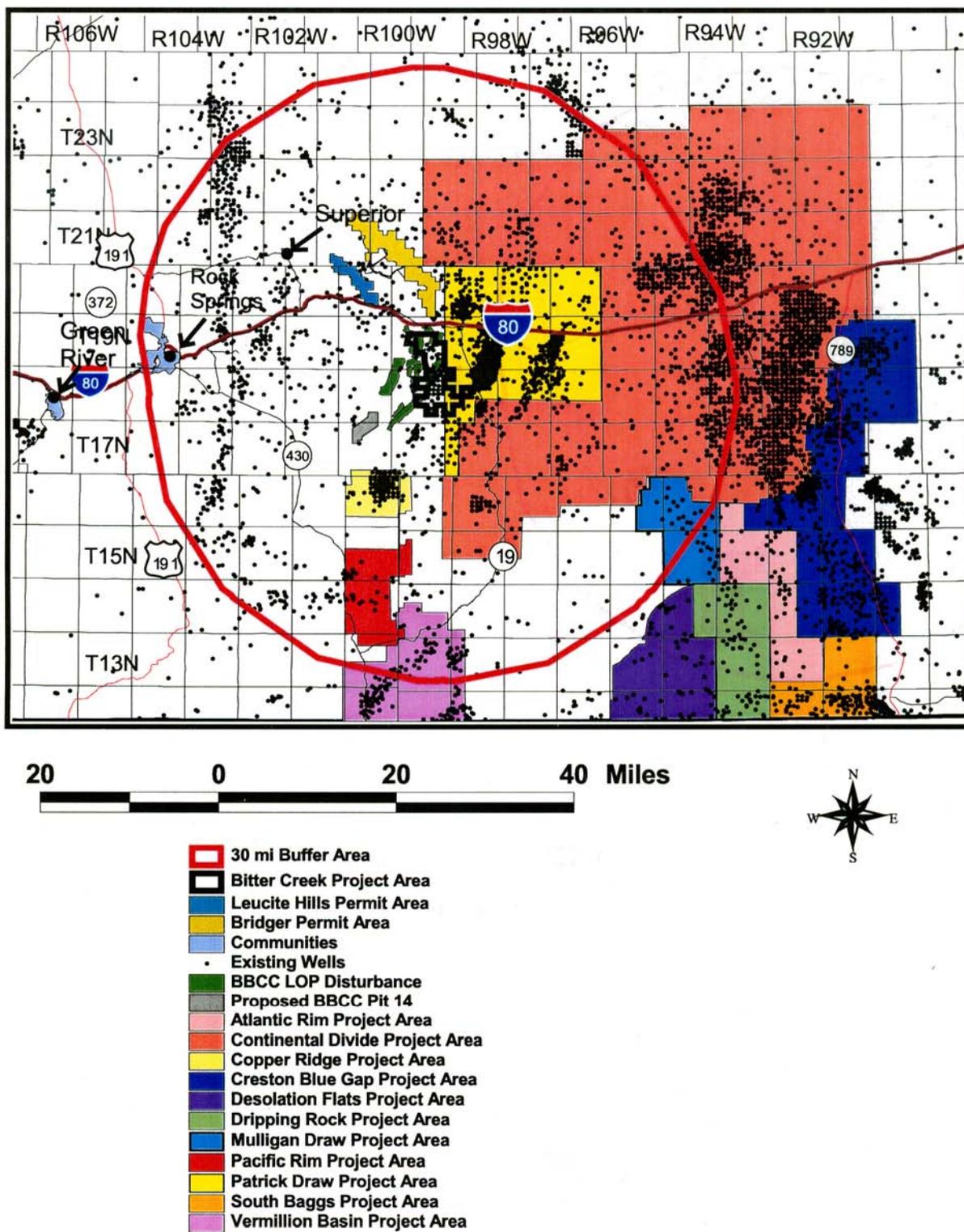


Figure 3.6 CIAA for Greater Sage-grouse.

Loggerhead shrike (*Lanius ludovicianus*). Loggerhead shrike in habit Basin-prairie shrub and mountain-foothill shrub. Suitable habitat occurs in the Bitter Creek Project area.

Long-billed curlew (*Numenius americanus*). These birds inhabit grasslands, plains, and foothills, primarily in association with wet meadows. Some suitable habitat occurs in the Bitter Creek Project area.

Ferruginous Hawk (*Buteo regalis*). Ferruginous hawks occur in, and successfully nest in, the Bitter Creek Project area.

White-faced ibis (*Plegadis chihi*). This species inhabits wet meadows and marshes, and may occasionally visit the Bitter Creek Project area.

Nelson's milkvetch (*Astragalus nelsonianus*). Nelson's milkvetch occurs on alkaline flats, shale bluffs and gullies, pebbly slopes, and volcanic cinders in sparsely vegetated sagebrush, juniper, and cushion plant communities at 5,200 to 7,600 ft elevation. The species is a regional endemic of southwest and central Wyoming, northeast Utah, and northwest Colorado. In Wyoming it is known from the Wind River, Green River, Washakie, southern Powder, and Great Divide basins as well as the Owl Creek Mountains and the Rock Springs Uplift in Fremont, Natrona, and Sweetwater Counties. It flowers from early to late June and sets fruit from late June to August. The species has not been observed in the Bitter Creek Project area, but has been observed within 1 mi of the area, and could occur there.

Mystery wormwood (*Artemisia biennis* var. *diffusa*). Mystery wormwood occurs on clay flats and playas at the 6,500 ft elevation. The species is endemic to Sweetwater County, Wyoming, and flowers and sets fruit August to September (Wyoming Rare Plant Technical Committee 1994). The species has not been observed in the Bitter Creek Project area.

The CIAA for BLM-sensitive species is the Bitter Creek Project area and a 4-mi buffer, an area of 126,560 acres, 25.4% (32,168 acres) of which has been disturbed. A majority of the disturbance (nearly 22,000 acres) is the result of surface coal mining by BBCC. A total of 464 oil and gas wells occur in the CIAA, disturbing an estimated 2,320 acres. Many of the wells occur in the Bitter Creek Project area and in the Patrick Draw field to the north and east. The area also includes portions of the Continental Divide project area.

3.4.2 Vegetation (Including Invasive, Nonnative Species)

Based on 1:100,000 scale mapping, Wyoming big sagebrush is the dominant plant community within the Bitter Creek Project area (71%), followed by greasewood fans and flats (13%), revegetated mine disturbance (7%), surface mining operations (6%), and desert shrub habitat (3%) (U.S. Geological Survey 1996) (Table 3.6).

Dominant species in the Wyoming big sagebrush plant community include Wyoming big sagebrush, black greasewood, shadscale, broom snakeweed, fringed sage, Hood's phlox, prairie Junegrass, needle-and-thread, green needlegrass, blue grama, bluebunch wheatgrass, alkali sacaton, western wheatgrass, and threadleaf sedge. The greasewood fans and flats community type is generally found along streams (e.g., Bitter Creek) on fine-textured, saline upland areas, and on basin fans and flats with black greasewood comprising more than 75% of the total shrub cover. Reclaimed mine disturbance includes all surface-mined areas that have been backfilled, re-contoured, re-topsoiled, and re-vegetated, and that support reclaimed native vegetation. Surface mine operations include all active and un-reclaimed mine areas and associated disturbance (e.g., roads, ponds, etc). The desert shrub includes a mixture of shrubs occurring in dry, saline habitats. Shrubs cover is often dominated by *Atriplex confertifolia*, but can be a mixture of Gardner's saltbush, black greasewood, and/or desert cushion plants (U.S. Geological Survey 1996).

Invasive/non-native species known to exist in the vicinity of the Bitter Creek Project area include perennial pepperweed, hoary cress, Canada thistle, Russian thistle, Russian knapweed, halogeton, cheat grass, kochia, and Dalmatian toadflax (personal communication, October 27, 2003, with Jim Cotterman, Sweetwater County Weed and Pest Control, Farson, Wyoming).

Table 3.6 Major Vegetation Communities within the Bitter Creek Project Area.

Vegetation Community	Approx. Acres Within Bitter Creek Project Area	Approx. % Within Bitter Creek Project Area
Wyoming big sagebrush	13,145	74
Greasewood fans and flats	2,233	12
Revegetated mine disturbance	1,150	6
Surface mine operations	1,000	6
Desert shrub	433	2
	17,961	100

The CIAA for vegetation includes the four 6th-level watersheds that occur in the Bitter Creek Project area (see Figure 3.4). The CIAA includes 67,815 acres, and approximately 36.3% (24,636 acres) has been disturbed, primarily by the BBCC surface coal mine. A total of 199 oil and gas wells occur in the area, disturbing an estimated 995 acres. The other disturbance is associated with roads, the railroad, and miscellaneous disturbances.

3.4.3 Wetlands and Riparian Areas

No formal jurisdictional wetland delineations have been conducted within the Bitter Creek Project area. According to National Wetland Inventory (NWI) maps produced by the USFWS, there are likely less than 14 acres (less than 0.1% of the Bitter Creek Project area) of potential wetlands in the Bitter Creek Project area. The potential wetland areas are widely scattered and include 18 separate areas (USFWS 1997).

Riparian areas in the Bitter Creek Project area are not numerous and, when they are present, are narrow. The most developed riparian areas occur along Bitter Creek, although some less developed riparian areas occur scattered throughout the project area.

The CIAA for wetlands and riparian areas includes the four 6th-level watersheds that occur in the Bitter Creek Project Area (see Figure 3.4). The CIAA includes 67,815 acres, and approximately 36.3% (24,636 acres) has been disturbed, primarily by the BBCC surface coal mine. A total of 199 oil and gas wells occur in the area, disturbing an estimated 995 acres. The other disturbance is associated with roads, the railroad, and miscellaneous disturbances.

3.4.4 Wildlife Resources

3.4.4.1 Introduction

Wildlife surveys, including aerial big game surveys, driving surveys, greater sage-grouse lek surveys, raptor nest surveys, etc., have been conducted for more than 20 years at the Black Butte Coal Mine. Results of the baseline and annual monitoring surveys are reported in permit documents and annual reports submitted to WDEQ/LQD. Some of the surveys were also conducted within a 4-mi buffer surrounding BBCC's current permit boundary that overlaps the western portion of the Bitter Creek Project area. Wildlife species composition within the Bitter Creek Project area is assumed to be generally comparable to that found on the Black Butte Coal Mine.

3.4.4.2 Big Game

Two big game species, pronghorn and mule deer, occur within the Bitter Creek Project area. Population estimates for big game herds are based upon WGFD models presented in the most recent annual big game herd unit reports (WGFD 2004a). The project is also within the Petition Elk Herd Unit (herd Unit 430); however, range type in the project area is classified as “undetermined” range. Elk in the Petition Herd Unit are found to the south of the Bitter Creek Project area in scattered bands at higher elevations on ridges such as Powder Rim, Kinney Rim, Flat Top Mountain, etc., and no elk use the project area. Therefore, elk are not discussed further in this EA.

Pronghorn. Pronghorn in the Bitter Creek Project area belong to the Bitter Creek Pronghorn Antelope Herd (herd unit 414). The Bitter Creek Pronghorn Antelope herd unit had a 2003 postseason population estimate of 12,000, approximately 48% of the population objective of 25,000 animals. The 5-year (1998-2002) population average was 13,200 animals (53% of objective). Continued drought, increasing oil and gas production, and increasing wild horse populations appear to be impacting the Bitter Creek herd unit (WGFD 2004a). Approximately 16,520 acres (99%) of the Bitter Creek Project area is designated as winter/yearlong antelope range, whereas the remaining 120 acres (1%) is designated as crucial winter/yearlong habitat (WGFD 2004a) (Figure 3.7). The crucial winter/yearlong habitat is located at the southern portion of the Bitter Creek Project area.

The CIAA for pronghorn is the Bitter Creek herd unit, which encompasses approximately 1,844,665 acres (Figure 3.8). Approximately 87% of the CIAA is winter/yearlong range, 12% is crucial winter/yearlong range, and 1% is severe winter relief range (Figure 3.5). Approximately 3.3% (60,091 acres) of the CIAA has been disturbed, has been authorized to be disturbed, or could be disturbed by reasonably foreseeable projects. Disturbances are the results of the Black Butte coal mine, roads, portions of Rock Springs, and 3,579 oil and gas wells in various project areas including Patrick Draw, Continental Divide/Wamsutter II, Creston-Blue Gap, South Baggs, Vermillion Basin, Copper Ridge, Pacific Rim, Atlantic Rim, Desolation Flats, Mulligan Draw, and Dripping Rock.

Mule Deer. Mule deer within the Bitter Creek Project area belong to South Rock Springs Mule Deer Herd (herd unit 424). The South Rock Springs Mule Deer Herd had a 2003 posthunt population estimate of 7,200, approximately 61% the population objective of 11,750 animals (WGFD 2004). The 5-year (1998-2002) population average was 6,320, 54% of objective (WGFD 2004a). All of the Bitter Creek Project area is winter/yearlong mule deer range. No mule deer crucial winter range occurs within the Bitter Creek Project area. The closest crucial winter range is located approximately 5 mi west of the Bitter Creek Project area (WGFD 2004a).

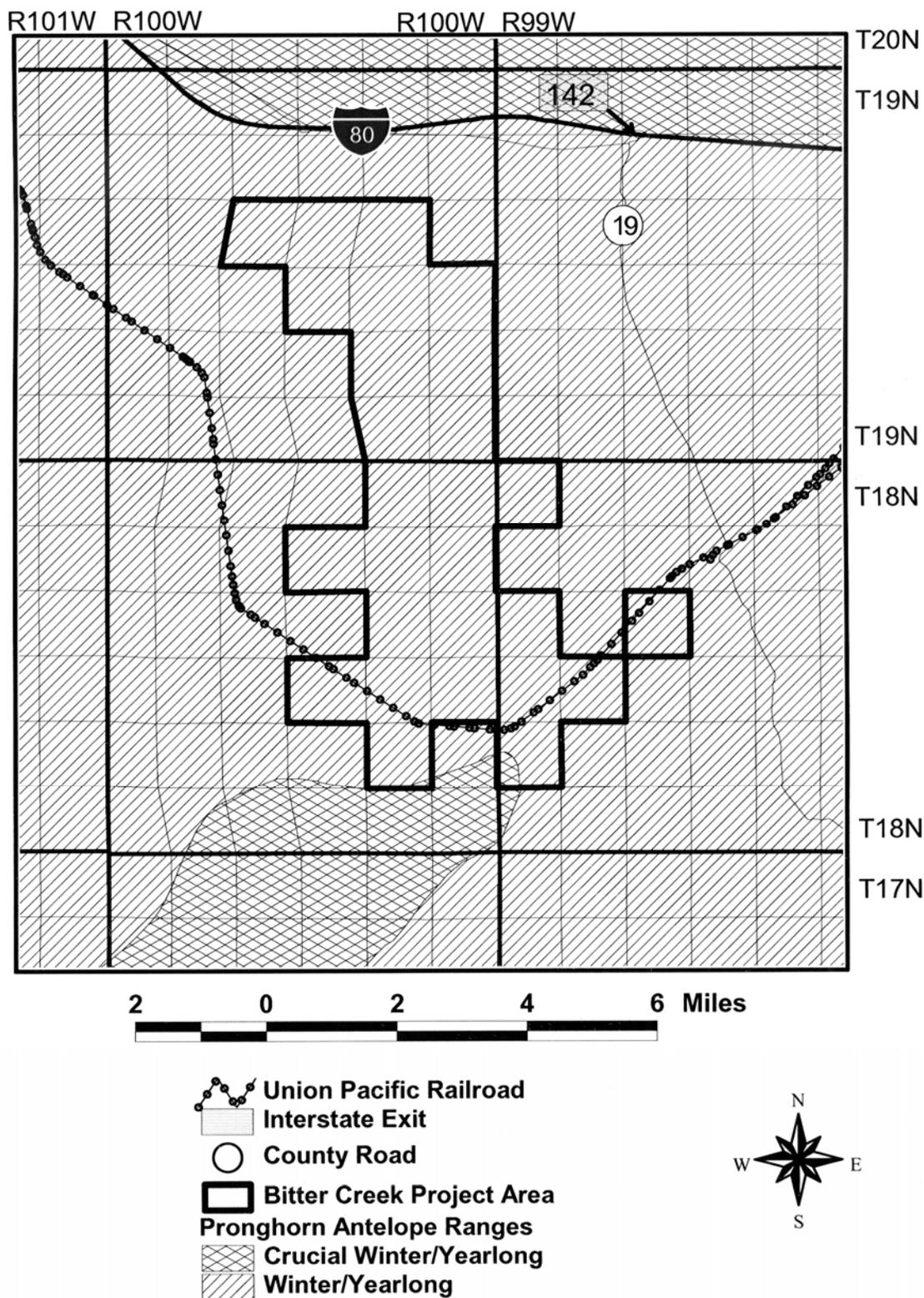
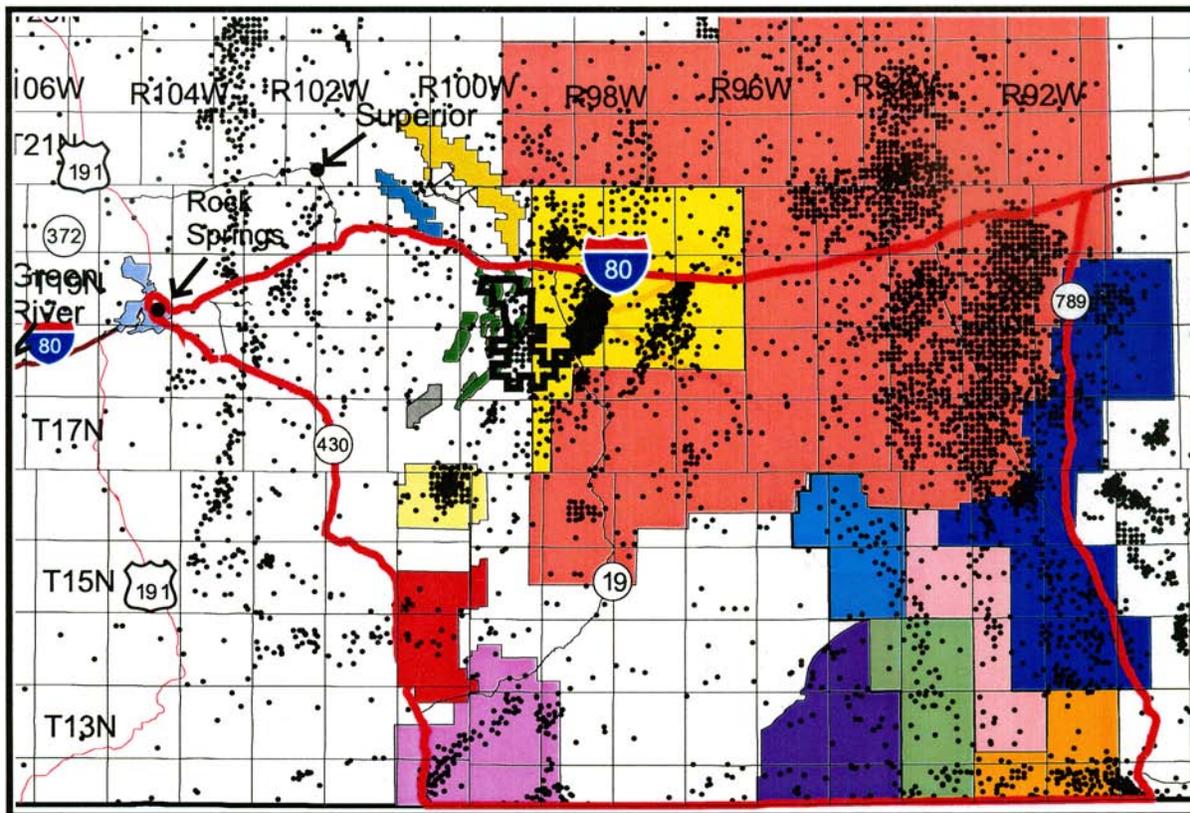


Figure 3.7 Pronghorn Range Types in Bitter Creek Project and Adjacent Areas.



- Antelope Herd Unit 414
- Bitter Creek Project Area
- Leucite Hills Permit Area
- Bridger Permit Area
- Communities
- Existing Wells
- BBCC LOP Disturbance
- Proposed BBCC Pit 14
- Atlantic Rim Project Area
- Continental Divide Project Area
- Copper Ridge Project Area
- Creston Blue Gap Project Area
- Desolation Flats Project Area
- Dripping Rock Project Area
- Mulligan Draw Project Area
- Pacific Rim Project Area
- Patrick Draw Project Area
- South Baggs Project Area
- Vermillion Basin Project Area

Figure 3.8 Bitter Creek Herd Unit, the CIAA for Pronghorn.

The CIAA for mule deer is the South Rock Springs Herd Unit, which encompasses approximately 1,477,069 acres (Figure 3.9). Approximately 53% of the CIAA is winter/yearlong range, 24% is crucial winter/yearlong range, and 23% is spring/summer/fall range. Approximately 3.5% (51,839 acres) of the CIAA has been disturbed, has been authorized to be disturbed, or could be disturbed by reasonably foreseeable projects. Disturbances include the Black Butte coal mine, roads, portions of Rock Springs and Green River, and 1,771 oil and gas wells in various project areas including Patrick Draw, Continental Divide/Wamsutter II, Vermillion Basin, Copper Ridge, and Pacific Rim.

3.4.4.3 Other Mammals

Predators known to occur or to potentially occur in the Bitter Creek Project area and CIAA include coyote, red fox, raccoon, ermine, long-tailed weasel, badger, western spotted skunk, striped skunk, mountain lion, and bobcat. Lagomorph species include desert cottontail, mountain (Nuttall's) cottontail, and white-tailed jackrabbit. Squirrels known to occur or to potentially occur include least chipmunk, Wyoming ground squirrel, golden-mantled ground squirrel, and thirteen-lined ground squirrel. Other rodents include four species of pocket gopher (northern, plains, Merriam's, and Great Basin), two species of pocket mouse (olive-backed and northern), Ord's kangaroo rat, deer mouse, northern grasshopper mouse, bushy-tailed woodrat, six species of vole (western, heather, meadow, long-tailed, prairie, and sagebrush), and western jumping mouse. Bats (western small-footed, long-eared, fringed, long-legged, little brown, and silver-haired) may also occur (WGFD 2004b).

The CIAA for other mammals is the Bitter Creek Project area and a 4-mi buffer, an area of 126,560 acres, 25.4% (32,168 acres) of which has been disturbed (see Figure 3.2). A majority of the disturbance (nearly 22,000 acres) is the result of surface coal mining by BBCC. A total of 464 oil and gas wells occur in the CIAA, disturbing an estimated 2,320 acres. Many of the wells occur in the Bitter Creek Project area and in the Patrick Draw field to the north and east. The area also includes portions of the Continental Divide project area.

3.4.4.4 Raptors

Raptor species known to occur within the Bitter Creek Project area and CIAA include golden eagle, prairie falcon, American kestrel, Swainson's hawk, ferruginous hawk, red-tailed hawk, northern harrier,

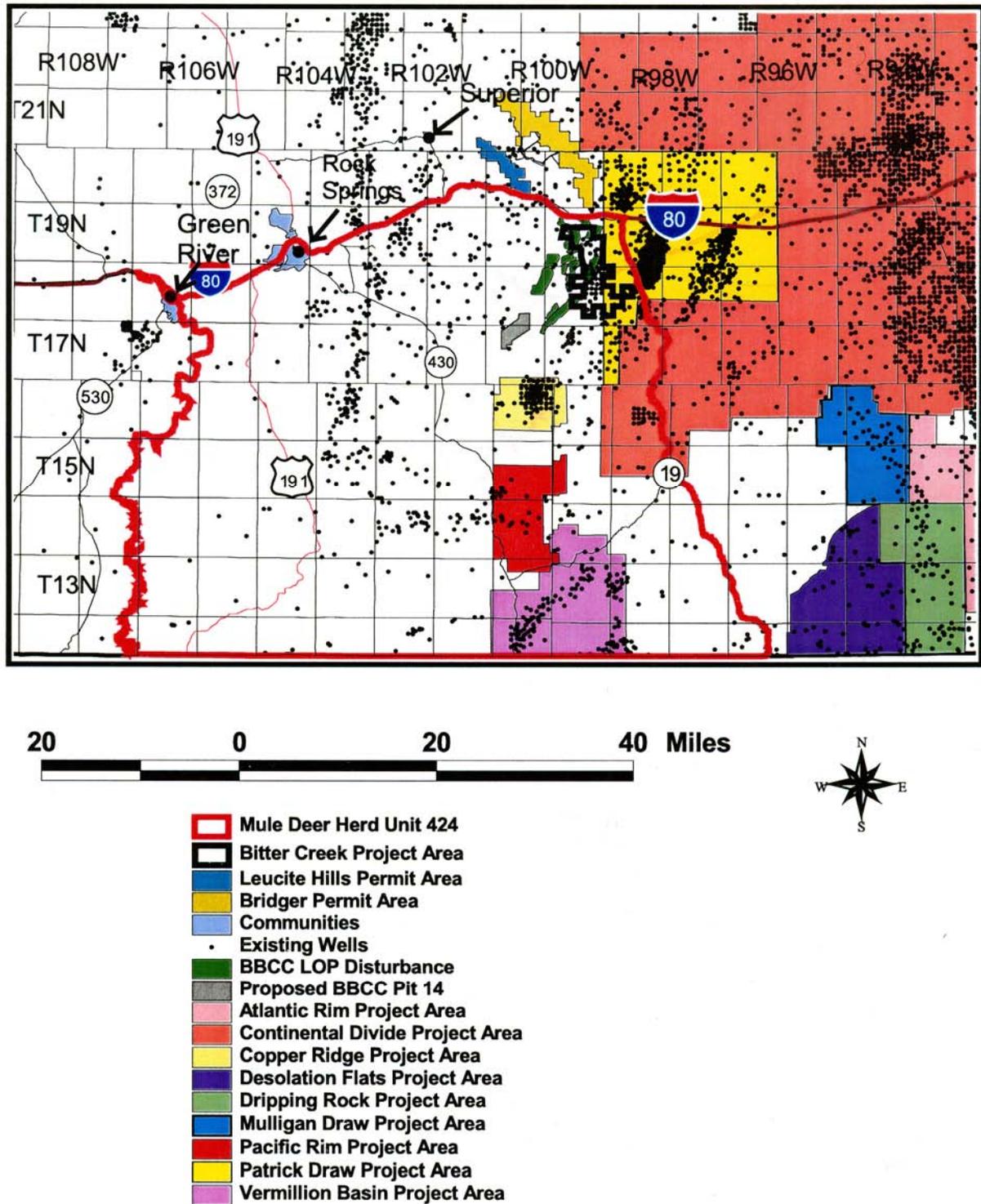


Figure 3.9 South Rock Springs Mule Deer Herd Unit, the CIAA for Mule Deer.

rough-legged hawk (winter resident), great horned owl, and burrowing owl (WGFD 2004b; BBCC 2004a; BLM 2003).

Historically, the western portion of the Bitter Creek Project area has been included in the annual raptor monitoring surveys conducted by BBCC. Approximately 69 raptor nests are known to occur within the Bitter Creek Project area (Figure 3.10). Fifty-three of these nests were identified as ferruginous hawk nests, six were identified as red-tailed hawk nests, one is an American kestrel nest, four are prairie falcon nests, four are golden eagle nests, and the identity of the raptor building one nest is unknown (BBCC 2004b). Three nests (all ferruginous hawk nests) within the Bitter Creek Project area were active in 2003 (BBCC 2004b). Raptors typically have multiple nesting sites, and surveys have determined that in the Black Butte area, depending upon the specific species and specific birds, some raptors may have as many as 17 different nests in a particular territory (BBCC 2004b).

The CIAA for raptors includes the Bitter Creek Project area and a 2-mi buffer area (approximately 67,800 acres) (see Figure 3.10). Raptor nests within the Bitter Creek Project area are discussed above. There are 91 additional raptor nest sites within a 2-mi buffer area (see Figure 3.10). Forty-two of these nests were identified as ferruginous hawk nests, 15 as golden eagle nests, 11 as prairie falcon aeries, three as red-tailed hawk nests, two as great horned owl nests, one as an American kestrel nest, and 17 as nests for which the species of raptor remains unknown (BBCC 2003). All of these nests are currently being monitored annually for occupancy and productivity by BBCC. Of the 160 known raptor nests in the CIAA (Bitter Creek Project Area and the 2-mi buffer area), six were determined to be active in 2003 (three golden eagle nests and three ferruginous hawk nests) (BBCC 2004b). Approximately 26.7% (18,109 acres) of the CIAA has been disturbed, has been authorized to be disturbed, or could be disturbed by reasonably foreseeable future actions.

3.4.4.5 Upland Game Birds

Mourning dove and greater sage-grouse are the only upland game bird species known to occur on and adjacent to the Bitter Creek Project area (BBCC 2004b). The greater sage-grouse is a BLM-sensitive species and is discussed in Section 3.4.1.3. The CIAA for mourning doves is the 2,300,000-acre Upland Game Bird Management area Number 6, of which approximately 4% is currently disturbed, authorized to be disturbed, or could reasonably be expected to be disturbed. Mourning doves are summer residents in

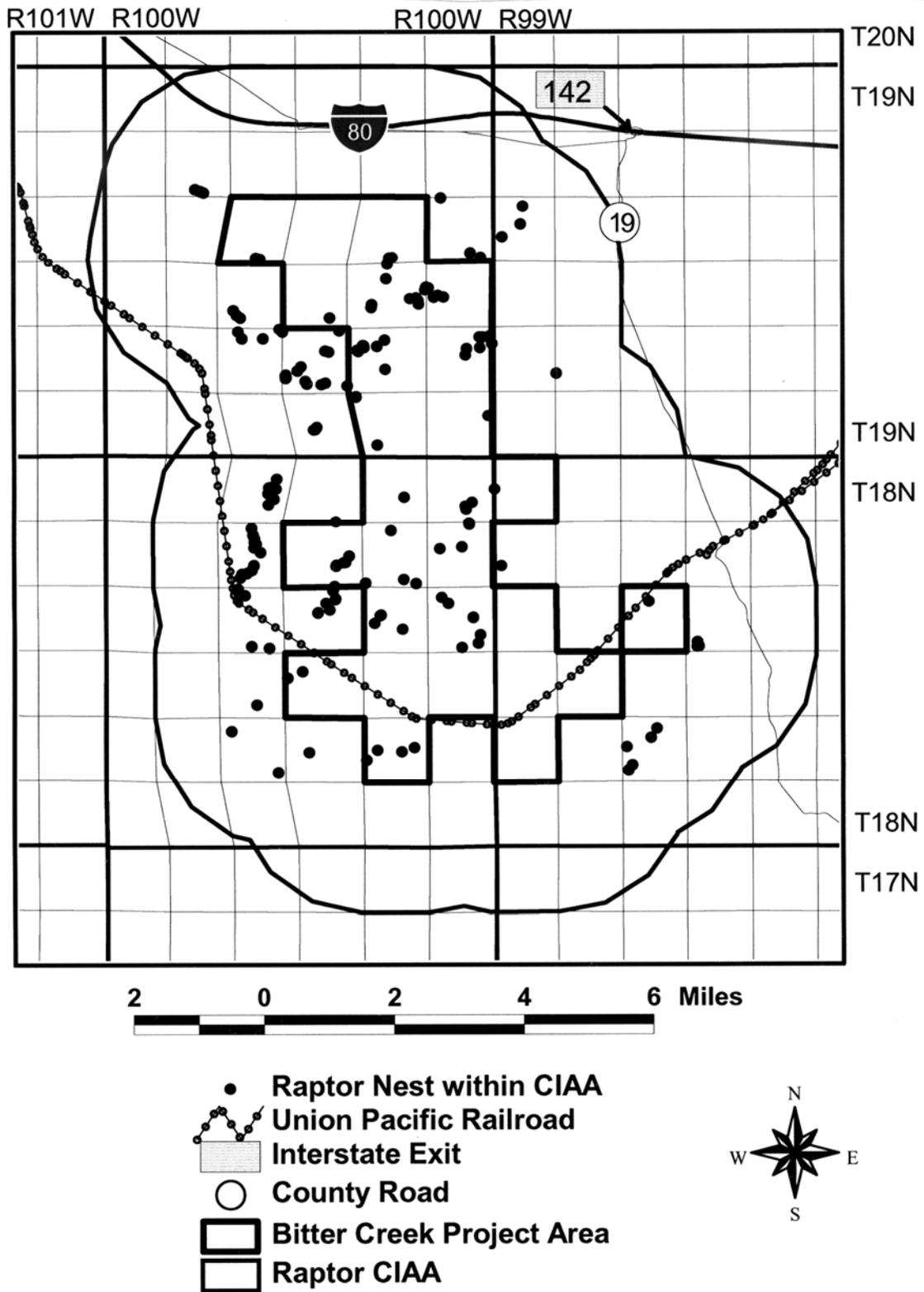


Figure 3.10 Raptor Nests Within the Bitter Creek Project Area and CIAA for Raptors.

Wyoming, are classified by the WGFD as abundant, and have been documented to nest in the CIAA (WGFD 2004b). An estimated 646 mourning doves were harvested during the 2003 hunting season in Upland Game Bird Management area Number 6 (WGFD 2004c).

3.4.4.6 Other Birds

Bird species potentially occurring within the Bitter Creek Project area, based upon range and habitat preference, include common nighthawk, Say's phoebe, western kingbird, horned lark, swallows (e.g., violet-green, barn, cliff), black-billed magpie, common raven, American crow, rock wren, mountain bluebird, loggerhead shrike, Brewer's sparrow, vesper sparrow, savannah sparrow, sage sparrow, lark bunting, McCown's longspur, red-winged blackbird, western meadowlark, Brewer's blackbird, common grackle, green-tailed towhee, and brown-headed cowbird (WGFD 2004b).

Because there are no permanent surface water bodies (except Bitter Creek) within the Bitter Creek Project area, it is unlikely that many waterfowl and shorebirds would typically nest in the area. However, several species of waterfowl and wading/shore birds may seasonally utilize portions of Bitter Creek or the BBCC sedimentation ponds located within the Bitter Creek Project area.

The CIAA for other birds encompasses the Bitter Creek Project area and a 4-mi buffer area and includes approximately 126,560 acres (see Figure 3.2). Waterfowl habitat in the CIAA includes approximately 19 mi of Bitter Creek and numerous BBCC ponds. Waterfowl species likely to occur in the CIAA include common loon, pied-billed grebe, horned grebe, western grebe, Clark's grebe, eared grebe, white pelican, double-breasted cormorant, American coot, Canada goose, mallard, green-winged teal, northern pintail, blue-winged teal, cinnamon teal, northern shoveler, redhead, ring-necked duck, goodwill, American wigeon, and common merganser (WGFD 2004b; BBCC 2004). Approximately 25.4% (32,168 acres) of the CIAA has been disturbed, has been authorized to be disturbed, or could be disturbed by reasonably foreseeable future actions.

3.4.4.7 Amphibians, Reptiles, and Fish

Based on range and habitat preference, few amphibians or reptiles are known to occur in the Bitter Creek Project Area. Species of amphibians or reptiles that have been documented to occur include tiger salamander, great basin spadefoot, sage lizard, greater short-horned lizard, and great basin gopher snake

(BBCC 2004b). There are no permanent water bodies or perennial streams within the Bitter Creek Project area except for a 5.5-mi segment of Bitter Creek that runs through the southern portion. Bitter Creek does not contain any game fish species; however, it does contain habitat for non-game fish species such as speckled dace, longnose dace, flannelmouth sucker, and mountain sucker (BBCC 2004a).

The CIAA for amphibians, reptiles, and fish includes the four 6th-level watersheds that occur in the Bitter Creek Project area (see Figure 3.5). The CIAA includes 67,815 acres, and approximately 36.3% (24,636 acres) has been disturbed, primarily by the BBCC surface coal mine. A total of 199 oil and gas wells occur in the area, disturbing an estimated 995 acres. The other disturbance is associated with roads, the railroad, and miscellaneous disturbances.

3.4.5 Wild Horses

The Bitter Creek Project area is within the Salt Wells Wild Horse Herd Management Area (WHHMA) that includes an area from U.S. Highway 191 south of Rock springs, east to the Rock Springs-Rawlins BLM Resource Area boundary, and south to the Wyoming-Colorado state line. The WHHMA includes 1,193,283 acres, 61% of which is federal surface, 3% of which is State of Wyoming surface, and 36% of which is private surface. The CIAA for wild horses is the Salt Wells WHHMA and the Bitter Creek Project area represents approximately 1.5% of the total area within the WHHMA (Figure 3.11). Few wild horses use the Bitter Creek Project area. The "herd-appropriate management level" for the Salt Wells herd, as determined by the BLM, is 251-365 wild horses, and the herd is currently estimated to have approximately 480 wild horses (personal communication, January 5, 2005, with Jay D'Ewart, Range Conservationist/Wild Horse Specialist, BLM, Rock Springs Field Office, Wyoming). There is minimal fencing within the Salt Wells WHHMA, and those fences that are present are associated with deeded property or major transportation corridors such as I-80, Wyoming Highway 430, and the Union Pacific Railroad tracks. Approximately 3.8% (45,676 acres) of the CIAA has been disturbed, has been authorized to be disturbed, or could be expected to be disturbed by reasonably foreseeable projects. Disturbances include the Black Buttes coal mine (approximately 15,000 acres), roads (approximately 8,000), 1,829 oil and gas wells (approximately 9,000 acres), railroads (approximately 1,300 acres), and communities (approximately 2,500 acres). All or portions of the Continental Divide, Patrick Draw, Copper Ridge, Pacific Rim, and Vermillion Basin project areas are included in the CIAA.

3.5 SOCIAL RESOURCES

3.5.1 Cultural Resources (Including Native American Religious Concerns)

3.5.1.1 Introduction

Cultural resources are the nonrenewable physical remains of past human activity and are protected under Section 106 of the *National Historic Preservation Act of 1966* (as amended), the *Archaeological Resources Protection Act of 1979* (as amended), the *Antiquities Act of 1906*, the *Native American Graves Protection and Repatriation Act of 1990*, and other authorities. Archaeological investigations in the Great Divide Basin indicate that human activity has occurred across the landscape over the past 10,000 years, beginning during the Paleoindian period and continuing up to the present. Throughout the prehistoric past, highly mobile hunters and gathers used the and exploited a wide variety of natural resources (Frison 1991).

A records check was conducted for the Bitter Creek Project area on March 25, 2004. A total of 72 cultural resource inventories have been completed within the Bitter Creek Project area to date, including a total of 67 Class III surveys (36 linear surveys, 19 block surveys, and 12 linear/block combination surveys). The remaining inventories included five Class II surveys (three linear and two block surveys). In addition, there have been two pipeline monitoring projects and one data recovery project.

Twelve of the 72 Class III inventories encompass large areas of the Bitter Creek Project area, and account for the majority of the recorded cultural resources. Ten of the 27 sections in the Bitter Creek Project area, mostly related to the Black Butte Coal Mine, have been completely inventoried as a result of these 12 large surveys. However, these inventories were conducted in 1974 and do not reflect current standards for archaeological inventories. Post-1980 block and linear Class III inventories account for approximately 1,000 acres. Therefore, approximately 6% of the entire project area has been inventoried to current standards. Nonetheless, if you combine the pre-1980 and post-1980 inventories, approximately 43% of the project area has been surveyed. Given the fact that 176 sites were recorded, it is estimated that a total of 410 prehistoric and historic sites would be present if 100% of the Bitter Creek Project area is inventoried (1 site per 42.2 acres).

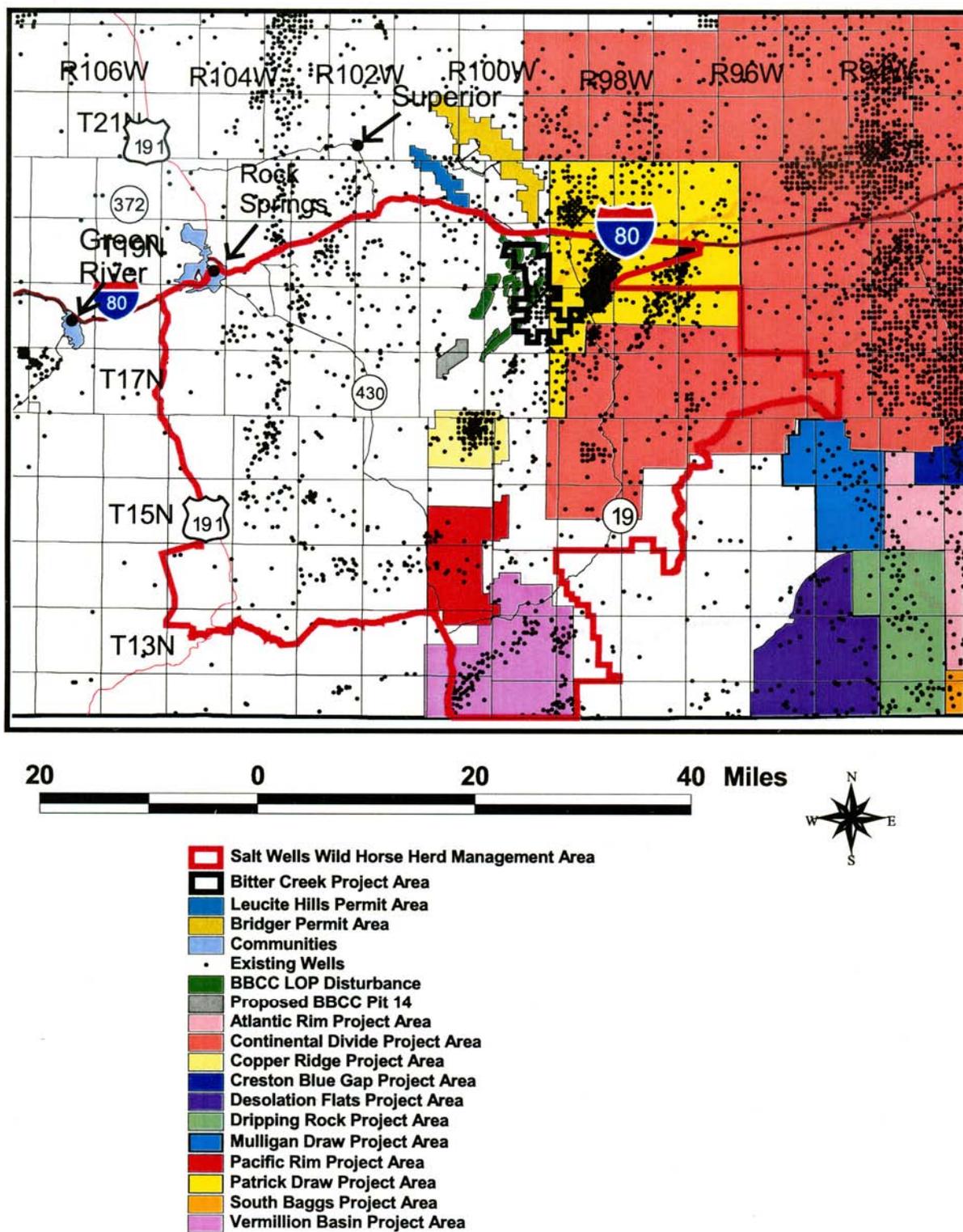


Figure 3.11 Salt Wells Wild Horse Herd Management for Wild Horses.

A total of 176 cultural resource sites have been recorded within the Bitter Creek Project area including 138 prehistoric sites, 28 historic sites, and 10 sites with both prehistoric and historic components. Nine of the prehistoric sites have been determined as eligible to the National Register of Historic Places (NRHP) with concurrence from the Wyoming State Historic Preservation Office (SHPO), 26 prehistoric sites have been determined as not eligible to the NRHP with SHPO concurrence, and 103 prehistoric sites remain unevaluated to the NRHP. One historic site has been determined as eligible to the NRHP with SHPO concurrence, one historic site has been determined as not eligible to the NRHP with SHPO concurrence, and 26 historic sites remain unevaluated to the NRHP. Of the 10 multicomponent sites, four have been determined as eligible to the NRHP with SHPO concurrence and six remain unevaluated to the NRHP.

The CIAA for cultural resources includes the Bitter Creek Project area and a 5-mile buffer (see Figure 3.2). The CIAA includes 161,555 acres, 33,684 (20.9%) of which are disturbed by coal mines, roads, railroads, and 506 oil and gas wells. Disturbance that has or will occur on federal surface or over federal minerals is subject to laws and regulations that protect cultural resources, especially those eligible for the NRHP. However, much of the CIAA is in checkerboard ownership, and some cultural resources on private surface may be disturbed/destroyed. The Proposed Action is on federal surface and would not result in significant cumulative impacts to cultural resources.

3.5.1.2 Prehistoric Site Types

The prehistoric sites (including the prehistoric components of multicomponent sites) located in the Bitter Creek Project area can be grouped into three categories: 1) open camp/habitation sites; 2) lithic scatters, knapping stations, and/or quarry sites; and 3) sites that contain features that may be associated with Native American sacred/respected places. Ninety sites are classified as open camp habitation sites based on the presence of hearths, fire-cracked rock, lithic debris, and diverse artifact assemblages (tools, milling implements, etc.). Four of these habitation sites are located in rockshelters, which are known for potentially containing deep cultural deposits as a result of high sedimentary deposition and low erosion. Forty-four sites are lithic scatters, knapping stations, or quarry sites characterized by the presence of debris from the modification of stone, and generally associated with no other artifact types or features. Three of the lithic scatters are classified as quarry sites where the procurement of lithic raw material occurred, and are characterized by the presence of tested cobbles and associated lithic debris. Sites within the Bitter Creek Project area that may be associated with Native American sacred/respected places include features such as stone circles, cairns, and petroglyphs. These properties, based on consultation

with Native American Tribes, may also be classified as Traditional Cultural Properties (TCP). Eight sites contain stone circles, two contain cairns, and one has prehistoric petroglyphs.

3.5.1.3 Historic Site Types

A total of 38 historic components (including the 28 historic sites and 10 historic components from multicomponent sites) have been recorded within the Bitter Creek Project area. Fifteen sites are associated with ranching or stock herding activities, and these sites are dominated by camping debris scatters created in the course of tending stock herds. Thirteen of the sites are trash scatters related to historic habitation and utilization of the area. Four of the sites are bridges, four contain historic rock inscriptions, one is the Patrick Station of the Union Pacific Railroad, and one is the Overland Trail.

The Overland Trail is the most notable historic site in the Bitter Creek Project area (Figure 3.12). According to the recorded trail segments discovered during cultural resource inventories, the trail roughly follows the course of Bitter Creek and passes through a portion of the Bitter Creek Project area. The overall trail is eligible for the NRHP; however, only intact segments of the trail are considered as contributing to the historic site and eligible for federal protection. The BLM has completed an evaluation of the portion of the Overland Trail located near the Bitter Creek Project area and determined that only 1.41 mi of the trail segment located within the Bitter Creek Project area contribute to the eligibility of the site and must continue to be protected from future impacts (personal communication, December 3, 2004, with Terry Del Bene, BLM cultural resource specialist, Rock Springs Field Office). The Green River RMP (BLM 1997) includes 0.5-mi wide Conditional Surface Use restrictions on contributing portions of the trail that occur on public lands. Visual intrusions in this 0.5-mi wide area are not permitted. Project may cross contributing segments of the trail only within existing disturbances, and an expansion of existing disturbances to contributing segments of the trail could only occur with a maintenance action to the Green River RMP. The contributing segments of the Overland Trail are located in Section 30 of T18N, R99W and Section 26 of T18N, R100W, and are located at the southern boundary of the Bitter Creek Project area (Figure 3.7). The remaining segments of the Overland Trail located within the Bitter Creek Project area do not contribute to the eligibility of the trail and do not warrant or require any protection measures.

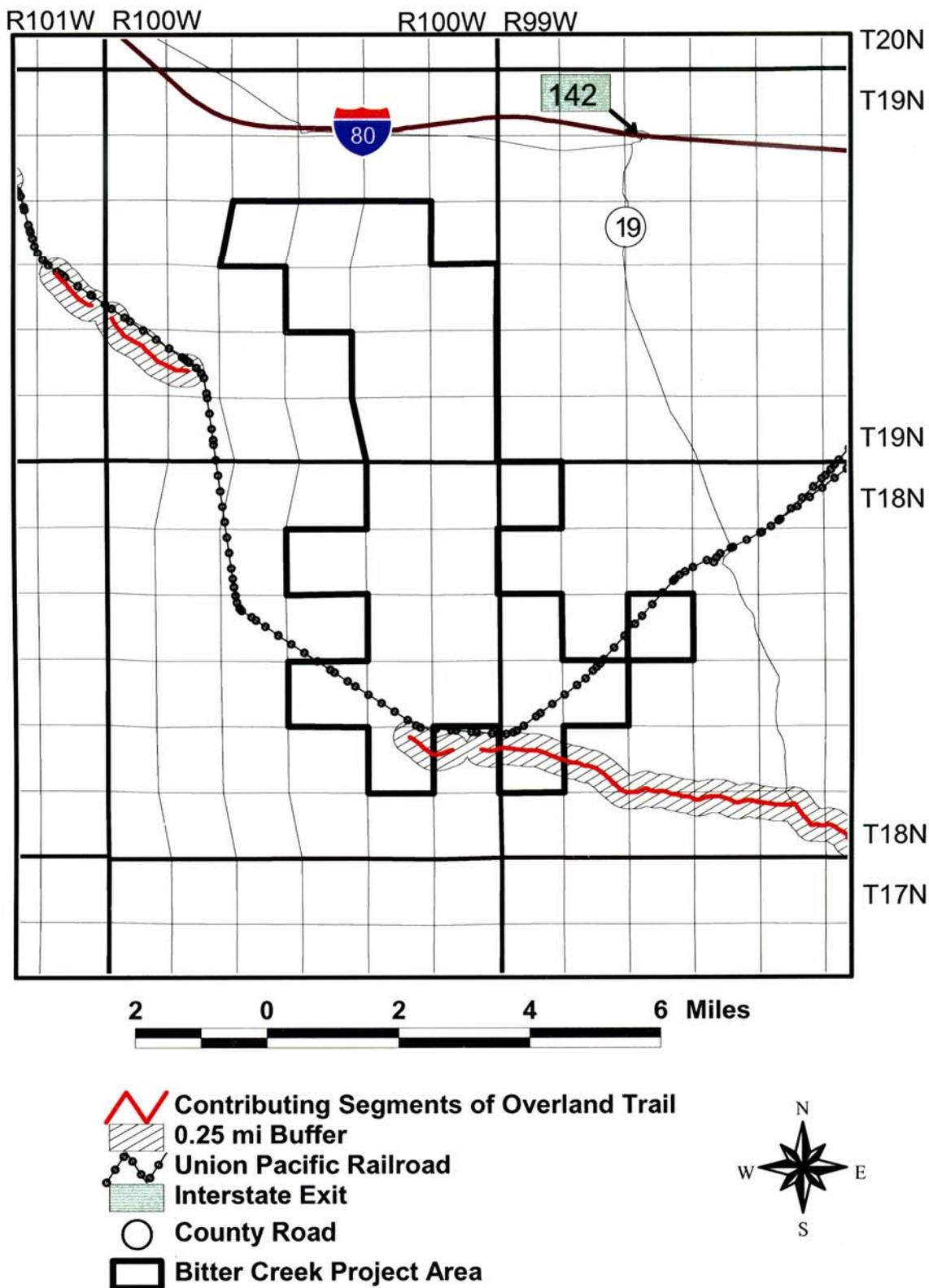


Figure 3.12 Contributing Segments of the Overland Trail Near the Bitter Creek Project Area.

3.5.2 Native American Religious Concerns

In accordance with the *American Indian Religious Freedom Act*, the *Native American Graves Protection and Repatriation Act*, the *National Historic Preservation Act*, BLM Manual 8160-1 Handbook (BLM 1979a), and other authorities, numerous Native American tribes were consulted during the preparation of this EA. The tribes retain all rights not explicitly ceded in the treaties transferring ownership to the Federal Government. Tribes and/or individuals were sent letters requesting their comments concerning any religious or cultural areas within or near the Bitter Creek Project area. The tribes officially recognized as having claims in the Bitter Creek Project area are the Eastern Shoshone, Shoshone Bannock, Northern Ute, and Northern Arapaho. Many other tribes, including the Sioux, Crow, Cheyenne, Cherokee, Navajo, and Winnebago have documented presence in the general area but have no land claims. The scoping request for information regarding important cultural resources does not eliminate the need to consult with the tribes regarding claims made during the development stage.

Prehistoric human burials, rock alignments, petroglyphs, steatite procurement locales, and modern-day Native American use, extraction, or religious sites are considered sensitive and sacred to modern Native Americans. These sites are referred to as Traditional Cultural Properties (TCPs). Several sensitive cultural sites are already known to occur in the general area and more are anticipated as our knowledge of the area increases. Potential TCPs known to occur within the Bitter Creek Project area include two cairn sites (48SW168 and 48SW426), five rock alignment sites (48SW509, 48SW510, 48SW6606, 48SW14101, and 48SW14102), and one petroglyph and/or pictograph site (48SW14288). These sites have the potential for being designated as TCPs by the federal government after soliciting tribal input.

The CIAA for Native American religious concerns includes the Bitter Creek Project area and a 5-mi buffer (see Figure 3.2). The CIAA includes 161,555 acres, 33,684 (20.9%) of which are disturbed by coal mines, roads, railroads, and 506 oil and gas wells. Disturbance that has or will occur on federal surface or over federal minerals is subject to laws and regulations that protect Native American religious concerns, especially those eligible for the NRHP. However, much of the CIAA is in checkerboard ownership, and some Native American religious concerns on private surface may be disturbed/destroyed.

3.5.3 Visual Resources

The BLM has undertaken visual resource management (VRM) on the lands under its management in the Bitter Creek Project area, with the overall objective of minimizing visual impacts resulting from human activities. The VRM inventory process considers the scenic quality of the landscape, viewer sensitivity, and the distance from the viewer to the landscape. VRM relative values are indicated by one of five designations (Table 3.7).

The BLM has mapped the entire Rock Springs Field Office area for VRM. Approximately 3% (500 acres) of the Bitter Creek Project area is located in VRM Class III. This Class III area is located along the northern boundary of the Bitter Creek Project area and includes a 1- to 3-mi wide corridor along I-80. Moderate changes to the existing landscape are allowed in Class III areas. Approximately 94% (16,821 acres) of the Bitter Creek Project area is classified as VRM Class IV, which allows resource

Table 3.7 BLM Visual Resource Management Class Objectives.¹

Class	Description
I	Preserve the existing character of the landscape. Although this class provides mainly for natural ecological change, limited development activity may be allowed in some areas, if the level of change to the characteristic landscape is very low and nearly unnoticeable. This class includes primitive (wilderness) areas, some nature areas, wild sections of national wild and scenic rivers, and other congressionally and administratively designated area where decisions have been made to preserve a natural landscape.
II	Retain the existing character of the landscape. Management activities may be seen but should not attract the attention of the casual observer. Change to the characteristic landscape should be low, and change must repeat the basic elements (i.e., form, line, color, texture) found in the predominant natural features of the existing landscape.
III	Partially retain the existing character of the landscape. Moderate changes to the existing landscape are allowed, although management activities associated with these changes should not dominate the view of the casual observer. As in Class II, change should repeat the basic elements of the characteristic landscape.
IV	Provide for management activities that require major modification of the existing character of the landscape. Although management activities may dominate the view and be the major focus of viewer attention, every attempt should be made to minimize the impact of these activities through careful location selection, minimal disturbance, and repetition of the basic elements of the characteristic landscape. The relative change to the characteristic landscape can be high.
V (Rehabilitation Area)	The natural character of the landscape has been disturbed (usually by cultural activities) to a point where rehabilitation is needed to bring it up to one of the higher classifications.

¹ Source: BLM (1986).

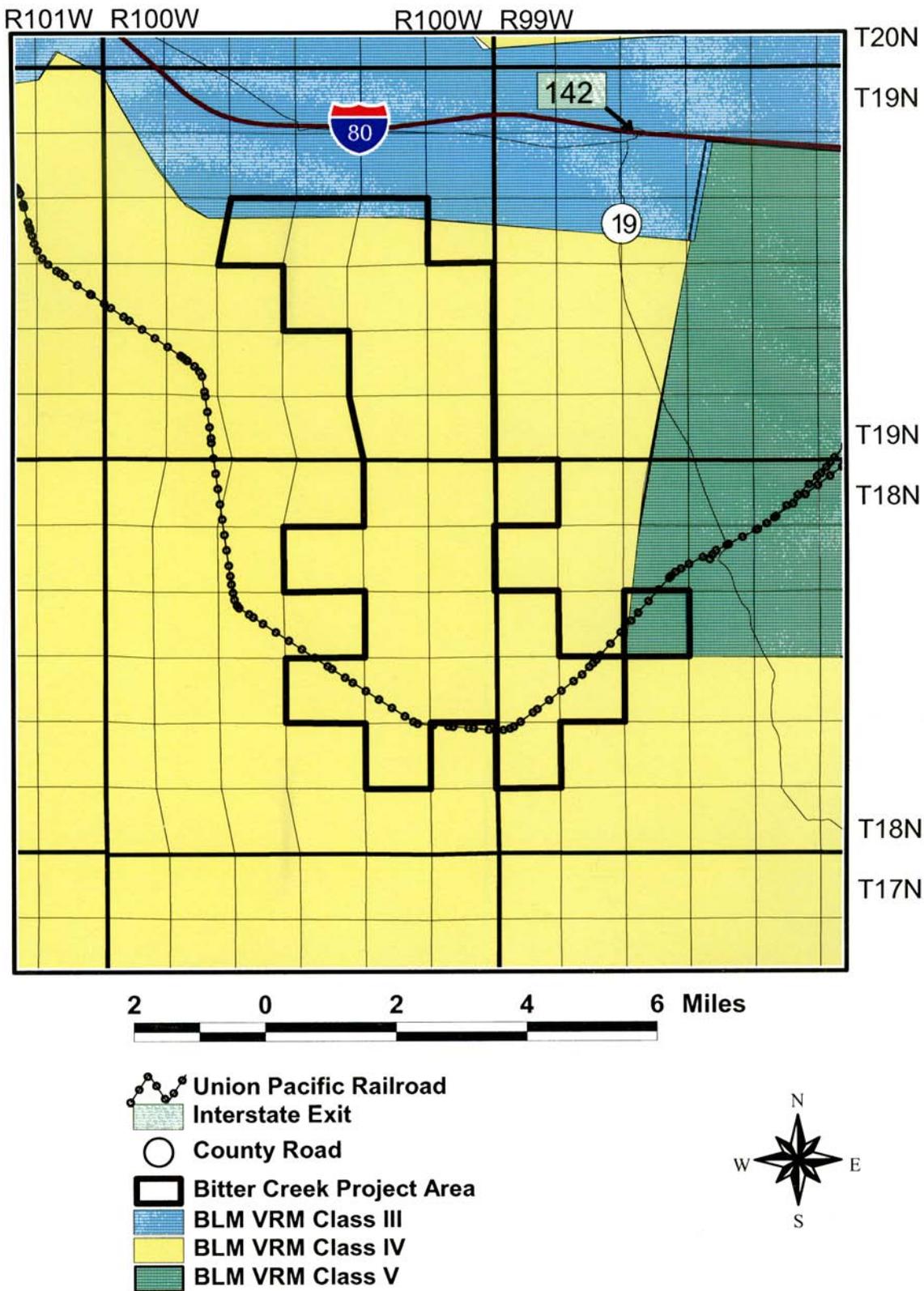


Figure 3.13 VRM Classes Within and Near the Bitter Creek Project Area.

management activities to result in major modifications to the existing character of the landscape. In addition, there are approximately 640 acres (3%) of Bitter Creek Project area that are designated as Class V (Rehabilitation Area), meaning that the natural character of the landscape has been previously disturbed (usually by human activities) (Figure 3.13). This portion of the Bitter Creek Project area overlaps the Patrick Draw oil and gas field that was discovered in 1959. Due to previous disturbance primarily the result of the Patrick Draw oil and gas field, Section 16 of T18N, R99W was classified as VRM Class V – Rehabilitation in the Green River RMP Approved Decision 1997. With the application of the Management Situation Analysis “Standard Practices Applied to Surface Disturbing Activities” April 6, 1990, and according to the RSFO recreation planner this area has been rehabilitated to the standards of a Class IV area and is managed as such. A maintenance action will be submitted to amend the Green River RMP’s previous classification of this area. The Class V area is managed in the same manner as a Class IV area.

The Bitter Creek Project area is the CIAA for visual resources. A total of 3,923 acres (21.8%) of the 17,961-acre CIAA has been disturbed, primarily by surface coal mining by BBCC (2,561 acres, 51% of which is in some state of reclamation) and by the 69 oil and gas wells, 29 of which have been permanently abandoned.

3.6 ECONOMIC RESOURCES

3.6.1 Socioeconomics

The Bitter Creek Project area is located in Sweetwater County and, based on data provided by the Pinedale Anticline Work Group (PAWG) (2005) Sweetwater County's population in 2002 was about 37,600, a 6-7% decrease from 1995. Total full-time and part-time employment in during that same period decreased about 2%. Total full-time and part-time employment in December 2003 was 19,695, with oil and gas accounting for 407 jobs, mining accounting for 1,904 jobs, retail trade accounting for 2,351 jobs, and 4,028 workers employed by government and government enterprises (Wyoming Department of Employment 2004a), and in January 2005 the civilian labor force in Sweetwater County was 22,093, with 21,210 employed, 883 unemployed, and an unemployment rate of 4% (Wyoming Department of Employment, Research and Planning 2005). This compared to the statewide unemployment rate of 4.6% and the U.S. unemployment rate of 5.7%.

Annual per capita personal income in Sweetwater County \$25,345 in 1998--a 50.8% increase over 1990 (USDOC 2000), and per capita income increased 19% from 1995 to 2002 to approximately \$32,000 (PAWG 2005). In 1999, the average annual wage for oil and gas workers in Wyoming (not including benefits) was approximately \$42,000 (Foulke et al. 2001). The cost of living index for Sweetwater County was 98 during the second quarter of 2004, compared to a statewide average of 100 (Wyoming Division of Economic Analysis 2004). According to the 2000 census, the percent of all persons living below the poverty level in Sweetwater County was 7.5%. The vacancy rate for housing in 2002 was 12.8% compared to the statewide average of 16.4% (TRC Mariah Associates Inc [TRC] 2005). However, the suitability and habitability of the vacant housing is unknown.

The adjusted crime rate in Sweetwater County declined between 1995 and 2003, but is higher than the statewide crime rate (PAWG 2005). In the 2001-2002 school year, 31 schools in two school districts served 7,175 students, and the average pupil/student ration of 13.8:1 was consistent with the state average.

Sales tax revenues increased 63% between 1995 and 2004, and use taxes increased 12%.

Rock Springs is the city closest to the project area. Man-camps would not be used in the Bitter Creek Project; therefore, most of the workforce would likely reside in Rock Springs, Green River, or Point of Rocks, thereby benefiting the economy of the local communities and Sweetwater County.

Sweetwater County is the CIAA for socioeconomics.

3.6.2 Landownership and Use

The surface ownership pattern within and adjacent to the Bitter Creek Project area is checkerboard, where even-numbered sections are typically owned by the federal government, odd-numbered sections are typically privately owned, and select even-numbered sections are owned by the State of Wyoming. The Bitter Creek Project area includes 11,768 acres (66%) of federal surface and minerals and approximately 6,193 acres (34%) of private surface and minerals (see Figure 1.2).

Major land uses in the Bitter Creek Project area include surface coal mining, oil and gas development, livestock grazing, wildlife habitat, and recreation. Activities associated with the BBCC include coal

exploration drilling, topsoil salvage operations, overburden and coal drilling and blasting, overburden removal, coal removal, overburden regrading, topsoil replacement, and revegetation efforts. BBCC has surface access rights on all federal, state, and private lands within 55% of the Bitter Creek Project area, and has obtained ROWs and/or special use permits for all mine-related activities located on BLM-administered lands located outside of the federal lease area and within the Bitter Creek Project area (BBCC 2004a). There are no rights-of way exclusion areas within the Bitter Creek Project area (BLM 1996b).

The CIAA for landownership and use is the Bitter Creek Project area and a 4-mi buffer area (see Figure 3.2) and includes approximately 126,560 acres. Approximately 25.4% (32,168 acres) of the CIAA has been disturbed, has been authorized to be disturbed, or is likely to be disturbed by reasonable foreseeable projects. A majority of the disturbance (nearly 22,000 acres) is the result of surface coal mining by BBCC. A total of 464 oil and gas wells occur in the CIAA, disturbing an estimated 2,320 acres. Many of the wells occur in the Bitter Creek Project area and in the Patrick Draw field to the north and east.

3.6.3 Livestock Grazing

The Bitter Creek Project area is located within the Rock Springs grazing allotment. Grazing privileges (including federal and state owned lands) within the area are permitted to private individuals. Stocking rates for livestock are approximately 12.5 acres per animal unit month (AUM) (personal communication, October 15, 2003, with Kevin Lloyd, BLM, Rock Springs Field Office, Wyoming). Therefore, the entire Bitter Creek Project area potentially includes approximately 1,437 AUMs.

The CIAA for livestock grazing is the 2,135,539-acre Rock Springs grazing allotment (Figure 3.14). Approximately 92% of the allotment is used from December 1 to May 15 by cattle and sheep, whereas the remaining 8% is permitted for spring and fall grazing. Of the 180,000 AUMs available within the Rock Springs grazing allotment, usage is approximately 90,000 AUMs (50% of the available AUMs) (personal communication, October 15, 2003, with Kevin Lloyd, BLM, Rock Springs Field Office, Wyoming). Approximately 3.71% (79,282 acres) of the CIAA has been disturbed, has been authorized to be disturbed, or is likely to be disturbed by reasonably foreseeable future actions. Disturbances include three coal mines (approximately 26,000 acres), roads (approximately 12,000), 2,257 oil and gas wells

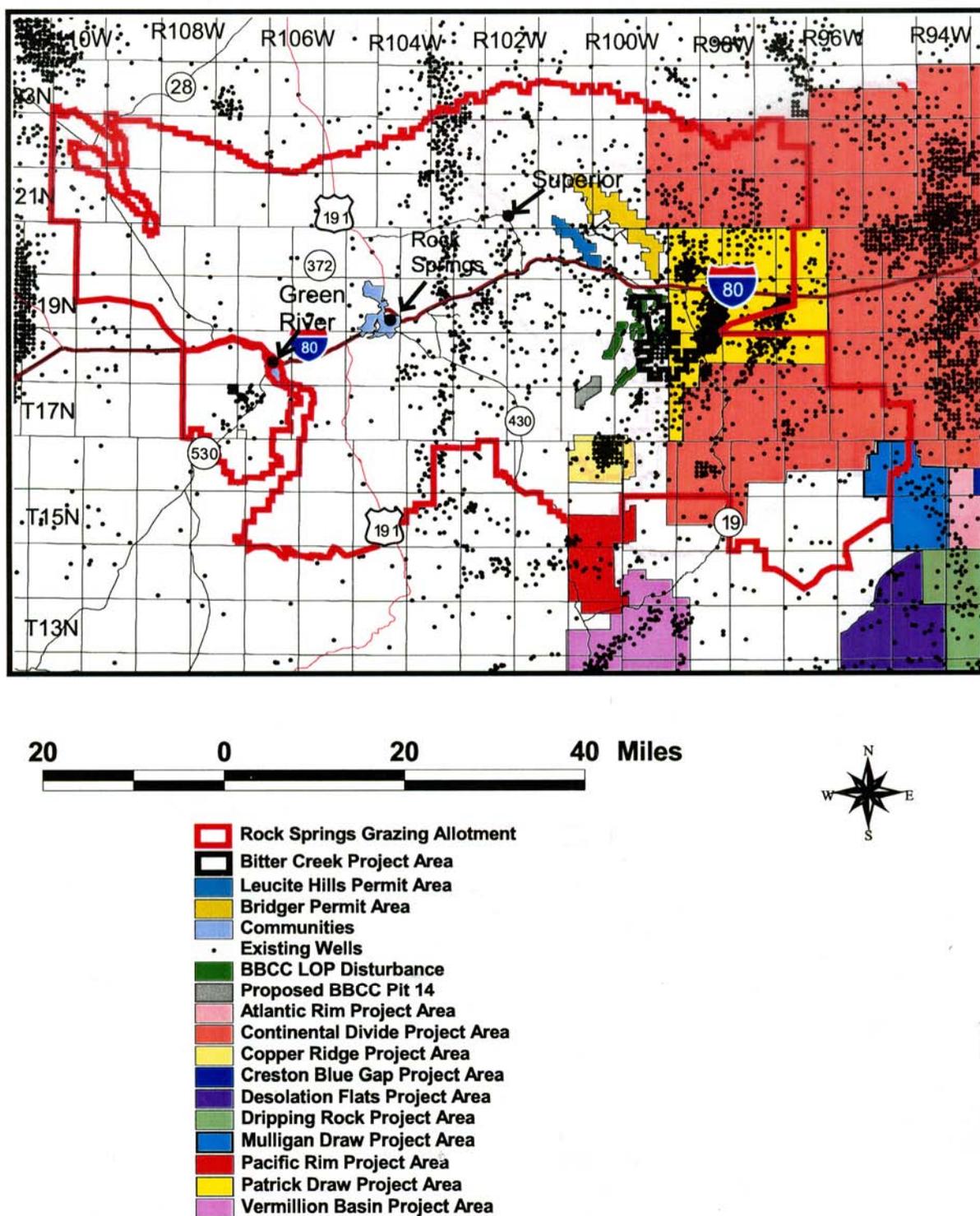


Figure 3.14 Rock Springs Grazing Allotment and the CIAA for Livestock Grazing.

(approximately 11,000 acres), railroads (approximately 11,000 acres), and communities (approximately 11,000 acres). All or portions of the Continental Divide, Patrick Draw, Copper Ridge, Pacific Rim, and Mulligan Draw project areas are included in the CIAA.

3.6.4 Recreation

Data on recreational use of the Bitter Creek Project area is not available; however, lands within the Bitter Creek Project area offer some big game hunting opportunities for pronghorn, mule deer, and greater sage-grouse. Secondary recreational activities include camping, off-road use, rock hunting, heritage tourism, and hiking. However, given the checkerboard landownership pattern, the controlled nature of the western portion located within the Black Butte Coal Mine permit area, and the availability of other more potentially appealing areas in the general area, recreational opportunities appear to be limited within the Bitter Creek Project area. No developed recreation areas occur within the Bitter Creek Project area.

The CIAA for recreation includes the Bitter Creek Project area and a 4-mi buffer, an area of 126,560 acres, 25.4% (32,168 acres) of which has been disturbed (see Figure 3.2). A majority of the disturbance (nearly 22,000 acres) is the result of surface coal mining by BBCC. A total of 464 oil and gas wells occur in the CIAA, disturbing an estimated 2,320 acres. Many of the wells occur in the Bitter Creek Project area and in the Patrick Draw field to the north and east. The area also includes portions of the Continental Divide project area.

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CHAPTER 4.0
ENVIRONMENTAL CONSEQUENCES

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

In accordance with NEPA (40 CFR 1502.16), this chapter of the EA discusses the potential environmental consequences of the Proposed Action and the No Action Alternative on each of the affected resources. An environmental impact is defined as a change in the quality or quantity of a given resource due to a modification in the existing environment resulting from project related activities. Impacts may be beneficial or adverse, may be a primary result (direct) or secondary result (indirect) of an action, and may be permanent and long-term or temporary and of short duration. Impacts may vary in degree from a slightly discernible change to a total change in the environment. This impact assessment assumes that all applicant-committed measures described in the Proposed Action would be successfully implemented. If such measures were not implemented, additional adverse impacts may occur.

Residual impacts are impacts resulting from the Proposed Action after application of appropriate mitigation measures (BLM 1988). These impacts would remain for some period of time but would eventually be ameliorated by natural conditions and would not be permanent. For example, increased soil erosion would be reduced as disturbed soils are stabilized and native vegetation is planted and becomes re-established.

Cumulative impacts result from the incremental effects of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts may result from individually minor, but collectively significant actions occurring over a period of time (40 CFR 1508.7). All environmental resources in this EA are addressed in accordance with BLM and CEQ policy (BLM 1994; CEQ 1997). The boundaries of individual CIAAs for this EA are based on the specific resource, and the reader should review Chapter 3 for a description of the various CIAAs.

Several projects have been authorized by the BLM but have not been fully implemented. These projects are important in the cumulative impact analysis because they represent on-going projects that have been authorized by the BLM that may result in impacts beyond those that have already occurred. Such projects include the Continental Divide/Wamsutter II Natural Gas Project, the Pacific Rim Shallow Gas Project, the Copper Ridge Shallow Natural Gas Project, and additional development of the Black Butte Coal Mine. These projects were examined to determine if they would result in future disturbance within any of the CIAAs. Potential disturbance was quantified based on that predicted in the appropriate NEPA

document. Reasonably foreseeable future actions under consideration by the BLM include the Proposed Action and the proposed expansion of the Black Butte Coal Mine (an additional 2,200 acres of disturbance); however, some CIAAs for some resources, especially air quality, include additional developments. Potential acreages of disturbance from these projects were also included in the cumulative impact analyses prepared for each resource.

Disturbance due to existing and authorized activities, as well as reasonably foreseeable future actions have been quantified using data input into a computerized geographic information system.

4.2 PHYSICAL RESOURCES

4.2.1 Air Quality

Air pollutant emissions would be generated in the Bitter Creek Project area during well pad construction activities and natural gas production. The primary pollutants emitted would be particulate matter less than 10 microns in diameter (PM₁₀), particulate matter less than 2.5 microns in diameter (PM_{2.5}), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOC), and sulfur dioxide (SO₂). Emissions of these air pollutants would occur temporarily during well pad and road construction and during natural gas production operations occurring over the LOP.

Air quality impacts from the emission of these pollutants are limited by regulations, standards, and implementation plans established under the Federal Clean Air Act and are administered within Wyoming by the WDEQ/AQD. Under FLPMA and the Clean Air Act, the BLM cannot conduct or authorize any activity which does not conform to all applicable local, state, tribal or federal air quality laws, statutes, regulations, standards, or implementation plans. Potential project impacts would be considered significant if it is demonstrated that:

- potential concentrations are greater than the applicable NAAQS or WAAQS;
 - potential concentrations are greater than the total value of the applicable PSD increments;
 - or
 - potential visibility reduction and atmospheric deposition are greater than applicable AQRVs.
-

4.2.1.1 Alternative A - Proposed Action

Air pollutant emissions from the construction phase of the Proposed Action would occur during construction of well pads and access roads, diesel-fired heavy construction equipment, diesel-fired well drilling engines, pipeline construction, travel on unpaved roads to and from the construction sites, and wind erosion of disturbed areas. The existing network of roads within the Bitter Creek Project area would be utilized to the extent possible; therefore, road construction would be limited to those areas not already serviced by existing roads. PM₁₀ and PM_{2.5} emissions would result from well pad, access road, and pipeline construction and travel on unpaved roads, and NO_x, CO, VOC, and SO₂ emissions would occur from drilling engine operation, completion operations, and tailpipe emissions from heavy construction equipment. Air pollutant impacts from each well would be temporary (i.e., occurring during the 22-day well construction period or pipeline construction period) and would occur in isolation, without significantly interacting with other sites under concurrent construction.

Although air emissions from fugitive dust-generating activities and from heavy equipment diesel combustion could occur at increased levels at locations adjacent to well and road construction sites, impacts would be temporary and would not be expected to violate ambient air quality standards or PSD increments, or significantly impact AQRVs.

NO_x emissions from the drilling of one well would be 1.1 tons per year (tpy). NO_x emissions from drilling engine diesel combustion were calculated based on two 800-hp engines operating 7 days per well, 24 hours per day, a manufacture's emission factor provided by the operator, and a load factor multiplier of 0.42 based on historical operator data. NO_x emissions from total wells drilled per year, conservatively estimated to be 31 wells based on a minimum of 2 years drilling operations, would result in total NO_x emissions of 34.1 tpy.

Air quality impacts from natural gas production would occur over the LOP from natural gas combustion in a production unit heater, a 20-hp engine located at each wellsite, and from employee travel on unpaved roads within the Bitter Creek Project area. One production unit heater and one 20-hp engine would operate year-round at each wellsite and would result in emissions of NO_x, CO, PM₁₀, and VOCs. SO₂ emissions from the heater and engine would be negligible. Employee travel on unpaved roads to and from wellsites in light pick-up trucks would result in emissions of PM₁₀ and PM_{2.5}.

Annual pollutant emissions for each wellsite and from 61 wells proposed under the Proposed Action are provided in Table 4.1.

4.2.1.2 Alternative B - No Action Alternative

Under the No Action Alternative, no additional development in the Bitter Creek Project Area would occur. Air quality impacts would remain at currently authorized levels.

4.2.1.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.2.1.4 Residual Impacts

Under the Proposed Action, 34.1 tpy of NO_x would be generated during drilling operations over a 2-4 year period, and approximately 106.8 tpy of NO_x would be generated during production operations over the LOP. Impacts from drilling would be temporary, lasting approximately 7 days per site. Impacts from production would be within state-permitted air quality standards and would be localized, decreasing with distance from the emissions source.

Table 4.1 BCPA Pollutant Emissions from the Proposed Action.

Activity	Pollutant Emission Rate (tpy)				
	NO _x	CO	SO ₂	PM ₁₀	VOC
Production Unit Heater	0.05	0.01	<0.01	<0.01	<0.01
20-hp Engine	1.70	0.31	<0.01	0.03	0.11
Total Per Well	1.75	0.32	<0.01	0.03	0.11
Total BCPA – Proposed Action (61 Wells)	106.8	19.5	<0.01	1.8	6.7

4.2.1.5 Cumulative Impacts

The air quality study prepared for the Atlantic Rim Natural Gas Project/Seminole Road Gas Development Project analyzed cumulative impacts from air emissions sources in southwest Wyoming at PSD Class I and sensitive PSD Class II areas (Table 4.2). The document contains the most recent cumulative inventory of air emissions available in southwest Wyoming, and used a “reasonable but conservative” approach that included the modeling of regional sources at permitted emission rates. Industrial development from January 1, 2001 to March 31, 2004 was explicitly modeled in the analysis for permitted sources within a large study domain which included southwest Wyoming, northwest Colorado, southeast Idaho, and northeast Utah. The subset of these sources that had begun operation as of the inventory end-date was classified as state-permitted sources, and those not yet in operation were classified as reasonably foreseeable future actions (RFFA). Industrial sources proposed in the State of Wyoming under NEPA were also included in the regional inventory. The developed portions of these projects were assumed to be included in monitored ambient background or included in the state-permitted source inventory. The undeveloped portions of projects proposed under NEPA were classified as reasonable foreseeable development (RFD). The regional emissions inventory and modeling analysis results accounted for industrial development prior to the baseline date by adding background ambient monitoring data collected for that period to modeled concentrations.

Under the proposed alternative, the Atlantic Rim Natural Gas Project/Seminole Road Gas Development Project cumulative impact analysis for air quality predicted an increase of 14,655 tpy of NO_x emissions over the background emissions. The analysis predicted potential increases to ambient concentrations and atmospheric deposition in PSD Class I and Class II areas, potential changes to lake acidity in sensitive lakes, and potential changes in visibility at the PSD Class I and sensitive Class II areas. However, the addition of predicted impacts from the two projects to background values would result in air quality below applicable ambient standards at all Class I and Class II areas. The study found no potential concentrations greater than applicable PSD increments. Potential impacts to atmosphere deposition at the Class I and sensitive Class II areas and acidity in the sensitive lakes were below levels of concern. Potential visibility impacts were found to be significant at Bridger Wilderness PSD Class I area for a maximum of four days per year and at each PSD Class II area (Popo Agie Wilderness Area and Wind River Roadless Area) for a maximum of one day per year. With full development of the Proposed Action,

Table 4.2 Summary of Far-Field Analyses Contained in the Atlantic Rim Natural Gas Project.

Air Quality Component	Comment
POTENTIAL AIR POLLUTANT CONCENTRATIONS	
Criteria Air Pollutants	<ul style="list-style-type: none"> • Far-Field total concentrations are in compliance with all applicable WAAQS and NAAQS <ul style="list-style-type: none"> ○ Particulate matter concentrations 40.0-44.8% of standards ○ NO₂ concentrations 19.2% of standard ○ SO₂ concentrations 10.8-17.2% of standards • Far-Field project concentrations are well below applicable PSD Class I increments <ul style="list-style-type: none"> ○ PM₁₀ concentrations 0.3-6.0% of increments ○ NO₂ concentration 3.7% of increment ○ SO₂ concentration 1.0% of increments
VISIBILITY	
Days with >1.0 ΔdV	<ul style="list-style-type: none"> • Potential cumulative visibility impacts were greater than the FLAG visibility threshold <ul style="list-style-type: none"> ○ 4 days in Bridger Wilderness ○ 0 days in Dinosaur National Monument ○ 0 days in Fitzpatrick Wilderness Area ○ 1 days in Popo Agie Wilderness Area ○ 0 days in Rawah Wilderness Area ○ 0 days in Rocky Mountain National Park ○ 0 days in Savage Run Wilderness Area ○ 1 days in Wind River Roadless Area ○ 0 days in Mt. Zirkel Wilderness Area
Days with >0.5 ΔdV	<ul style="list-style-type: none"> • Potential cumulative visibility impacts were greater than the USFS visibility threshold <ul style="list-style-type: none"> ○ 10 days in Bridger Wilderness ○ 4 days in Dinosaur National Monument ○ 1 days in Fitzpatrick Wilderness Area ○ 4 days in Popo Agie Wilderness Area ○ 0 days in Rawah Wilderness Area ○ 0 days in Rocky Mountain National Park ○ 0 days in Savage Run Wilderness Area ○ 9 days in Wind River Roadless Area ○ 0 days in Mt. Zirkel Wilderness Area
ATMOSPHERIC DEPOSITION	
Lake Chemistry	
Level of Acceptable Change (LAC)	<ul style="list-style-type: none"> • Cumulative decreases in ANC were less than the lake chemistry LAC for sensitive lakes. <ul style="list-style-type: none"> ○ 1.6% of LAC for Black Joe Lake ○ 1.8% of LAC for Deep Lake ○ 0.9% of LAC for Elbert Lake ○ 0.6% of LAC for Hobbs Lake ○ 0.5% of LAC for Island Lake ○ 0.2% of LAC for Kelly Lake ○ 2.3% of LAC for Lower Saddle Lake ○ 0.8% of LAC for Rawah #4 Lake ○ 0.6% of LAC for Ross Lake ○ 1.7% of LAC for Seven Lakes ○ 1.0% of LAC for Summit Lake ○ 1.9% of LAC for West Glacier Lake
Acid Neutralizing Capacity (ANC) Change	<ul style="list-style-type: none"> • Cumulative decreases in ANC were less than the lake chemistry LAC (1.0 µeq/liter) for very sensitive lakes <ul style="list-style-type: none"> ○ Lazy Boy Lake (0.028 µeq/liter) ○ Upper Frozen Lake (0.12 µeq/liter)

NO_x emissions in the cumulative study area would increase by 106.8 tpy, a 0.7% increase in emissions over those analyzed in the Atlantic Rim Natural Gas Project/Seminole Road Gas Development Project air quality study.

4.2.2 Mineral Resources

4.2.2.1 Proposed Action

The primary impact on mineral resources would be the removal of oil and natural gas from the Lance and Almond Formations from within the Bitter Creek Project area. As a result, these resources would not be available for future use. Portions of Pits 1 and 4 of the Black Butte Coal Mine are located within the Bitter Creek Project area; however, all the mineable coal reserves have been recovered and the pits have been reclaimed or are awaiting final reclamation. Because the coal reserves have been recovered, the Proposed Action would not interfere with the orderly development of coal reserves; however, it could disrupt reclamation operations in the remaining un-reclaimed portions of these pits. Under the Proposed Action oil and gas drilling and development could be conducted within unmined portions of Pits 3, 5, and 10 (which have been developed and partially mined) and Pit 7 (which has not been developed or mined). Therefore, it is possible that development and reclamation conflicts could arise between the Operators and BBCC. In addition, the Proposed Action could result in disturbance to previously reclaimed areas in Pits 1, 3, 4, 5, and 10. Under the Proposed Action, all disturbance created by the Operators (including that occurring on areas previously reclaimed by BBCC) would be the responsibility of the Operators. The Operators would be responsible for reclaiming and revegetating all lands disturbed by project-related facilities including roads, well pads, and pipelines.

The BLM expects lessees to mutually resolve any development conflicts if existing oil or gas leases within the Bitter Creek Project area are developed at the same time that mining operations are being conducted. As administrators of public land, including those within the Bitter Creek Project area, BLM has prepared Instruction Memorandum No. 2000-081 that directs BLM to work to achieve three principal goals in resolving mineral development conflicts. The three goals are:

- to protect the rights of each lessee under the terms of its lease, the MLA and the implementing regulations, including those concerning conservation of natural resources;
 - to optimize the recovery of multiple resources; and
 - to optimize the return to the public while protecting public safety and the environment and minimizing impacts on local communities.
-

The BLM prefers that these goals be achieved through mutual agreement between/among the lessees; BLM would use its authority to manage mineral development on public lands if necessary.

There are no known locatable mineral (e.g., precious metals, bentonite, etc.) mines or economically recoverable deposits of locatable minerals and there are no known claims for any locatable minerals within the Bitter Creek Project area, nor are there any active construction aggregate quarries (a saleable mineral). Therefore, the Proposed Action would have no impacts on these resources and no development conflicts would occur.

Water withdrawal would be minimal and would not cause subsidence. The water is contained within the formations, not in voids. The same is true of natural gas. Drilling has occurred in the general area for many years and no subsidence has occurred as a result of that development.

Water withdrawal would be minimal and would not cause subsidence. The water is contained within the formations, not in the voids. The same is true of natural gas. Drilling has occurred in the general area for many years and no subsidence has occurred as a result of that development.

4.2.2.2 No Action Alternative

Exploration for and development of oil and gas as currently proposed by the Operators within the Bitter Creek Project area would not occur under the No Action Alternative. However, oil and gas exploration and development on private and state lease areas would continue and would likely result in the drainage of some natural gas from federal lands. This would result in a loss of revenues paid to the federal government. Some of the oil and natural gas reserves located on the federal lands within the Bitter Creek Project area would remain available for future recovery; however, any delay in the development of the federal leases would negatively impact the United States' current need for additional supplies of natural gas and oil.

Other mineral resources (including coal) located on federal lands would not be impacted under the No Action Alternative, and could be developed in the future based on product availability and demand and existing federal land management policies.

4.2.2.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.2.2.4 Residual Impacts

There would be no residual impacts from the Proposed Action to mineral resources other than the recovery of oil and natural gas resources.

4.2.2.5 Cumulative Impacts

The Bitter Creek Project would add up to 61 wells to the numerous other oil and gas projects in the 126,560-acre CIAA, which has already seen 400-500 wells drilled. It would add 326 acres of surface disturbance (<1% addition) to the 32,168 acres of cumulative surface disturbance, much of which can be attributed to the Black Butte Coal Mine (including the proposed disturbance of an additional 2,200 acres).

4.2.3 Paleontological Resources

4.2.3.1 Proposed Action

Under the Proposed Action, approximately 326 acres of total disturbance would occur in various locations within the Bitter Creek Project area. The BLM has determined that outcrop areas of the Wasatch, Fort Union, Lance, and Almond Formations are of special interest and concern for paleontological resources, and mitigation of ground-disturbing activities would be required to prevent the loss of scientifically important fossils (BLM 2002). Therefore, to protect and mitigate potential impacts to scientifically important paleontological resources, the Operators would undertake on-the-ground surveys of impacted areas as directed by the BLM. These surveys would be performed prior to approval of any surface disturbing activities by a qualified paleontologist holding a BLM Paleontological Resources Use Permit. The need for an on-the-ground survey could be waived by the BLM during the APD process if it is determined that the proposed development would not impact important geologic outcrop areas, the area has previously been surveyed for paleontological resources, or the area has been previously disturbed. If a survey is conducted and scientifically important fossils are discovered during the survey, BLM may require the proponent to alter the construction plan to avoid disturbing the locality or mitigate the site by either collecting a sample of the fossil material or fully excavating of the locality. The BLM may also require, based on the paleontologist's recommendation, that construction activities be monitored for the presence of previously undocumented, but important fossils. These and other applicant-committed environmental protection measures would mitigate impacts to fossils, and impacts would likely be negligible to low.

4.2.3.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action and no additional oil and gas disturbance/development would occur beyond that which has already been authorized by the BLM. However, currently approved and authorized actions within the Bitter Creek Project area would continue, but would likely have negligible to low impacts to paleontological resources.

4.2.3.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.2.3.4 Residual Impacts

Some fossils could be destroyed by project-related activities.

4.2.3.5 Cumulative Impacts

The CIAA is known to contain numerous localities of scientifically important fossils. Implementation of the Proposed Action (with the appropriate mitigation measures) would not be expected to increase cumulative impacts associated with the loss of such fossils. Mitigation efforts included in the Proposed Action would minimize any additional adverse impacts and would likely add to the knowledge of fossils within the Bitter Creek Project area.

4.2.4 Soils

4.2.4.1 Proposed Action

Under the Proposed Action, construction-related activities would result in removal of native vegetation, exposure of the soil, mixing of soil horizons, loss of topsoil productivity, soil compaction, and increased susceptibility to wind and water erosion. These impacts may, in turn, result in increased runoff, soil erosion, and sedimentation to receiving waters.

Under the Proposed Action a total of 326 acres of soil resources would be disturbed over the life of the project. Approximately 234 acres would be stabilized and reclaimed within 1-2 years after being disturbed. The remaining 92 acres would be LOP disturbance and would not be reclaimed until wells and associated facilities would be abandoned in 15-20 years. After reclamation operations have been successfully completed, soil stability would likely be achieved and the rate of soil erosion would return to pre-disturbance levels in 3-5 years.

Control of surface runoff and sedimentation would be accomplished by implementation of best management practices (BMP), storm water pollution prevention measures, and other mitigation measures specified in Chapter 2 of this EA, and would generally reduce impacts to soils to low levels.

Some biological soil crusts within the Bitter Creek Project area may be disturbed by the Proposed Action. However, the fact that biological soil crusts exist in the Bitter Creek Project area does not limit development or other surface-disturbing activities. Biological soil crusts are integral to topsoil, and in fact are part of the topsoil. As such, biological soil crusts receive the same level of protection as all do topsoil resources, which is considered to be a valuable resource. The BLM mandates that a minimum of 6 inches of topsoil or suitable subsoil be salvaged from all areas that would be disturbed. During reclamation operations, the salvaged topsoil is replaced, recontoured, and seeded with native species to increase reclamation success. It is unlikely that construction activities related to the Proposed Action would be located on contiguous areas of biological soil crusts. Should such an area be identified during the APD process, efforts would be made to avoid these contiguous biological soil crust areas, much as any area identified as having sensitive or fragile soils would be avoided.

4.2.4.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action and no additional disturbance/development beyond that which has already been authorized by the BLM would occur. Impacts to soil resources within the Bitter Creek Project area would continue at current rates, being affected primarily by past and ongoing mining and oil and gas activity.

4.2.4.3 Mitigation and Monitoring

The following mitigation would be required:

- all roads would be constructed to appropriate BLM road standards;
- all roads will be graveled;
- culvert outlets may need to be rock armored to prevent scouring of drainage banks;
- cut slopes may need to be stabilized with erosion matting to enhance re-vegetation;
- any drainage banks cut by pipelines will be returned to their original slope and stabilized;
- peripheral, non-working areas of well pads, road borrow ditches, and pipeline rights of way will be graded and seeded within one year of completion of construction activity, and temporary stabilization may be necessary within this period;
- surface disturbing activities will be avoided within 100 ft of ephemeral channels and 500 ft of wetlands and riparian areas;
- runoff directly impacting Bitter Creek may require additional erosion or salinity control measures;
- pipelines would be located adjacent to roads where feasible;
- well pads in areas which are heavily grazed may need to be fenced; and
- no uncontrolled runoff would be allowed to enter reclaimed areas on the Black Butte Coal Mine.

4.2.4.4 Residual Impacts

The Proposed Action would result in some increased and unavoidable soil loss and sedimentation to the receiving waters as a result of water and wind erosion. Productivity of some disturbed soils would be reduced due to vegetation removal, soil compaction and exposure, mixing of soil horizons, and increased susceptibility to wind and water erosion.

4.2.4.5 Cumulative Impacts

Under the Proposed Action, soil resources within the CIAA would continue to be impacted by surface coal mining, oil and natural gas development, livestock grazing and recreational use. The Proposed Action would add a total of approximately 326 acres of additional surface disturbance to the 24,636 acres of disturbance in the CIAA associated with past, present, and reasonably foreseeable future actions, along

with the additional soil erosion that would result from such disturbance. Impacts to soil and surface water resources have been and are being minimized and mitigated by implementation of storm water pollution prevention measures and reclamation operations, especially on federal projects where mitigation measures similar to those incorporated into this EA have been imposed.

Sediment control ponds and associated interceptor ditches have been constructed and/or will be constructed within drainage basins affected by existing or future surface coal mining operations. Impacts to soil and surface water resources are also minimized by on-going and concurrent reclamation, stabilization, and re-vegetation operations in accordance with BLM, WOGCC, WDEQ/LQD, and the Office of Surface Mining Reclamation and Enforcement regulations. Miners and oil and gas operators are required to post bonds to ensure in part that reclamation operations are conducted and affected areas are re-vegetated. The on-going and concurrent reclamation operations stabilize soil resources as soon as practicable and control soil erosion and water pollution to the extent possible. There is no visual evidence or regulatory compliance issues that demonstrate wide spread soil erosion or water pollution problems.

It is important to note that not all of the 24,636 acres disturbed in the 67,815-acre CIAA are, or would be, disturbed at any one time. Rather, the 24,636 acres represents the aggregate disturbance within the CIAA. Reclamation operations are on-going and would limit the amount of disturbance that would occur at any one time. Based on 24,636 acres of disturbance, approximately 36.3% of the CIAA is currently disturbed, has been authorized for disturbance, or is expected to be disturbed by reasonably foreseeable projects. Under the Proposed Action this would increase by 326 acres (less than 0.5%) to approximately 36.8% of the CIAA.

4.2.5 Water Resources

4.2.5.1 Proposed Action

Potential impacts to surface water resources from the Proposed Action include increased turbidity, salinity, and sedimentation due to increase runoff and erosion from 326 acres of total surface disturbance or accidental spills of petroleum products or other pollutants. Erosion on disturbed areas would increase above current rates until they are successfully re-vegetated. The potential for erosion and stream sedimentation would be minimized through the implementation of the applicant-committed environmental protection measures and BMPs. Therefore, the Proposed Action would not result in any changes in the flow or water quality in any perennial stream.

Potential impacts to groundwater resources from the Proposed Action include water consumption during drilling, completion, testing, and production operations. Water required for the Proposed Action would be obtained from existing wells within the Bitter Creek Project area, and no impacts to existing water rights would occur. During the development of each well, water and fluids used for drilling and completion operations would be stored in reserve pits at each well location. All pits would be lined to eliminate any subsurface or groundwater contamination. Therefore, there would be negligible impacts to groundwater resources from leaking reserve pits.

There are no identified seeps or springs within the Bitter Creek Project area. However, to protect any previously unidentified seeps or springs, the Operators would evaluate potential drilling sites during the siting process prior to constructing the proposed drill pad. As specified in the applicant-committed environmental protection measures, the Operators would not construct any facilities within 600 ft of any seep or spring. Therefore, there would be negligible impacts to seeps and springs.

Additional potential impacts to groundwater resources include cross-aquifer mixing through the well bore. These potential down-hole impacts would be minimized by the implementation of drilling, casing, and cementing procedures conducted in accordance with Onshore Oil and Gas Order No.2 contained in 43 CFR 3160. Therefore, the Proposed Action would have negligible impacts on the groundwater resources due to cross-aquifer mixing.

4.2.5.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action and no additional disturbance/development beyond that which has already been authorized by the BLM would occur. Impacts to water resources would remain at existing levels, affected primarily by mining, oil and gas development, and grazing.

4.2.5.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.2.5.4 Residual Impacts

The Proposed Action would result in some unavoidable increase in turbidity, salinity, and sedimentation due to increased runoff and erosion from 326 acres of total disturbance. Once natural gas production associated within the Proposed Action has been completed (15-20 years), impacts to surface water resource would return to pre-disturbance levels.

4.2.5.5 Cumulative Impacts

Water resources within the 67,815-acre CIAA would continue to be impacted by on-going surface coal mining, oil and natural gas development, livestock grazing, and recreational use. The Proposed Action would add an additional 326 acres of disturbance to the 24,636 acres of disturbance resulting from existing, BLM-authorized, and reasonably foreseeable future actions. This would include disturbance associated with the Black Butte Coal Mine, oil and gas development, and various roads and railroad tracks. It is important to note that not all of the 24,636 acres disturbed in the CIAA are or would be disturbed at any one time. Rather, the 24,636 acres represents the aggregate disturbance within the CIAA. Reclamation operations are on-going and would limit the amount of disturbance that would occur at any one time. Based on 24,636 acres of disturbance, approximately 36.3% of the CIAA is currently disturbed, has been authorized for disturbance, or is expected to be disturbed by reasonably foreseeable projects. Under the Proposed Action this would increase by 326 acres (less than 0.5%) to approximately 36.8% of the CIAA. Once all surface coal mining and oil and gas production operations have been completed, facilities removed, and the disturbed areas reclaimed, soils would be stabilized and soil erosion rates would eventually return to pre-disturbance levels. Ogle and Wood (2004) report “there is low potential for the occurrence of material damage to the surface and groundwater resources due to coal mining...due to the high variability of the natural system and the environmental practices of mining reclamation” and “There will be some impacts due to mining, but they are not expected to be permanent and none were found to be cumulative in nature.” The initial water quality in the backfill aquifer is predicted to have increased dissolved salts, but will meet livestock class of use once saturation is complete and flow is re-established. Therefore, additional cumulative impacts to water resources from the Proposed Action within the CIAA would be low.

4.2.6 Wastes (Solid and Hazardous)

4.2.6.1 Proposed Action

Under the Proposed Action, hazardous and solid waste would likely be generated by the Operators. However, no hazardous or solid waste would be disposed of on-site. The Operators would handle and dispose of all hazardous waste in accordance with applicable state and federal rules and regulations. Any release of hazardous substances in excess of reportable quantities, established in Title 40 CFR Part 117, would be reported as required by CERCLA, as amended. If a release of a reportable quantity of any hazardous substances occurs, a report would be furnished to WDEQ and all other appropriate federal and state agencies.

Toilets would be provided for workers on-site and the waste would be properly disposed of through the septic system or at an approved waste disposal facility on an as-needed basis. Solid waste such as garbage, trash, and other discarded solid materials would be collected at a designated collection site and disposed of at an approved solid waste management facility. Solid waste would not be imported or disposed of within the Bitter Creek Project area. Spills of petroleum products may occur during exploration, development, and production operations due to periodic equipment maintenance and/or accidents. Soils contaminated with petroleum would be disposed of in an approved facility capable of accepting such waste. All non-hazardous material would be disposed of in accordance with appropriate local, state, and federal regulations.

Unanticipated release events (such as spills or leaks) are possible but unlikely, and the Operators would comply with all applicable planning and emergency procedures regarding spill prevention, reporting, and cleanup required by local, state, and federal laws and regulations should an accident occur. Therefore, impacts from solid and hazardous wastes would be negligible.

4.2.6.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action and no additional disturbance/development beyond that which has already been authorized by the BLM would occur. Impacts to hazardous and solid waste would remain at existing levels as a result of mining and oil and gas development.

4.2.6.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.2.6.4 Residual Impacts

If a spill, leak, or release of hazardous wastes would occur, the affected area would be cleaned up in a timely manner and in accordance with state and federal rules and regulations. During the time between the spill and the cleanup, some adverse environmental impacts could occur, most likely to soils or surface waters.

4.2.6.5 Cumulative Impacts

Under RCRA regulations, there are no designated hazardous waste generators within the 126,560-acre CIAA other than the Black Butte Coal Company. Oil and gas operators are registered as a conditionally exempt small quantity hazardous waste generator or as small-quantity hazardous waste generators. There are no designated hazardous waste treatment, storage, or disposal facilities or solid waste disposal facilities within the CIAA. As a result, any hazardous or solid waste generated by these facilities is handled in accordance with specific federal and state rules and regulations. Therefore, cumulative impacts associated with hazardous and solid wastes within the CIAA would likely be negligible.

4.3 BIOLOGICAL RESOURCES

4.3.1 Special Status Plant and Animal Species

4.3.1.1 Proposed Action

Bald Eagle. Migrating or foraging bald eagles, and those nesting or wintering along the Green River, may occasionally forage or fly over the Bitter Creek Project area; however, such use would likely be intermittent and for relatively short periods of time. To minimize potential impacts to all raptors (including bald eagles), any project related powerlines would be designed and constructed in accordance with *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* (Avian Power Line Interaction Committee 1996). Given the intermittent use and the lack of nesting and roosting habitat

in the Bitter Creek Project area, as well as the powerline mitigation measures, the Proposed Action would have no effect on bald eagle.

Colorado River Endangered Fish Species. There would be no surface water depletions associated with the Proposed Action; therefore, there would be no effect to the four Colorado River endangered fish species.

BLM-sensitive Animal and Plant Species. Impacts to BLM-sensitive species likely would occur in direct proportion to the amount of their habitat that would be disturbed. The Proposed Action would result in approximately 326 acres of surface disturbance, only a small portion of which would likely provide suitable habitat for any one of the BLM-sensitive species. In addition, the disturbance would likely occur at a rate of approximately 80-160 acres per year and would be distributed across the 17,961-acre Bitter Creek Project area. Most of these animal species are mobile enough that they would avoid direct mortality from surface disturbing activities; however, a loss of suitable habitat would likely result in a reduction in population size unless suitable unpopulated habitat occurs nearby. Flannelmouth sucker would be protected as a result of applicant committed protection measures to avoid disturbance to Bitter Creek, especially during the spawning season (see Section 2.2.1.8).

Site-specific mitigation for BLM-sensitive species would be addressed during the APD process. Where warranted and directed by the BLM, surveys for BLM-sensitive species would be conducted using standard survey techniques and mitigation measures would be implemented to minimize potential impacts to those plants and animals. Applicant-committed environmental protection measures would avoid active raptor nests to protect nesting raptors.

Because no occupied greater sage-grouse leks or other important habitats have been documented within 2 mi of the Bitter Creek Project area, the Proposed Action would not be expected to have impacts on local greater sage-grouse populations. Some suitable greater sage-grouse nesting habitat does occur in the area, and surveys for nesting grouse would be conducted if determined to be warranted by BLM. If nesting grouse were present, avoidance would take place until nesting was complete. Some individual greater sage-grouse could be impacted due to bird/vehicle collisions due to increased traffic. These accidents would likely be uncommon and have negligible impacts on local grouse populations.

Suitable habitat for Great Basin spadefoot and northern leopard frog would be avoided, and these two species would not be affected by the project. There would be no disturbance to Bitter Creek that would interfere with spawning activities of flannelmouth sucker or to bluehead sucker (should they occur), and these species would not be affected. BMPs would limit additional sediment loading to all drainages, including Bitter Creek.

Based on the discussion presented above, the Proposed Action would not contribute to the need to list any BLM-sensitive species under the provisions of the ESA.

Based on the previous discussion, the Proposed Action would have negligible impacts to any BLM-sensitive species.

4.3.1.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action and no additional disturbance/development beyond that which has already been authorized by the BLM would occur. Impacts to TEPC species and BLM-sensitive species would continue at present low levels, with population fluctuations due primarily to weather, disease, and other natural causes.

4.3.1.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.3.1.4 Residual Impacts

Under the Proposed Action there would be some loss and/or displacement of BLM-sensitive species. There would be no impacts to TEPC species.

4.3.1.5 Cumulative Impacts

The source of water for the wells previously drilled in the Bitter Creek Project area was the same as that to be used in the Proposed Action. Therefore, none of the wells previously drilled have resulted in surface water depletions, and neither the Proposed Action nor the previously drilled wells would contribute to cumulative impacts to Colorado River endangered fish species.

Bitter Creek is listed as an impaired water by WDEQ/WQD due to high bacterial counts and high concentrations of total dissolved chlorides. Apparently, this has not noticeably affected spawning success of flannelmouth suckers, perhaps because highest concentrations of pollutants are found downstream from the Bitter Creek Project area in areas of higher human population. There is no information available indicating that there are or have been any significant adverse cumulative impacts to any other TEPC or BLM-sensitive species within the 126,560-acre CIAA, and impacts to TEPC species and BLM-sensitive species within CIAA would not increase as a result of the Proposed Action.

4.3.2 Vegetation (Including Invasive, Non-native Species)

4.3.2.1 Proposed Action

The primary impact of the Proposed Action to vegetation would be the removal of vegetation on 326 acres of surface disturbance. The 234 acres of short-term disturbance would return to some level of vegetative production for livestock and wildlife grazing and wildlife habitat within 3-5 years; however, it would likely require 20-30 years for vegetation communities--especially shrub communities--to return to pre-disturbance levels. The remaining 92 acres of vegetation affected by LOP disturbance would be unavailable for livestock or wildlife use for 25-35 years, at which time production operations would end and all remaining disturbance would be reclaimed and re-vegetated. Overall, impacts to vegetation would be low.

Disturbance would also create opportunities for the establishment of invasive nonnative species such as perennial pepperweed, hoary cress, Canada thistle, Russian thistle, Russian knapweed, halogeton, cheatgrass, kochia, and dalmation toadflax. Invasive nonnative species are easily established and commonly found on all newly disturbed and reclaimed sites throughout Wyoming. These species are fast growing, can out compete native species, can increase the dangers of wildfires, and can prevent the establishment of native grass, forb, and shrub species. Assuming permanent vegetation (i.e., those species that were intentionally seeded) eventually become established, invasive and nonnative species can act to reduce soil erosion by holding the soil, breaking up the impact of direct precipitation on the soil, and by acting to alter the microclimate of the soil (e.g., reduce soil temperatures, lower wind speeds, collect snow fall, and reduce soil evaporation) until such time as desirable plant species become established. However, the establishment of some invasive nonnative species (e.g., Russian thistle, Russian knapweed, and cheatgrass) can result in long-term reclamation problems. Cultural (i.e., mechanical or grazing methods)

and chemical controls are generally required to eliminate or control these species. The Operators would utilize only certified weed-free mulch and seed during reclamation operations, and would continue to implement invasive nonnative species control measures included in Proposed Action. Overall, adverse impacts from invasive non-native plant species would likely be low.

4.3.2.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action and no additional disturbance/development beyond that which has already been authorized by the BLM would occur. Impacts to vegetation (including invasive nonnative species) would continue to occur at current rates, which are low.

4.3.2.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.3.2.4 Residual Impacts

The Proposed Action would result in the temporary but unavoidable removal of vegetation from an estimated 326 acres within the Bitter Creek Project area. Approximately 92 acres of this disturbance would continue for the LOP. There would likely be an unavoidable increase in the population of invasive nonnative species.

4.3.2.5 Cumulative Impacts

Vegetation (including invasive nonnative species) within the 67,815-acre CIAA continues to be impacted by on-going surface coal mining, oil and gas development, livestock grazing, and recreational use. The Proposed Action would add approximately 326 acres of surface disturbance to the CIAA. On-going, authorized, and reasonably foreseeable surface coal mining activities at the Black Butte Coal Mine would result in a total of 17,754 acres of long-term disturbance. However, although 17,754 acres would eventually be disturbed, BBCC conducts on-going reclamation operations that are concurrent with mining operations. For example, at the end of 2003 approximately 6,743 acres had been disturbed at the Black Butte Coal Mine and 3,814 acres had been reclaimed and revegetated (personal communication, October 28, 2004, with Teri Deakins, BLM RSFO). Mining operations will eventually disturb

17,754 acres, but within an additional 15-20 years all disturbed areas will be reclaimed and revegetated. WDEQ/LQD holds a multi-million dollar reclamation performance bond to ensure that vegetation standards are met and that financial resources are available to re-vegetate reclaimed areas if the reclamation bond were to be forfeited.

On-going natural gas development in the Continental Divide, Pacific Rim, and Copper Ridge projects would result in an additional 1,550 acres of surface disturbance, and existing transportation systems account for an additional 9,384 acres of disturbance. However, once all mining and oil and gas production projects have been completed, all disturbed areas would be reclaimed, vegetation communities would eventually return to pre-disturbance levels, and the lands would once again support livestock grazing and wildlife habitat. Based on 24,636 acres of disturbance, approximately 36.3% of the CIAA is currently disturbed, has been authorized for disturbance, or is expected to be disturbed by reasonably foreseeable projects. Under the Proposed Action this would increase by 326 acres (less than 0.5%) to approximately 36.8% of the CIAA. Once all surface coal mining and oil and gas production operations have been completed, facilities removed, and the disturbed areas reclaimed, soils would be stabilized and soil erosion rates would eventually return to pre-disturbance levels. Therefore, cumulative impacts to vegetation within the CIAA would be negligible.

4.3.3 Wetlands/Riparian Areas

4.3.3.1 Proposed Action

There are approximately 14 acres of potential wetlands or waters of the U.S. within the Bitter Creek Project area. This represents less than 0.1% of the entire Bitter Creek Project area. As specified in the Proposed Action, the Operators would avoid any wetlands and waters of the U.S. The Operators would evaluate potential sites to be disturbed during the APD process and facilities would be relocated to avoid potential impacts. The Operators would coordinate with the COE and obtain proper authorization where avoidance would not be practicable. In addition, the Operators would maintain a 100-ft wide buffer strip of natural vegetation between all construction areas and any ephemeral channels, and a 500-ft buffer between construction and any wetlands or riparian areas. Therefore, the Proposed Action would have negligible impacts on wetlands and other waters of the U.S.

Riparian areas are uncommon in the Bitter Creek Project area, and would be avoided. There could be some negligible impacts if riparian areas were crossed by roads or pipelines. However, such impacts would be avoided to the extent practicable.

4.3.3.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action and no additional disturbance/development beyond that which has already been authorized by the BLM would occur. Impacts to wetlands and riparian areas would continue to occur at current rates, but would be avoided whenever possible by federal policy and regulation.

4.3.3.3 Mitigation Measures

No additional mitigation or monitoring is recommended.

4.3.3.4 Residual Impacts

With implementation of the appropriate mitigation measures there would be no residual impacts to wetlands or riparian areas.

4.3.3.5 Cumulative Impacts

Wetlands and riparian areas within the 67,815-acre CIAA are impacted by on-going surface coal mining, oil and gas development, livestock grazing, and recreational use. Surface mining operations at the Black Butte Coal Mine would result in greater impacts to wetlands and riparian areas than any other current activity within the CIAA. Existing impacts include the temporary removal of wetland areas and waters of the U.S. Impacts, however, would not be permanent, and wetlands and waters of the U.S. would eventually be reestablished in accordance with the approved mine permit. The Proposed Action would result in an additional 326 acres of surface disturbance, but would avoid wetlands and riparian areas and would not add to cumulative impacts to these resources.

4.3.4 Wildlife Resources

4.3.4.1 Proposed Action

Direct impacts to wildlife resources could result from a number of causes including: loss of habitat due to vegetation removal; displacement due to disturbance by project-related activities; direct mortality due to construction-related activities; increased mortality due to poaching and harassment; the increased likelihood of animal/vehicle collisions due to increased traffic in the area; and habitat fragmentation. Approximately 1.8% (326 acres) of wildlife habitat in the Bitter Creek Project area would be directly affected by habitat removal. Noss and Csuti (1994) state that “Fragmentation of habitat can be defined as the decrease in the size of habitat patches and interior habitat and the increase in distance between patches.” When large blocks of habitat are separated into small habitats the resulting fragmentation of the habitat may limit the ability of big game animals to move throughout the winter range as conditions change with the result that the animals utilize less suitable habitat (Brown 1992). The Wilderness Society (2002) suggests that landscape analysis is a proven way to identify habitat fragmentation.

Fragmentation of habitat is widely acknowledged as detrimental to wildlife and plant species. Landscape analysis is a proven method to identify fragmentation and other agents of change in a given area. Yet landscape analysis is seldom completed prior to initiation of oil and gas projects, despite considerable evidence that oil and gas extraction and transmittal are likely to cause wide-ranging disturbances to the landscape.

The author continues:

Because our results clearly show that oil and gas drilling and extraction cause significant fragmentation of habitat, we recommend that similar spatial analysis be incorporated into the evaluation and monitoring of the ecological impacts or proposed oil and gas projects.

The authors used GIS technology to draw buffer areas of various widths around roads, pipeline ROWs, well pads, and other features to demonstrate habitat fragmentation. Using the very densely developed 166 mi² Big Piney-LaBarge oil and gas field as an example, they calculate that the entire field is within 0.5 mi of a road, pipeline ROW, well head, etc. Ninety-seven percent of the field is within 0.25 mi of such facilities, and 73% and 52% are within 500 ft and 250 ft, respectively. These calculations are certainly correct mathematically. However, their biological significance is less clear, and such significance becomes even more difficult to determine when well density is less than in the Big Piney-LaBarge field. Research studies provide little detailed information on the significance of various levels of

habitat fragmentation for the vast majority of species, or even what constitutes habitat fragmentation for a given species. This is demonstrated by the relatively few examples (for a relatively few species) cited in the report. Habitat fragmentation is certainly one factor considered by a wildlife biologist when evaluating the impacts of a project, and was a consideration even before the term “habitat fragmentation” came into common use. However, decisions regarding impacts are still largely a matter of professional judgement based on limited studies and personal observations, and different professionals often have different opinions. The WGFD (2004) states that impacts from development of 1-4 wells and up to 20 acres of disturbance per section to mule deer and pronghorn crucial winter ranges would be moderate with appropriate mitigation measures. This is the range of surface disturbance that would occur in the Bitter Creek Project area and, as discussed earlier, no crucial winter ranges would be disturbed.

Big Game. Construction, drilling, and reclamation activities would likely cause some pronghorn and mule deer that currently use the Bitter Creek Project area to temporarily vacate the area of disturbance (up to 0.5 mi or more) until activities have been completed. However, once initial construction and drilling activities are completed, most big game animals would be expected to become acclimated to increased human activity to some extent and use areas within 0.5 mi of disturbed areas, although not to the extent they were used prior to disturbance. This has been observed in big game animals at the Black Butte Coal Mine (BBCC 2004a). Surface disturbance would result in the loss of 326 acres of big game habitat due to vegetation removal (approximately 1.8% of the Bitter Creek Project area). It could take 10-20 years after reclamation operations have been completed for some of the reclaimed areas to attain shrub conditions and vegetation diversity comparable to pre-disturbance conditions. However, once all production operations have been completed, facilities abandoned, revegetation operations completed, and suitable vegetation habitat re-established, big game would likely re-occupy all previously disturbed areas.

Ninety-nine percent of the Bitter Creek Project area is pronghorn winter/yearlong range and 1% is pronghorn crucial winter range. The Operators would not construct or drill in pronghorn crucial winter range from November 15 to April 30, although activity on producing wells would continue through that period of the year. All of the Bitter Creek Project area is mule deer winter/yearlong range. There is no mule deer crucial winter range. As with pronghorn, total surface disturbance under the Proposed Action would disturb approximately 1.8% of the mule deer range.

Other Mammals. Generally, the dispersed and relatively small amount (326 acres, or 1.8% of the Bitter Creek Project area) of wildlife habitat physically disturbed by project-related activities would limit

impacts to all wildlife species to negligible to low levels. Most small mammal populations are relatively tolerant of human activity and would likely experience reduced populations in direct proportion to the amount of habitat removed. This would most likely be true for species with relatively small home ranges (rodents, lagomorphs, etc.) and would be less applicable to more wide-ranging species such as coyote. Project-related impacts to small mammals would likely be masked by natural variations in populations due to weather, disease, and other natural factors. Impacts to rare habitats, such as wetlands and riparian areas, would be avoided.

Raptors. Potential impacts to raptors include decreased raptor reproductive success due to physical disturbance of the nest; decreased raptor reproductive success due to increased human activities near the nest; destruction of nest, egg, and/or young; increased predation of eggs or young; and impacts to hunting, foraging, and roosting habitat (National Wildlife Federation 1987). Because of the applicant-committed environmental protection measures and standard mitigation measures that would be in effect, it is unlikely that raptor populations would be impacted by the Proposed Action, although individual birds may be affected.

Upland Game Birds. Direct impacts to mourning doves include disturbance/loss of breeding and nesting habitat; displacement due to increased human activity; and collisions with vehicles. Indirect impacts include the displacement due to noise and ground vibrations. Measures to mitigate surface disturbance and other project-related activities would also minimize impacts to mourning doves. Greater sage-grouse (an upland game bird) is a BLM-sensitive species and is addressed separately in Section 4.3.3 of this EA.

Other Birds. Other birds may be adversely affected by increased human activity under the Proposed Action. The primary impacts would likely occur in direct proportion to the amount of a species' habitat that was disturbed. Some increased mortality would likely occur from bird/vehicle collisions due to increased vehicle traffic, collisions with structures such as drilling rigs, and nest destruction/desertion during construction activities. Measures to mitigate surface disturbance and project-related activities would minimize impacts to other bird species as well. Impacts to waterfowl and shorebirds would be minimal because no wetlands or other suitable habitat would be affected and because these very mobile birds could temporarily move to adjacent undisturbed habitats. Overall, impacts to birds would negligible to low, and populations would be regulated primarily by weather, disease, and other natural causes.

Amphibians, Reptiles, and Fish. Few amphibians or reptiles are found within the Bitter Creek Project area, and non-game fish species are limited to portions of Bitter Creek. Potential adverse impacts to amphibians or reptiles as a result of the Proposed Action include direct mortality as a result of surface disturbance, loss of suitable habitat, and displacement of individuals from the area. Impacts to amphibians and reptiles due to the Proposed Action likely would occur in direct proportion to the amount of suitable habitat disturbed. Bitter Creek would not be directly impacted by the Proposed Action and implementation of appropriate storm water pollution prevention measures described in the Proposed Action would mitigate any indirect impacts that could result from construction-related disturbance. Additional mitigation measures described in the Proposed Action to minimize surface disturbance and to ensure timely reclamation and stabilization would keep project-related impacts to amphibians, reptiles, and fish to negligible levels.

4.3.4.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action and no additional disturbance/development beyond that which has already been authorized by the BLM would occur. Impacts to wildlife populations would continue at present levels, with fluctuations due primarily to weather, disease, and other natural causes.

4.3.4.3 Mitigation Measures

No additional mitigation or monitoring is recommended.

4.3.4.4 Residual Impacts

The Proposed Action would result in the direct loss of approximately 326 acres wildlife habitat due to vegetation removal. All wildlife species could be temporarily displaced from project-related construction activities and some species, especially small mammals, birds, amphibians, and reptiles may be killed by construction operations. Habitat effectiveness would be reduced, especially for pronghorn and mule deer, in areas adjacent to well pads and roads. There would also be an increase in the frequency of wildlife/vehicle collisions.

4.3.4.5 Cumulative Impacts

The Proposed Action would result in 326 acres of surface disturbance and would increase surface disturbance within the Bitter Creek Project area from 3,976 acres (22% of the area) to 4,302 acres (24% of the area). Most of this surface disturbance is associated with the Black Buttes Coal Mine.

Pronghorn. Approximately 60,091 acres (3.26%) of the CIAA for pronghorn is currently disturbed, is authorized to be disturbed, or could reasonably be expected to be disturbed. Approximately 95% of this disturbance area is winter/yearlong habitat and 5% is crucial winter/yearlong range. The Proposed Action would add 326 acres of additional surface disturbance (less than a 1% addition to existing disturbance) as well as additional indirect disturbance resulting from human activity. No crucial habitats would be disturbed.

Mule Deer. Approximately 51,839 acres (or 3.51%) of the CIAA for mule deer is currently disturbed, authorized to be disturbed, or could reasonably be expected to be disturbed. The Proposed Action would add 326 acres of additional surface disturbance (less than a 1% addition to existing disturbance) as well as additional indirect disturbance resulting from human activity. No crucial habitats would be disturbed.

Other Mammals. The Bitter Creek Project would add little to cumulative impacts to other mammals in the 126,560-acre CIAA because of the small amount of surface disturbance associated with the project.

Raptors. The 67,800-acre CIAA includes 160 known raptor nests. Total existing, authorized, and reasonably foreseeable disturbance in the CIAA is estimated to be 18,109 acres (26.7% of the CIAA). Disturbance from the major industrial facilities (Black Butte Coal Mine), minor industrial facilities (oil and gas development), and road and railroad corridors are part of the long-term economic development within the CIAA. None of the current land uses within the CIAA limits the area's ability to support various nesting raptors in the long term. The western portion of the CIAA and the Bitter Creek Project area are located within the raptor survey area for the Black Butte Coal Mine, and BBCC personnel have conducted raptor monitoring for more than 25 years, and continue to monitor more than 400 raptor nests within the mine permit boundary and buffer area. BBCC has also developed an extensive raptor mitigation plan to address potential impacts of mining on individual raptors and this plan has been successfully implemented and potential impacts on nesting raptors have been minimized (BBCC 2004a).

Reductions in prey species abundance would be negligible and would not be expected to adversely affect raptor populations. Therefore, cumulative impacts to raptors would be low to moderate.

Upland Game Birds. The CIAA for upland game birds (mourning doves) is the 2,300,000-acre Upland Game Bird Management area Number 6, of which approximately 4% is currently disturbed, authorized to be disturbed, or could reasonably be expected to be disturbed. Mourning doves are summer residents in Wyoming, are classified by the WGFD as abundant, and have been documented to nest in the CIAA (WGFD 2004b). An estimated 646 mourning doves were harvested during the 2003 hunting season in Upland Game Bird Management area Number 6 (WGFD 2004c). None of the current land uses within the CIAA limits the area's ability to support mourning doves. The Bitter Creek Project would add little to cumulative impacts in the 2,300,000-acre CIAA because of the small amount of surface disturbance associated with the project.

Other Birds. The CIAA for other birds is the 2,300,000-acre Upland Game Bird Management area Number 6, of which approximately 4% is currently disturbed, authorized to be disturbed, or could be disturbed by reasonably foreseeable projects. Disturbance from the major industrial facilities, minor industrial facilities, and roads are part of the long-term economic development within the CIAA. None of the current land uses within the CIAA limits the area's ability to support various other bird species. The Bitter Creek Project would add little to cumulative impacts in the 2,300,000-acre CIAA because of the small amount of surface disturbance associated with the project.

Amphibians, Reptiles, and Fish. The CIAA for amphibians, reptiles, and fish is the four 6th level watersheds that drain the Bitter Creek Project area. They have a combined drainage area of 67,815 acres. Approximately 24,636 acres (36.3%) of the CIAA are currently disturbed, authorized to be disturbed, or could be disturbed by reasonably foreseeable future projects. The Bitter Creek Project would add little to cumulative impacts in the 67,815-acre CIAA because of the small amount of surface disturbance associated with the project and the avoidance of habitats suitable for reptiles, amphibians, and fish.

4.3.5 Wild Horses

4.3.5.1 Proposed Action

Direct impacts to wild horse populations could result from the temporary loss of 326 acres of habitat due to vegetation removal; displacement of wild horses due to disturbance by project-related activities; direct mortality due to construction-related activities; and an increased likelihood of horse/vehicle collisions due to increased traffic. Impacts to vegetation would be limited because disturbance would be spread over a large area rather than a single block. The wild horse population in the Salt Wells WHHMA is above the appropriate management level, but there is plenty of habitat for wild horses to utilize in and around use the Bitter Creek Project area. Overall, impacts to wild horse population in the Salt Wells WHHMA would be negligible.

4.3.5.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action and no additional disturbance/development beyond that which has already been authorized by the BLM would occur. Impacts on wild horse populations would continue at present levels, with fluctuations due primarily to weather, disease, and other natural causes, and to herd reductions implemented by BLM.

4.3.5.3 Mitigation Measures

No additional mitigation or monitoring is recommended.

4.3.5.4 Residual Impacts

The Proposed Action would result in the temporary removal of vegetation--forage for horses--from an estimated 326 acres, and some additional mortality could occur due to horse/vehicle collisions.

4.3.5.5 Cumulative Impacts

The CIAA for wild horses is the 1,193,283-acre Salt Wells WHHMA, of which approximately 3.8% (45,676 acres) has been disturbed, has been authorized to be disturbed, or could be expected to be

disturbed. Under the Proposed Action, an additional 326 acres would be disturbed, representing an additional 0.03% of the CIAA. Such an increase would be a negligible addition to cumulative impacts to wild horses. Cumulative impacts have not prevented the population from exceeding the herd-appropriate management level.

4.4 SOCIAL RESOURCES

4.4.1 Cultural Resources

4.4.1.1 Proposed Action

As indicated in Section 3.5 of this EA, WSHPO records indicate that numerous cultural resource inventories have been conducted within the Bitter Creek Project area and most of these inventories have been conducted in association with the Black Butte Coal Mine and recent oil and gas development. Potential direct impacts to sites considered eligible to the NRHP would primarily result from construction-related activities within the 326 acres of proposed disturbance. Activities that could have the greatest effect on cultural resources include construction of well pads, roads, and pipelines. Indirect impacts include unauthorized surface collecting of artifacts and casual use activities such as surveying that might physically alter the site assemblage, and the development of additional roads that provide increased acres and could result in increased vandalism.

Under the Proposed Action, but prior to BLM approval of individual APDs and the initiation of construction activities, the Operators would conduct a BLM Class III cultural resource inventory of areas proposed for disturbance that have not adequately been previously inventoried as determined by the BLM. Cultural resources considered eligible for the NRHP would be avoided or would be mitigated prior to disturbance. As determined through the Section 106 consultation process, it may be necessary to test and/or conduct data recovery operations within historic properties. Such activities will be conducted by permitted archaeologists acting under plans approved by the AO in consultation with the WSHPO. All activities conducted under these approved plans in support of applications for development shall be paid for by the applicant. This and other applicant-committed environmental protection measures and mitigation would protect cultural resources and limit impacts to low levels.

4.4.1.2 No Action Alternative

Under the No Action Alternative the BLM would deny the current Proposed Action and no additional disturbance/development beyond that which has already been approved by the BLM would occur. There would be no additional impacts to cultural resources other than those already identified in other NEPA documents.

4.4.1.3 Mitigation Measures

No additional mitigation or monitoring is recommended.

4.4.1.4 Residual Impacts

Some loss of unidentified cultural resource sites or artifacts may occur, as well as some additional illegal collection of artifacts.

4.4.1.5 Cumulative Impacts

Numerous BLM Class III cultural resource inventories have been conducted in the CIAA (the Bitter Creek Project area) and various prehistoric and historic sites have been identified. All development projects within the CIAA that required federal authorization would comply with appropriate cultural resource laws. These BLM-authorized projects would be undertaken with similar mitigation measures described in this EA and the resulting impacts would likely be low. However, some additional vandalism could occur as a result of increased access.

4.4.2 Native American Religious Concerns

4.4.2.1 Proposed Action

Several potential TCPs, as well as sites designated as TCPs, have been identified within the Bitter Creek Project area. Consultation with Native American tribes will be necessary to resolve potential issues of direct and indirect impacts to these resources. If additional TCPs are identified at a later date, they would be taken into consideration by the BLM, in conjunction with Native American consultation, and would be addressed in accordance with applicable rules, regulations, and policies.

4.4.2.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action and no additional disturbance/development beyond that which has already been approved by the BLM would occur. There would be no impacts to Native American religious concerns.

4.4.2.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.4.2.4 Residual Impacts

No residual impacts to Native American concerns are anticipated.

4.4.2.5 Cumulative Impacts

Several Native American consultations have been conducted in the Bitter Creek CIAA. These have revealed stone circle sites to be significant to the Eastern Shoshone and Northern Ute as “sacred/respected places.” There is a high potential for additional sacred/respected places to be located in the Bitter Creek Project Area that will require additional Native American consultation. All projects on federal lands would be required to comply with appropriate laws to protect these resources, and impacts would likely be low. However, some additional vandalism could occur as a result of increased access.

4.4.3 Visual Resources

4.4.3.1 Proposed Action

VRM Class III, IV, and V classifications allow for moderate to major changes in the existing landscape. The Proposed Action would continue existing land use and form found in the Bitter Creek Project area-- mining and oil and gas development. Therefore, the Proposed Action would not attract the attention of the casual observer and would continue the basic elements of form, line, color, and texture that currently exist in the Bitter Creek Project area.

Because of the natural topographic diversity and existing industrial development (i.e., Black Butte Coal Mine and existing oil and gas development) that occurs within the Bitter Creek Project area, the Proposed Action would not dominate the view of the casual observer. Impacts to visual resources would be mitigated by minimization of disturbance, prompt reclamation of all short- and long-term disturbance, utilization of screening techniques, and the painting of project-related facilities with use of low contrast paint. A majority of the Bitter Creek Project area would not be visible from any public roads, and there are no unique visual resources other than portions of the Overland Trail and the many sites of cultural importance to Native Americans that occur in the area. Contributing portions of the Overland Trail would receive special consideration to protect the visual integrity of those segments if development occurs within 0.25 mi.

4.4.3.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action and no additional disturbance/development beyond that which has already been authorized by the BLM would occur. Impacts to visual resources would continue to occur at current rates.

4.4.3.3 Mitigation Measures

No additional mitigation or monitoring is recommended.

4.4.3.4 Residual Impacts

The Proposed Action would result in additional impacts to visual resources, but would not violate VRM standards.

4.4.3.5 Cumulative Impacts

The visual environment within the CIAA (the Bitter Creek Project area) has already been altered by mining, oil and gas development, roads and railroad corridors, and other forms of disturbance. The Proposed Action would further alter the visual environment, but would not violate VRM standards.

4.5 ECONOMIC RESOURCES

4.5.1 Socioeconomics

4.5.1.1 Proposed Action

Workers currently employed by the Operators have established residence in Sweetwater County. Any new workers that would be employed by the Operators would likely replace existing workers and there would be a minimal change in the total number of employees. The Operators would continue to hire qualified contractors from Sweetwater County. As a result, the Proposed Action would have negligible impacts on the infrastructure and social services of local, county, or state governments.

The project would generate substantial revenues for state, county, and local governments as well as area school districts through ad valorem taxes, severance taxes, federal royalties, and other taxes on facilities and production. The Operators anticipate that each of the 61 completed wells would produce 36 MMCF/year for a total of approximately 43,920 MMCF for the LOP from all wells. Assuming that 61 wells would be completed, and natural gas prices were \$3.25/mcf (CREG 2003), it is estimated that LOP nominal gross income from the field would be approximately \$120 million. Nominal transportation costs are estimated at \$18 million (paid to pipeline companies), federal royalties at approximately \$16 million (half of the royalties are returned to the state), state severance taxes at approximately \$7.5 million, and county ad valorem taxes at \$8.7 million. Total nominal taxes and revenues generated by Infinity would be approximately \$31.8 million over the LOP. Because natural gas prices have ranged from less than \$1.00/mcf to nearly \$9.00/mcf, these revenues could vary considerably depending upon future prices. Prices in January 2005 were about \$5.50/mcf. In addition, property tax revenues would increase due to the increased tax base resulting from capital improvements in the SPPA. Additional natural gas production impacts consumers because retail prices for natural gas are affected by supply and demand. As supply increases in relation to demand, prices of natural gas tend to fall. Reduced energy costs benefit local, state, and national economies.

The following information is based on information developed for two large oil and gas development projects that include Sweetwater County in their area of influence (TRC 2005). Assuming an average cost of \$500,000 to drill and complete one well would generate total economic impacts of \$684,054 and would generate approximately 4.5 annual job equivalents (AJEs). Over the 4-year development period,

then, drilling 61 wells would generate total economic impacts of nearly \$42 million and generate approximately 274 AJEs. Expenditures for operating and production from one well would generate direct and secondary economic impacts of \$559,480 annually and would generate 0.33 AJEs annually. Therefore, over the LOP (20 years), production would nominally return approximately \$683 million and approximately 403 AJEs.

The Bitter Creek Project could result in a very small increase in population in Sweetwater County, although existing industry expertise and services in the general area are generally adequate to support additional oil and gas development. There is, however, beginning to be a shortage of drilling rigs and crews, and this project would add minimally to that shortage because there would be up to two wells drilling at any one time for the next 2-4 years. Jobs created by the project would be well paying jobs, and well above the present personal per capita income in Sweetwater County.

4.5.1.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action and no additional disturbance/development beyond that which has already been authorized by the BLM would occur. Workers that would have contributed to the development of the Bitter Creek Project would forgo such employment and seek employment elsewhere. Additional tax revenues would not be realized. The economy of Sweetwater County depends to a considerable extent on oil and gas development, and new projects are necessary to keep the economy healthy.

4.5.1.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.5.1.4 Residual Impacts

There would be no adverse residual impacts associated with the Proposed Action.

4.5.1.5 Cumulative Impacts

Oil and natural gas development associated with the Proposed Action within the CIAA (Sweetwater County) would add to the economic viability of Sweetwater County, the State of Wyoming, and the U.S.

The Proposed Action would be another source of tax revenue for the municipal, county, state, and federal governments--a desirable outcome from an economic development perspective--in addition to the Black Buttes Coal Mine and other oil and gas development. The Proposed Action would add to the economic stability for the various government entities.

Increases in regional oil and gas development activity in a short period of time can cause notable changes in employment and income. These variables can in turn cause changes in population trends, which could have detrimental effects on community services, social structures and lifestyles. Such changes have been reported as occurring in Sublette County to the north of Sweetwater County (PAWG 2005). Sublette County, however, has a population of about 6,000, about one-sixth the population of Sweetwater County and less than one-third the population of Rock Springs, the largest town in Sweetwater County. Therefore, increased oil and gas development has a greater impact in Sublette County because of a much less developed infrastructure.

The Bitter Creek Project itself is a relatively small project and would contribute little to cumulative impacts to socioeconomics. More monies would be available for the educational system and for county infrastructure, and increased affluence could attract additional health care providers and encourage existing health care providers to remain in the area. Because the Operators have been active for several years in the same area on private surface, their infrastructure is already in place.

4.5.2 Landownership and Use

4.5.2.1 Proposed Action

Under the Proposed Action, landownership would not change. Current land uses--mining, oil and gas development, livestock grazing, wildlife habitat, and dispersed recreation--would continue at near their current rates, although some additional emphasis would be given to oil and gas development to the detriment of livestock grazing, wildlife habitat, and recreation. Approximately 326 acres would be disturbed by the construction of well pads, roads, and pipelines over the life of the project and would be unavailable for livestock grazing, wildlife habitat and recreational use. Ninety-two acres would be unavailable for the LOP, whereas the remaining 234 acres would be reclaimed shortly after the initial disturbance. Once oil and gas production operations have been completed, reclamation and re-vegetation would return the land to its pre-disturbance uses.

4.5.2.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the current Proposed Action and there would be no additional impacts to landownership or land use beyond those that have already been authorized or already exist.

4.5.2.3 Mitigation Measures

No additional mitigation or monitoring is recommended.

4.5.2.4 Residual Impacts

There would be no residual impacts to landownership. Residual impacts to land use would include a greater emphasis on oil and gas development to the detriment of livestock grazing, wildlife habitat, and recreation for the LOP.

4.5.2.5 Cumulative Impacts

Land use in the 126,560-acre CIAA would continue to include mining, oil and gas development, livestock grazing, wildlife habitat, and recreational use. The Proposed Action would add 326 acres of surface disturbance to the 32,168 acres (25.4%) of existing and proposed disturbance, an increase of 0.3%.

4.5.3 Livestock Grazing

4.5.3.1 Proposed Action

Impacts to livestock grazing would include the loss of vegetation and vegetative production from 326 acres. Assuming an average stocking rate of 12.5 acres per AUM and project-related disturbance only within public grazing allotments, the Proposed Action would result in a temporary reduction/displacement of 26 AUMs from the Rock Springs grazing allotment (18 AUMs for the short-term only and 8 AUMs for the LOP). Eighteen AUMs would return to some level of forage production for livestock grazing within 3-5 years, whereas 8 AUMs would not be recovered for the LOP (15-20 years). Other direct impacts would include an increased risk of livestock/vehicle collisions, which would likely be rare.

4.5.3.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action and no additional disturbance/development beyond that which has already been authorized by the BLM would occur. Impacts livestock grazing operations would continue to occur at current rates.

4.5.3.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.5.3.4 Residual Impacts

The Proposed Action would result in the loss of 26 AUMs in the short term and 8 AUMs for the LOP.

4.5.3.5 Cumulative Impacts

Grazing resources continue to be impacted by on-going surface coal mining operations, oil and natural gas development, community and road development, and recreational use. Approximately 79,282 acres (3.7%) of the 2,135,539-acre CIAA are currently disturbed, authorized to be disturbed, or could be disturbed by reasonably foreseeable future actions. The Proposed Action would disturb an additional 326 acres of rangelands, or less than 0.02% of the allotment.

4.5.4 Recreation

4.5.4.1 Proposed Action

The Proposed Action would not prohibit recreational activity within the Bitter Creek Project area. However, recreational activities such as big game hunting within the western portion of the Bitter Creek Project area would continue to be discouraged by BBCC. This area is located within the Black Butte Coal Mine permit boundary and is a potential safety hazard to the public due to ongoing surface mining operations, as well as the potential hazards to mine workers from firearms use. However, BBCC cannot prohibit or restrict access to public lands in the western portion of the Bitter Creek Project area due to the lack of controlled access points and authorized ongoing activities such as oil and gas development and

livestock grazing. As a result, BBCC will not be able to prevent the public from entering the western portion of the Bitter Creek Project area, and access to the eastern portion of the Bitter Creek Project area would continue to be uncontrolled. In accordance with WDEQ/LQD regulations, however, signs would be posted by BBCC on main roads leading into the western portion of the Bitter Creek Project area to inform the public that they are entering a mine area. The Operators would attempt to minimize conflicts between project-related vehicles and recreation traffic by posting appropriate warning signs, implementing operator safety training, and requiring project-related vehicles to adhere to posted speed limits. Hunting and other dispersed recreational activities that currently occur within the Bitter Creek Project area would likely continue at near existing levels.

4.5.4.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action and there would be no additional impacts to recreational resources beyond those that already exist.

4.5.4.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.5.4.4 Residual Impacts

Some decrease in recreational use would likely occur as a result of the Proposed Action.

4.5.4.5 Cumulative Impacts

There are no developed recreational areas in the Bitter Creek Project area, and a majority of the land is seldom used by the public for recreation except for hunting. Surface disturbances in the general vicinity of the Bitter Creek Project area includes the Black Butte Coal Mine, the Jim Bridger Coal Mine, Leucite Hills Coal Mine, Jim Bridger Power Plant, various oil and gas developments, and numerous roads and powerlines. Disturbance from these activities is part of the ongoing economic development of the Sweetwater County. The Bitter Creek Project would contribute little to impacts to recreation in the 126,560-acre CIAA because of the small amount of disturbance and the lack of use of the area for recreational activities.

CHAPTER 5.0
CONSULTATION AND COORDINATION

5.0 CONSULTATION AND COORDINATION

5.1 PUBLIC INVOLVEMENT PROCESS

A Notice of Scoping for the *Environmental Assessment (EA) for the Bitter Creek Shallow Gas Development Project, Sweetwater County, Wyoming* was issued on October 15, 2003, to more than 50 government offices and government officials, public land users and user groups, newspapers, radio stations, and television stations, for a 30-day public comment period (Appendix A). Twelve comment letters were received, including letters from the WGFD, USFWS, National Wildlife Federation, Biodiversity Conservation Alliance, Anadarko E&P Company LP, Petroleum Association of Wyoming, Sweetwater County Board of County Commissioners, Sweetwater County Land Use Department, Black Butte Coal Company, Oregon-California Trails Association, Mormon Trails Association, and Tim A. Kaumo, Mayor of Rock Springs.

The WGFD expressed numerous concerns regarding terrestrial and aquatic resources in the Bitter Creek Project area. The USFWS provided a list of threatened and endangered species that could occur in the area, as well as comments regarding protection of candidate species, sensitive species, migratory birds, greater sage-grouse, and wetlands and riparian areas. The Biodiversity Conservation Alliance provided a long list of comments regarding the ecological importance of Bitter Creek as well as more specific comments on the NEPA process, protection of natural resources, and alternative technologies for recovering natural gas. Black Butte Coal Company comments on three major problems with the Bitter Creek Project: 1) development of gas wells on established reclamation; 2) development of wells in areas of future mining; and 3) increased traffic within the mine permit boundary. The Oregon-California Trails Association commented that the exact location of the Overland Trail should be established so that it can be give adequate protection, and the Mormon Trails Association also requested that adequate protection be afforded the trail. The National Wildlife Federation requested receipt of the EA once it is issued to afford the Federation an opportunity to comment. Anadarko E&P Company LP, the Petroleum Association of Wyoming, the Sweetwater County Board of County Commissioners, and the Mayor of Rock Springs all endorsed the project and stressed the economic benefits to the economy that would be realized. The Sweetwater County Land Use Department also recognized the importance of the project to the economic base of Sweetwater County and provided comments on compliance with County regulations regarding such development.

5.2 LIST OF AGENCIES, ORGANIZATIONS, AND INDIVIDUALS CONTACTED

Table 5.1 lists the agencies, organizations, and individuals contacted during preparation of this EA.

Table 5.1 Record of Persons, Groups, and Governmental Agencies Contacted or Provided Comments.¹

Company/Agency	Individual	Discipline/Position
Anadarko E&P Company LP	Tom Clayson	
Biodiversity Conservation Alliance	Erik Molvar	
Black Butte Coal Company	Marc Kenley	Engineering Manager
City of Rock Springs	Tim Kaumo	Mayor
Infinity Oil and Gas of Wyoming, Inc.	Jim Tuell	President
	Bob Richardson	Landman
	Monty Collins	Operations Superintendent
Mormon Trail Association	Ron Anderson	
National Wildlife Federation	Kathleen Zimmerman	Senior Land Stewardship Policy Specialist
Oregon-California Trails Association	Dave Welch	
Petroleum Association of Wyoming	Dru Brower	Vice President
Sweetwater County Board of Commissioners	John Pallesen	Chairman
Sweetwater County – Department of Staff Resources and Technical Services	Mark Kot	Planner
Sweetwater County Weed and Pest Control	Jim Cotterman	Weed Specialist
U.S. Fish and Wildlife Service, Wyoming Office	Brian Kelly	Field Officer Supervisor
	Kathleen Erwin	Staff Biologist
	Pat Deibert	Staff Biologist
U.S. Geological Survey	Jayne Belnap	Soils Specialist
Wyoming Department of Parks and Cultural Resources	Judy Wolf	Deputy State Historic Preservation Office
Wyoming Department of Environmental Quality	Kathy Brown	Solid and Hazardous Waste Division
	Bob Schick	Air Quality Division
	Ken Rairigh	Air Quality Division
Wyoming Game and Fish Department		
Cheyenne	Bill Wichers	Deputy Director
Green River	Tom Collins	Biologist
Wyoming Natural Diversity Database	Doug Keinath	Zoologist
	Tessa Dutcher	Assistant Data Manager
	Bonnie Heidel	Botanist
	Walt Fertig	Botanist
Yates Petroleum Corporation		

¹ Additional individuals, groups, and agencies were contacted during scoping.

5.3 LIST OF PREPARERS

Table 5.2 lists the names of people who prepared this EA.

Table 5.2 List of EA Preparers.

Agency/Company	Discipline/Position
BLM Interdisciplinary Team, RSFO	
Darlene Horsey	Project Lead
John MacDonald	Soils
Jim Glennon	Sensitive Plant Species
Chris Durham	Wildlife Resources, TEPC species, and BLM-sensitive species
Jo Foster	Visual Resources
Dennis Doncaster	Water Resources
Terry Del Bene	Cultural Resources
Sherry Blackburn	Paleontology
Kevin Lloyd	Wild Horses
John Henderson	Fisheries
Patricia Hamilton	Realty Specialist
Jeff Clawson	Mining Engineer
Bonnie Bruce	Cultural Resources
Jay D'Ewart	Wild Horses
Kirk Rentmeister	Geology
BLM Interdisciplinary Team, WSO	
Roy Allen	Economist
Susan Caplan	Air Quality
TRC Mariah Associates Inc.	
Roger Schoumacher	Project Manager
Scott Kamber	EA Preparation
Jan Hart	Wildlife, TEPC species, and BLM-sensitive species
Susan Connell	Air Quality
Mark Karpinski	Cultural Resources
Genial DeCastro	Document Production

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CHAPTER 6.0
LITERATURE CITED

6.0 LITERATURE CITED

- Avian Power Line Interaction Committee. 1996. Suggested practices for raptor protection on power lines: The state of the art in 1994. Edison Electric Institute/Raptor Research Foundation, Washington, D.C. 125 pp.
- Black Butte Coal Company. 2004a. T-5, State Program Compliance Submittal, Permit Application #467-T5. Black Butte Coal Company, Point of Rocks, Wyoming.
- _____. 2004b. 2003 Annual Report for Permit #467. Submitted to the Wyoming Department of Environmental Quality, Land Quality Division. Black Butte Coal Company, Point of Rocks, Wyoming. 175 pp.
- U.S. Department of Agriculture, Natural Resources Conservation Service. 1978. Unpublished Soil Survey of Sweetwater County, Wyoming.
- Belnap, J., R. Rosentreter, S. Leonard, J.H. Kaltenecker, J. Williams, and D. Eldridge. 2001. Biological soil crusts: Ecology and management. U.S. Department of the Interior, Bureau of Land Management, Technical Reference 1730-2. 109 pp.
- Brown, C.G. 1992. Movement and migration patterns of mule deer in southeastern Idaho. *Journal of Wildlife Management* 56: 246-253.
- Bureau of Land Management. 1978. Final environmental impact statement, development of coal resources in southwestern Wyoming. U.S. Department of Interior, Bureau of Land Management, Washington, D.C. 3 volume set, 850 pp. + maps.
- _____. 1983. Air resources technical report for the Riley Ridge environmental impact statement. U.S. Department of Interior, Bureau of Land Management, Division of Environmental Impact Statement Services, Denver, Colorado.
- _____. 1985. Manual 9113: Roads. Engineering, Rel. 9-247. U.S. Department of the Interior, Washington, D.C. 67 pp. + append.
- _____. 1988. National Environmental Policy Act handbook, H-1790-1. U.S. Department of the Interior, Bureau of Land Management, Washington, D.C. 126 pp. + append.
- _____. 1991. Wyoming Supplement to Bureau 9113 Manual. U.S. Department of Interior, Bureau of Land Management, Wyoming State Office, Cheyenne, Wyoming. 16 pp.
- _____. 1992. Green River Resource Area, Resource Management Plan and draft environmental impact statement. U.S. Department of the Interior, Bureau of Land Management, Rock Springs District, Rock Springs, Wyoming, BLM-WY-ES-92-019-4410. 901 pp.
- _____. 1994. Guidelines and considerations for cumulative impacts. U.S. Department of the Interior, Bureau of Land Management, Washington, D.C. 69 pp.
- _____. 1996a. Overview of BLM's NEPA process. U.S. Department of the Interior, Bureau of Land Management, National Training Center Course Number 1620-02.
-

- _____. 1996. Green River Resource Area Resource Management Plan and final environmental impact statement. U.S. Department of the Interior, Bureau of Land Management, Rock Springs District, Rock Springs, Wyoming. BLM/WY/PL-96/012 + 1610. 1,009 pp.
- _____. 1997. Record of Decision and Green River Resource Management Plan. U.S. Department of the Interior, Bureau of Land Management, Rock Springs District, Rock Springs, Wyoming. BLM/WY/PL-97/027 + 1610. 216 pp.
- _____. 1999a. Draft environmental impact statement, Continental Divide/Wamsutter II natural gas project, Sweetwater and Carbon Counties, Wyoming. U.S. Department of the Interior, Bureau of Land Management, Rock Springs Field Office, Rock Springs, Wyoming. BLM/WY/PL-98/024 + 1320. 242 pp. + append.
- _____. 1999b. Final environmental impact statement, Continental Divide/Wamsutter II natural gas project, Sweetwater and Carbon Counties, Wyoming. U.S. Department of the Interior, Bureau of Land Management, Rock Springs Field Office, Rock Springs, Wyoming. BLM/WY/PL-00/005 + 1610. 27 pp. + append.
- _____. 1999c. Interim guidance. Changes to the list of critical elements of the human environment in the Bureau of Land Management's National Environmental Policy Act Handbook. Distribution Memorandum No. 99-178. Washington, D.C. 3 pp.
- _____. 2001a. BLM implementation of the national energy policy. Information Bulletin No. 2001-138. U.S. Department of the Interior, Bureau of Land Management, Washington, D.C. 8 pp.
- _____. 2002a. Probable Fossil Yield Classification in Wyoming. Prepared by D. Hanson, Regional Paleontologist. U.S. Department of the Interior, Bureau of Land Management, Wyoming State Office, Cheyenne, Wyoming. 8 pp.
- _____. 2002b. Unpublished data, geographic information system. Bureau of Land Management, Rock Springs Field Office.
- _____. 2003. Draft environmental impact statement for the Desolation Flats natural gas field development project. U.S. Department of the Interior, Bureau of Land Management, Rock Springs and Rawlins Field Offices, Rock Springs, Wyoming, and Rawlins Wyoming. 417 pp. + append.
- _____. 2004. Final Environmental Assessment for the Proposed Ten Mile Rim Coal Lease-By-Application and Associated Rights-of-Way, Sweetwater County, Wyoming. U.S. Department of the Interior, Bureau of Land Management, Rock Springs Field Office, Rock Springs, Wyoming. 24 pp. + append.
- Call, M.W. 1978. Nesting habitats and surveying techniques for common western raptors. U.S. Department of the Interior, Bureau of Land Management, Technical Note No. 316. 115 pp.
- Clark, T.W., and M.R. Stromberg. 1987. Mammals in Wyoming. University of Kansas, Museum of Natural History, Public Education Series No. 10. 314 pp.
-

-
- Council on Environmental Quality. 1997. Considering Cumulative Effects Under the National Environmental Policy Act. Executive Office of the President, Council on Environmental Quality, Washington, D.C. 64 pp. + append.
- Edwards, C.C. 1969. Winter behavior and population dynamics of American eagles in Utah. Ph.D. dissertation, Brigham Young University, Provo, Utah. 156 pp.
- Forrest, S.C., T.W. Clark, L. Richardson, and T.M. Campbell III. 1985. Black-footed ferret habitat: Some management and reintroduction considerations. Wyoming Bureau of Land Management Wildlife Technical Bulletin No. 2. 49 pp.
- Foulke, Thomas, Roger Coupal, and David Taylor. 2001. Economic Trends in Wyoming's Mineral Sector: Gas & Oil. B-112. University of Wyoming. Laramie, Wyoming. 20 pp.
- Frison, G.C. 1991. Prehistoric hunters of the high plains. Academic Press, Inc. New York, New York. 532 pp.
- Infinity Oil & Gas of Wyoming, Inc. 2001. Water Quality Results for Wells Located in the Bitter Creek Area of Sweetwater County, Wyoming. Denver, Colorado. Unpublished data. 20 pp.
- Knight, D.H. 1994. Mountains and plains: The ecology of Wyoming landscapes. Yale University Press, New Haven, Connecticut. 338 pp.
- Martner, B.E. 1986. Wyoming climatic atlas. University of Nebraska Press, Lincoln, Nebraska. 432 pp.
- National Wildlife Federation. 1987. Raptor management techniques manual. National Wildlife Federation Scientific and Technical Series No. 10. Port City Press, Inc., Baltimore, Maryland. 420 pp.
- Noss, R.F., and B. Csuti. 1994. Habitat fragmentation. Pages 237-264 in G.K. Meffe and C.R. Carroll, eds. Principles of conservation biology. Sinauer Associates, Sunderland, Massachusetts.
- Ogle, K.M., and B. Wood. 2004. Cumulative hydrological impact assessment of coal mining in the upper Bitter Creek, southwestern Wyoming. Wyoming Department of Environmental Quality, Land Quality Division, DEOQ-CHIA-10, 56 pp. 2 plates
- Peterson, A. 1986. Habitat suitability index models: Bald eagle (breeding season). U.S. Fish and Wildlife Service Biological Report 82(10.126). 25 pp.
- Pinedale Anticline Work Group. 2005. Historical data tracking. Presented at the March 2, 2005 meeting of the Pinedale Anticline Work Group by the Socioeconomic Task Group.
- Sheets, R.G., R.L. Linder, and R.B. Dahlgren. 1972. Food habits of two litters of black-footed ferrets in South Dakota. American Midland Naturalist 87:249-251.
- Snow, C. 1973. Habitat management series for endangered species. Report No. 5: Southern bald eagle (*Haliaeetus leucocephalus leucocephalus*) and northern bald eagle (*H.l. alascanus*). U.S. Department of the Interior, Bureau of Land Management, Technical Note No. 171. 58 pp.
-

- Steenhof, K. 1978. Management of wintering bald eagles. U.S. Fish and Wildlife Service FWS/OBS-78/79. 59 pp.
- TRC Mariah Associates Inc. 2005. Draft socioeconomic analysis technical support document for the Jonah Infill Drilling and South Piney Project environmental impact statements. Prepared for Bureau of Land Management and Jonah Infill Drilling Project operators. 292 pp. + appends.
- Ulmschneider, Helen. 2004. Surveying for pygmy rabbits (*Brachylagus idahoensis*). U.S. Department of the Interior, Bureau of Land Management, Boise District, Boise, Idaho. 25 pp.
- U.S. Census Bureau. 2003. Detailed tables. Census 2000 Summary File (SF-1) 100-Percent Data. <<http://factfinder.census.gov>>. Accessed December 31, 2003.
- U.S. Department of Commerce. 2000. 2000 census of population. U.S. Department of Commerce, Economics, and Statistics, Bureau of the Census. U.S. Government Printing Office, Washington, D.C.
- U.S. Fish and Wildlife Service. 1997. National Wetlands Inventory data for portions of Wyoming: Spatial Data and Visualization Center, Laramie, Wyoming. <<http://www.nwi.fws.gov/Maps/maps.htm>>. Accessed on October 6, 2004.
- _____. 1989. Black-footed ferret survey guidelines for compliance with the Endangered Species Act. U.S. Fish and Wildlife Service, Denver, Colorado, and Albuquerque, New Mexico. 10 pp. + append.
- _____. 2003. Letter from Brian Kelly (Field Supervisor, Wyoming Field Office) to Ted Murphy (Acting Field Office Manager, BLM Rock Springs Field Office, Rock Springs, Wyoming) in response to the scoping notice for the proposed Bitter Creek Shallow Gas Development Project. USFWS letter number ES-61411/W.02/WY7736.
- _____. 2004. Letter from Brian Kelly (Field Supervisor, Wyoming Field Office) to interested parties regarding statewide survey requirements for black-footed ferrets. USFWS letter number ES 61411/BFF/WY7746.
- U.S. Geological Survey. 1996. Final report, Wyoming gap analysis: A geographic analysis of biodiversity. Prepared in cooperation with the Wyoming Cooperative Fish and Wildlife Research Unit and University of Wyoming, Laramie, Wyoming. 109 pp.
- The Wilderness Society. 2002. Fragmenting our lands: The ecological footprint from oil and gas development. 24 pp.
- Wyoming Cooperative Fishery and Wildlife Research Unit. 1994. Raptor mitigation handbook. Wyoming Cooperative Fishery and Wildlife Research Unit, Laramie, Wyoming. 62 pp. + append.
- Wyoming Department of Employment. 2004a. Employment for Sweetwater County for the 4th Quarter of 2003. <http://doe.state.wy.us/lmi/03Q4_202/03q4t89.htm>. Data accessed October 8, 2004.
- Wyoming Department of Employment. 2004b. Unemployment for Sweetwater County for 2003. <<http://doe.state.wy.us/lmi/laus/03bmk.htm>>. Data accessed October 8, 2004.
-

-
- _____. 2005. Wyoming employment news release, March 11, 2005. Research and Planning Division, Casper, Wyoming. 2 pp.
- Wyoming Department of Environmental Quality/Water Quality Division. 2001. Water Quality Rules and Regulations, Chapter 1: Quality Standards for Wyoming Surface Waters. Cheyenne, Wyoming. 24 pp + append.
- _____. 2004. Wyoming's 2002 303(d) Waters Requiring TMD's. Cheyenne, Wyoming. 8 pp. + append.
- Wyoming Department of Environmental Quality/Air Quality Division. 2000a. Wyoming air quality standards and regulations, Chapter 3: General Emission Standards. Cheyenne, Wyoming. 52 pp.
- _____. 2000b. Wyoming air quality rules and regulations, Chapter 6, Permitting Requirements. Cheyenne, Wyoming. 93 pp.
- Wyoming Division of Economic Analysis. 2004. Wyoming Cost of Living for the Second Quarter of 2004. <<http://eadiv.state.wy.us/wcli/wcli.asp>>. Accessed October 8, 2004.
- Wyoming Game and Fish Department. 1997. Black-footed ferret. Wyoming Game and Fish Conservation Publication, Volume 13, No. 8. 3 pp.
- _____. 2003a. Wyoming Greater Sage-Grouse Conservation Plan. Wyoming Game and Fish Department, Cheyenne, Wyoming. 97 pp.
- _____. 2003b. Unpublished greater sage-grouse lek monitoring data. Wyoming Game and Fish Department, Cheyenne, Wyoming.
- _____. 2004a. Annual Big Game Herd Units Reports. Wyoming Game and Fish Department, Cheyenne, Wyoming. 650 pp.
- _____. 2004b. Atlas of birds, mammals, reptiles, and amphibians in Wyoming. Wyoming Game and Fish Department, Wildlife Division. Cheyenne, Wyoming. 190 pp.
- _____. 2004c. Annual Report of Upland and Small Game Harvest 2003. Wyoming Game and Fish Department, Wildlife Division. Cheyenne, Wyoming. 84 pp.
- Wyoming Natural Diversity Database. 2004. Elements of concern database search for the Bitter Creek Shallow Oil and Gas Project Area (T18-19N, R99-100W in Sweetwater County). Wyoming Natural Diversity Database, The Nature Conservancy, Laramie, Wyoming. Unpublished data. 12 pp.
- Wyoming Rare Plant Technical Committee. 1994. Wyoming Rare Plant Guide.
- Wyoming State Engineer's Office. 2004. Wyoming Groundwater Permits Database. <http://seo.state.wy.us/wrdb/PS_TnsRngSec.aspx>. Accessed June 28, 2004.
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CHAPTER 7.0

GLOSSARY

7.0 GLOSSARY

abandon: To cease producing oil or gas from a well when it becomes unprofitable. Usually, some of the casing is removed and salvaged, and one or more cement plugs placed in the borehole to prevent migration of fluids between formations.

acre foot: A volume of water that covers an area of one acre to a depth of one foot (43,560 cubic feet or 325,851 gallons).

affected environment: The area potentially affected by the proposed action and alternatives analyzed in a NEPA document.

allotment: An area of land where one or more permittees graze their livestock. Generally consists of public land but may include parcels of private or State lands. The number of livestock and season of use are stipulated for each allotment. An allotment may consist of several pastures or be only one pasture.

alluvium: Clay, silt, sand, and gravel or other rock material transported by flowing water and deposited as sorted or semi-sorted sediments.

ambient air quality: The state of the atmosphere at ground-level as defined by the range of measured and/or predicted ambient concentrations of all significant pollutants for all averaging periods of interest.

ambient concentration: The mass of a pollutant in a given volume of air. It is typically measured as micrograms of pollutant per cubic meter of air.

ambient: The environment as it exists at the point of measurement and against which changes or impacts are measured.

ancillary facilities: Facilities often required in an oil and gas field other than the wells and pipelines, such as compressor stations.

animal unit month (AUM): The amount of forage necessary for the sustenance of one cow/calf pair for 1 month.

Annual job equivalent (AJE): An annual job equivalent represents 260 worker days of employment, whether by one person or any number of persons.

Application for Permit to Drill (APD): The Department of Interior application permit form to authorize oil and gas drilling activities on federal land.

aquifer: A water-bearing bed or layer of permeable rock, sand, or gravel capable of yielding water, or the part of a water-driven reservoir that contains the aquifer.

background concentration: The existing levels of air pollutant concentration in a given region. In general, it includes natural and existing emission sources, but not future emission sources.

badland: Steep or very steep, commonly non-stony barren land dissected by many intermittent drainage channels. Badland is most common in semi-arid and arid regions where streams are entrenched in soft geologic material. Runoff potential is very high, and geologic erosion is active in such areas.

borehole: The circular hole made by drilling, and extending from the surface to the gas resource to be recovered.

casing: Steel pipe placed in an oil or gas well to prevent the hole from collapsing.

completion: The activities and methods to prepare a well for production. Includes installation of equipment for production from an oil or gas well.

condensate: Hydrocarbons contained in the natural gas stream and removed by condensation. Condensates are a saleable by-product of the gas recovery process.

conglomerate: A sedimentary rock comprised of an unstratified mixture or stratified layers of cobbles, gravel, and sand.

Council on Environmental Quality (CEQ): An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

critical elements of the human environment: A list of 14 resource concerns that must be addressed in every NEPA document.

crucial range: Any particular seasonal range or habitat component that has been documented as the determining factor in a population's ability to maintain itself at a certain level over the long-term.

cultural resources: The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) and the conceptual content or context (as a setting for legendary, historic, or prehistoric events, such as a sacred area of native peoples, etc.) of an area of prehistoric or historic occupation.

cumulative impact: The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taken place over a period of time (40 CFR 1508.7).

cuttings: The material removed from the borehole by the drill bit and lifted to the surface.

directional drilling: The intentional deviation of a well bore from vertical to reach subsurface areas off to one side from the drilling site.

discharge: The volume of water flowing past a point per unit time, commonly expressed as cubic feet per second (cfs), gallons per minute (gpm), or million gallons per day (mgd).

drainage: Natural channel through which water flows some time of the year. Natural and artificial means for effecting discharge of water as by a system of surface and subsurface passages.

drilling fluid: Fluid used to lubricate and cool the drill bit, assist in lifting cutting from the borehole, and control pressures in the borehole.

drilling mud: The circulating fluid used to bring cuttings out of the well bore, cool the drill bit, and provide hole stability and pressure control. Drilling mud includes a number of additives to maintain the mud at desired viscosities and weights. Some additives that may be used are caustic, toxic, or acidic.

earthquake: Sudden movement of the earth's crust resulting from faulting, volcanism, or other mechanisms.

emission factor: An empirically derived mathematical relationship between pollutant emission rate and some characteristic of the source such as volume, area, mass, or process output.

emission: Air pollution discharge into the atmosphere, usually specified by mass per unit time.

endangered species (animal): Any animal species in danger of extinction throughout all or a significant portion of its range. This definition excludes species of insects that the Secretary of the Interior determines to be pests and whose protection under the Endangered Species Act of 1973 would present an overwhelming and overriding risk to man.

endangered species (plant): Species of plants in danger of extinction throughout all or a significant portion of their ranges. Existence may be endangered because of the destruction, drastic change, or severe curtailment of habitat, or because of over exploitation, disease, predation, or even unknown reasons. Plant taxa from very limited areas (e.g., the type localities only), or from restricted fragile habitats usually are considered endangered.

environment: The aggregate of physical, biological, economic, and social factors affecting organisms in an area.

environmental impact statement (EIS): An analysis of alternative actions and their predictable environmental impacts, including physical, biological, economic, and social consequences and their interactions; short- and long-term impacts; direct, indirect, and cumulative impacts.

ephemeral drainage: A drainage area or a stream that has no base flow. Water flows for a short time each year but only in direct response to rainfall or snowmelt events.

erosion: The removal, detachment, and entrainment of earth materials by weathering, dissolution, abrasion, and corrosion, later to be transported by moving water, wind, gravity, or glaciers.

fault: A fracture in bedrock along which there has been vertical and/or horizontal movement caused by differential forces in the earth's crust.

floodplain: That portion of a river valley, adjacent to the channel, which is built of recently deposited sediments and is covered with water when the river overflows its banks at flood stages.

forage: Vegetation of all forms available for animal consumption.

forb: A broad-leafed flowering herb other than grass.

frac (fracturing): A method of stimulating well production by increasing the permeability of the producing formation. Under extremely high hydraulic pressure, the fracturing fluid (water, oil, dilute hydrochloric acid, or other fluid) is pumped into the formation which parts or fractures it. Proppants or propping agents such as sand or glass beads are pumped into the formation as part of the fracturing job. The proppants become wedged in the open fractures, leaving channels for oil to flow into the well after the hydraulic fracture pressure is released. This process is often called a "frac job." When high concentrations of acid are used, it may be called an "acid frac job."

groundwater: Water contained in the pore spaces of consolidated and unconsolidated surface material.

habitat: A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

human environment: The factors that include, but are not limited to biological, physical, social, economic, cultural and aesthetic factors that interrelate to form the environment.

hydrostatic testing: Testing of the integrity of a newly placed, but uncovered pipeline for leaks. The pipeline is filled with water and pressurized to operating pressures, and the pipeline is visually inspected.

impacts: These include: a) Direct impacts, which are caused by the action and occur at the same time and place; b) Indirect impacts, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect impacts may include growth inducing impacts and other impacts related to induced changes in the pattern of land use, population density or growth rate, and related impacts on air and water and other natural systems, including ecosystems. Impacts include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Impacts may also include those resulting from actions which may have both beneficial and detrimental impacts, even if on balance the agency believes that the impact will be beneficial (40 CFR 1508.8).

impoundment: The accumulation of any form of water in a reservoir or other storage area.

increment: Incremental standards (prevention of significant deterioration) are the maximum amounts of pollutants allowed above the baseline in regions of clean air.

infrastructure: The basic framework or underlying foundation of a community including road networks, electric and gas distribution, water and sanitation services, and facilities.

interdisciplinary team (IDT): A group selected to work within the NEPA process in scoping, analysis, and document preparation. The purpose of the team is to integrate its collective knowledge of the physical, biological, economic, and social sciences and the environmental design arts into the environmental analysis process. Interaction among team members often provides insight that otherwise would not be apparent.

intermittent stream: A stream or reach of a stream that drains a watershed of at least one square mile; or a stream or reach of a stream that is below the local water table for at least some part of the year, and obtains its flow from both surface runoff and groundwater discharge.

land use: Land uses determined for a given area that establish the types of activities allowed (e.g., mining, agriculture, timber production, residential, industrial).

lease: (1) A legal document that conveys to an operator the right to drill for oil and gas. (2) The tract of land on which a lease has been obtained, where producing wells and production equipment are located.

lek: An assembly area for communal courtship display, usually in reference to greater sage-grouse or other grouse.

life-of-project (LOP): Begins with the first disturbance authorized under the ROD for this Project and ends when all wells are plugged and abandoned and all surface disturbance meets the reclamation performance objective of 80% of original cover and plant composition.

lithic scatter: A surface scatter of cultural artifacts and debris that consists entirely of lithic (i.e., stone) tools and chipped stone debris. This is a common prehistoric site type that is contrasted to a cultural material scatter, which contains other or additional artifact types such as pottery or bone artifacts, to a camp which contains habitation features, such as hearths, storage features or occupation features, or to other site types that contain different artifacts or features.

log: A systematic recording of data, as from the driller's log, mud log, electrical well log, or radioactivity log. Many different logs may be run to obtain various characteristics of downhole formations.

long-term impacts: For the purpose of the South Piney Natural Gas Development Project NEPA analysis, long-term impacts that last for the life of the project or beyond.

mitigate: To lessen the severity.

mitigation measures: Actions taken to reduce or minimize potential impacts to the environment.

mitigation: Avoiding the impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting the degree of magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and/or compensating for the impact by replacing or providing substitute resources or environments.

monitor: To systematically and repeatedly watch, observe, or measure environmental conditions in order to track changes.

mud system: A system used to manage suspended mud in the well-drilling process.

National Ambient Air Quality Standards (NAAQS): The allowable concentrations of air pollutants in the air specified by the Federal government. The air quality standards are divided into primary standards (based on the air quality criteria and allowing an adequate margin of safety and requisite to protect the public health) and secondary standards (based on the air quality criteria and allowing an adequate margin of safety and requisite to protect the public welfare from any unknown or expected adverse effects of air pollutants).

National Environmental Policy Act (NEPA): The federal law established in 1969, which went into effect on January 1, 1970, that (1) established a national policy for the environment, (2) requires federal agencies to become aware of the environmental ramifications of their proposed actions, (3) requires full disclosure to the public of proposed federal actions and a mechanism for public input into the federal decision-making process, and (4) requires federal agencies to prepare an environmental impact statement for every major action that would significantly affect the quality of the human environment.

National Register of Historic Places: A list of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture.

natural gas: Those hydrocarbons, other than oil and other than natural gas liquids separated from natural gas, that occur naturally in the gaseous phase in the reservoir and are produced and recovered at the wellhead in gaseous form. Natural gas includes coal bed methane gas.

No Action Alternative: The management direction, activities, outputs, and effects that are likely to exist in the future if the current plan would continue unchanged.

no surface occupancy: A stipulation in a lease that disallows any surface disturbance in the lease area at any time. Natural gas or oil, for instance, would have to be recovered by directional drilling.

nominal value: The value of project activities in dollars with no adjustments.

noxious weeds: Officially designated undesirable or invading weedy species generally introduced into an area due to human activity.

oil and gas field: A natural accumulation of oil and gas in the subsurface. Oil and gas may be present in two or more reservoirs at different depths.

oil and gas lease: A federal oil and gas lease is a legal document that gives the lease holder the right to explore for and develop any oil and gas that may be present under the area designated in the lease while complying with any surface use conditions which may have been stipulated when the lease was issued.

ozone: A molecule containing three oxygen atoms (O₃) produced by passage of an electrical spark through air or oxygen (O₂).

particulate matter: A particle of soil or liquid matter (e.g., soot, dust, aerosols, fumes and mist).

perennial stream: A stream or reach of a stream that flows throughout the year.

physiographic province: A region having a pattern of relief features or landforms that differs significantly from adjacent regions.

physiographic: pertaining to the genesis and evolution of landforms.

PM_{2.5}: Airborne suspended particles with an aerodynamic diameter of 2.5 microns or less.

PM₁₀: Airborne suspended particles with an aerodynamic diameter of 10 microns or less.

preferred alternative: The alternative identified in the EIS as the action favored by the agency.

prevention of significant deterioration of air quality (PSD): A classification established to preserve, protect, and enhance the air quality in National Wilderness Preservation System areas in existence prior to August 1977 and other areas of National significance, while ensuring economic growth can occur in a manner consistent with the preservation of existing clean air resources. Specific emission limitations and other measures, by class, are detailed in the Clean Air Act (42 USC 1875 et 15q.).

produced water: Formation water pumped during the development of a gas well.

production casing: Steel pipe installed in the borehole to isolate all formation in the borehole and eliminate communication between hydrocarbon-bearing zones and/or water aquifers and other mineral resources.

PSD increments: The maximum allowable increase in pollutant concentrations permitted over baseline conditions as specified in the EPA Prevention of Significant Deterioration (PSD) regulations (40 CFR Part 52.21). The regulations apply only to area currently attaining NAAQS/WAAQS. Most National Parks and Wilderness areas are Class I Areas, where almost no future pollution increase is permitted. Most other areas are Class II Areas, where moderate increases in pollution levels are allowed.

range: Land producing native forage for animal consumption and lands that are revegetated naturally or artificially to provide forage cover that is managed like native vegetation, which are amenable to certain range management principles or practices.

raptor: A group of carnivorous birds consisting of hawks, eagles, falcons, kites, vultures, and owls.

reclamation: rehabilitation of a disturbed area to make it acceptable for designated uses. This normally involves regrading, replacement of topsoil, revegetation and other work necessary to restore it for use.

record of decision (ROD): A decision document for an Environmental Impact Statement or Supplemental EIS that publicly and officially discloses the responsible official's decision regarding the actions proposed in the EIS and their implementation.

reserve pit: (1) Usually an excavated pit that may be lined with plastic, that holds drill cuttings and waste mud. (2) Term for the pit which holds the drilling mud.

reserves: Identified resources of mineral-bearing rock from which the mineral can be extracted profitably with existing technology and under present economic conditions.

revegetation: The re-establishment and development of self-sustaining plant cover. On disturbed sites, human assistance will speed natural processes by seed bed preparation, reseeding and mulching.

rig: A collective term to describe the permanent equipment needed when drilling a well.

right-of-way (ROW): The legal right for use, occupancy, or access across land or water areas for a specified purpose or purposes.

riparian: Land areas which are directly influenced by water. They usually have visible vegetative or physical characteristics showing this water influence. Streamsides and lake borders are typical riparian areas.

roosting: To rest or sleep in a roost. A bird will typically use the same roost for an extended period of time.

runoff: That part of precipitation that appears in surface streams. Precipitation that is not retained on the site where it falls and is not absorbed by the soil.

scatter (archeological): Random evidence of prior disturbance that is distributed about an area rather than concentrated in a single location.

scoping: An early and open process for determining the scope of issues to be addressed in an EIS and for identifying the significant issues related to a proposed action. Scoping may involve public meetings, field interviews with representatives of agencies and interest groups, discussions with resource specialists and managers, and written comments in response to news releases, direct mailings, and articles about the proposed action and scoping meetings.

sediment: Soil or mineral transported by moving water, wind, gravity, or glaciers, and deposited in streams or other bodies of water, or on land.

seismic: Pertaining to an earthquake or earth vibration, including those that are artificially induced.

short-term impacts: For the purpose of the South Piney Natural Gas Development Project NEPA analysis, short-term impacts are generally defined as those that would last for 5 years or less.

significant impact: A meaningful standard to which an action may impact the environment. The impact may be beneficial, adverse, direct, indirect, or cumulative, and may have short-term or long-term impacts.

soil: Loose, unconsolidated surface material comprising topsoil and subsoil.

spacing: The number of acres per given well. For instance, 160-acre spacing means that one well would be drilled in each quarter section (160 acres), or up to four wells per section (640 acres).

species: (1) The classification level of biological nomenclature which categorized each group of related organisms potentially capable of interbreeding; (2) the accepted level of classification to differentiate one specific type of organism from another.

stipulation: A legal requirement, specifically a requirement that is part of the terms of a mineral lease. Some stipulations are standard on all federal leases. Other stipulations may be applied to the lease at the discretion of the surface management agency to protect valuable surface resources.

strata: An identifiable layer of bedrock or sediment; does not imply a particular thickness of rock.

substrate: Material consisting of silts, sands, gravels, boulder and woody debris found on the bottom of a stream channel.

threatened and endangered species: Any species, plant or animal, which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Threatened species are identified by the Secretary of the Interior in accordance with the 1973 Endangered Species Act.

topography: The features of the earth, including relief, vegetation, and waters.

vegetation type: A plant community with visually distinguishable characteristics, named for the apparent dominant species.

vegetation: All of the plants growing in and characterizing a specific area or region; the combination of different plant communities found there.

visual resource: The composite of basic terrain, geologic features, water features, vegetation patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for viewers.

Visual Resource Management (VRM): A system of visual management used by the BLM. The program has a dual purpose, to manage the quality of the visual environment and to reduce the visual impact of development activities while maintaining effectiveness in all Bureau resource programs. VRM also identifies scenic areas that warrant protection through special management attention. The system uses five classes for categorizing visual resources.

Class 1 - Natural ecological changes and very limited management activity are allowed. Any contrasts created within the characteristic landscape must not attract attention. This classification is applied to wilderness areas, wild and scenic rivers, and other similar situations.

Class 2 - Changes in any of the basic elements (form line, color, texture) caused by a management activity should not be evident in the characteristic landscape. Contrasts are seen, but must not attract attention.

Class 3 - Contrasts to the basic elements caused by a management activity are evident, but should remain subordinate to the existing landscape.

Class 4 - Any contrast attracts attention and is a dominant feature of the landscape in terms of scale, but it should repeat the form, line, color and texture of the characteristic landscape.

Class 5 - The classification is applied to areas where the natural character of the landscape has been disturbed to a point where rehabilitation is needed to bring it up to one of the four other classifications. The classification also applies to areas where unacceptable cultural modification has lowered scenic quality; it is often used as an interim classification until objectives of another class can be reached.

water quality: Refers to a set of chemical, physical, or biological characteristics that describe the condition of a river, stream, or lake. The quality of water determines which beneficial uses it can support. Different instream conditions or levels of water quality are required to support different beneficial uses.

watershed: The total land area that drains to a given location.

well: Refers to a well bore or bottomholes, several of which may be drilled from a single well pad.)

well pad: Relatively flat work area that is used for drilling a well and producing from the well once it is completed. The term “well pad” as used in this EIS identifies the surface location from which a single or multiple wells or well bores or bottomholes may be drilled.

well bore: The hole drilled from the surface to the gas-bearing formation.

wetlands: Areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

winter range: The place where migratory (and sometimes non-migratory) animals congregate during the winter season.

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APPENDIX A:
SCOPING NOTICE

SCOPING STATEMENT
BITTER CREEK SHALLOW GAS DEVELOPMENT PROJECT
Infinity Oil & Gas of Wyoming, Inc., Yates Petroleum Corporation,
and Merrion Oil & Gas Corporation
Bureau of Land Management
Rock Springs Field Office
Description of Project

Infinity Oil & Gas of Wyoming, Inc. (IOGW), Yates Petroleum Corporation (YPC), and Merrion Oil & Gas Corporation (MOGC) (hereinafter referred to as “the Companies”) have notified the Bureau of Land Management (BLM), Rock Springs Field Office that the Companies propose to explore and potentially develop a shallow gas project located within the administrative boundary of the BLM Rock Springs Field Office. The proposed Bitter Creek Shallow Gas Project (Bitter Creek Project) area is generally located in Townships 18 and 19 North, Ranges 99 and 100 West, 6th Principal Meridian, Sweetwater County, Wyoming (see attached map).

The project area encompasses approximately 16,640 acres, of which approximately 10,680 acres are federal surface and minerals, approximately 1,280 acres are federal surface and State of Wyoming minerals, and approximately 4,680 acres are private surface and minerals. Anadarko Petroleum Corporation and its affiliated companies own the 4,680 acres of private surface and mineral estate with the rights to explore and develop shallow gas reserves thereon held by IOGW. Access to the area would be via Interstate 80, Sweetwater County Road #4-19 and existing roads/trails in the area. The Bitter Creek Project area overlies an area which has already experienced some exploratory drilling by the Companies. Drilling operations within the Bitter Creek Project Area began on federal surface/mineral estate in 1963 with the drilling of a single well in Section 14 of Township 18 North, Range 100 West, which continues to produce today. A second producing well was drilled in Section 2 of Township 18 North, Range 100 West in 1988. These two producing wells are currently owned and operated by MOGC. Activity within the project area was sporadic until early 2001, when IOGW began a shallow gas exploration program on fee surface and mineral estate in Section 1 of Township 18 North, Range 100 West.

Since 2001, IOGW has drilled 30 wells (26 fee and 4 federal) in the project area. Of these 30 wells, 14 are currently producing varying quantities of natural gas, 13 are either shut-in or waiting on completion, and 3 were drilled as water disposal (injection) wells. The Companies propose drilling a maximum of 61 additional wells on federal surface estate within the Bitter Creek Project area. These wells would be drilled on a 160-acre spacing pattern and would utilize as much of the existing infrastructure (i.e., access roads and pipelines) as possible. Drilling is expected to last for approximately two to four years, with a projected life-of-project (LOP) of 15 to 20 years.

Proposed Drilling Operations

Approximately 7 days would be required to drill, log, and run casing for each well with an additional 7 days required to run a bond log, perforate the well casing, and set production equipment. The approximate size of each individual well pad would be 200 feet by 300 feet. A reserve pit would be constructed at each drill site location to hold drilling fluids and cuttings. The reserve pit would be approximately 75 feet wide by 110 feet long by 10 feet deep. Drilling depths would vary within the project area between approximately 2,000 feet and 4,000 feet. Produced water for use in drilling operations would be obtained from producing IOGW gas wells located within the overall project area.

Each well would be designed with a 3-inch water discharge line and a 4-inch gas line. Disposal of produced water would be accomplished via existing and new injection wells or through disposal at a commercial water disposal facility as appropriate. No surface disposal of produced water is proposed. A separator and storage tank may need to be placed at some or all well locations along with metering equipment.

Following drilling and completion, flowlines and gathering facilities would be installed. Production equipment would be powered by either natural gas or electricity where readily available. Gas lines would be tied into compressors to be located within the project area. High gas volumes would dictate the need for additional compression or compressors. Any additional natural gas produced within the Bitter Creek Project Area would be transported by both new and existing pipelines and new and existing gathering lines. The Companies would parallel existing roads, pipelines, and gathering lines whenever feasible.

If any of the wells are either non-productive or non-economical, they would be plugged and abandoned, with all disturbed areas being recontoured, reseeded, and otherwise reclaimed to appropriate federal, state, or private landowner specifications.

Relationship to Existing Plans and Documents

Resource Management Plan - The document which directs management of federal lands within the Rock Springs Field Office (RSFO) is the Green River Resource Management Plan (GRRMP) and Record of Decision approved in 1997. The objective for the management of oil and gas resources, as stated in the GRRMP, is to provide for leasing, exploration, and development of oil and gas while protecting other resource values. In addition, the GRRMP states public lands within the checkerboard area are open to mineral leasing and development (to promote mineral recovery) with appropriate mitigation on a case-by-case basis.

The development of natural gas within the Bitter Creek Project area is in conformance with the GRRMP. The environmental analysis that will be prepared for the proposed Bitter Creek Project proposal submitted by the Companies will incorporate decisions, terms, and conditions of use as described in the GRRMP.

Use Authorizations - Use authorizations (e.g., rights-of-way, permits, etc.) for roads, power lines, pipelines, and well site facilities would be processed through BLM's Application for Permit to Drill (APD) and Sundry Notice permitting process as long as the facilities remain on-lease and are owned and operated by the lessee or designated operator. Any facilities located off-lease would require individual right-of-way permits.

Lease Stipulations - Some federal oil and gas leases within the proposed area may include special stipulations on occupancy. These stipulations are in addition to the standard lease terms and are designed to protect surface resources such as soils, water, and wildlife by restricting periods of activity and areas of disturbance. Application of these lease stipulations will be handled on a case-by-case basis for each APD submitted to the BLM.

National Environmental Policy Act

The proposed project will be analyzed in accordance with the requirements of the National Environmental Policy Act (NEPA). To comply with NEPA and the Council on Environmental Quality regulations, which implement NEPA, the BLM is required to prepare an environmental analysis. The environmental document will serve several purposes. It will provide both the public and governmental agencies with information about the potential environmental consequences of the project and alternatives; identify all practicable means to avoid or minimize environmental harm from the project and alternatives; and

provide the responsible official with information upon which to make an informed decision regarding the project.

One element of the NEPA process is scoping. Scoping activities are initiated early in the process to:

- identify reasonable alternatives to be evaluated in the environmental analysis;
- identify environmental issues of concern related to the proposed project; and
- determine the depth of analysis for issues addressed in the environmental document.

This scoping statement has been prepared to enable governmental agencies, the general public, and other interested parties to participate in and contribute to the analysis process. Public input is important in establishing the scope of analysis for any NEPA document, and the BLM encourages public participation.

Identified Resource Management Issues, Concerns, and Opportunities

The following issues and concerns have been identified by an interdisciplinary team of BLM specialists. The issues identified below are not meant to be all-inclusive, but rather a starting point for public input:

- Potential increased traffic and associated impacts to existing county, state, and BLM roads.
- Potential socio-economic impacts to local communities.
- Potential impacts from emissions resulting from additional drilling and production activities.
- Potential impact to surface and ground water resources.
- Potential impacts related to reclamation of disturbed areas and control of noxious weed invasions.
- Potential impacts to cultural and historical values within the analysis area.
- Potential impacts to wildlife habitats within the analysis area, including big game, sage grouse, and raptors.
- Potential impacts to listed, or proposed for listing, threatened, endangered, and candidate plant and animal species.
- Potential cumulative effects of drilling and development activities when combined with other ongoing and proposed developments on lands adjacent to the Bitter Creek Project area.
- Potential conflicts between oil and gas exploration, development, and solid mineral (coal) development activities and opportunities.

Interdisciplinary Team

Based on current understanding of issues, concerns, and opportunities and established objectives from other plans, an interdisciplinary team made up of the following specialists has been tentatively identified:

Air Quality Specialist

Soil Scientist
Range Management Specialist
Archeologist
Geologist
Realty Specialist
Recreation Planner
Hydrologist
Petroleum Engineer
Wildlife Biologist
Environmental Scientist (surface protection)
Interdisciplinary Team Leader
Public Affairs Specialist

Timing Needs or Requirements

Public input is important in establishing the level and scope of the analysis. The public is encouraged to participate throughout the environmental analysis process to help in identifying the level of analysis needed, alternatives to the proposed action, other issues or concerns that should be analyzed, mitigative opportunities, and any other comments or ideas to help ensure the completeness of the analysis process.

Comments are due by **November 17, 2003**. Please submit your comments to:

Address: Darlene Horsey, Project Lead
BLM - Rock Springs Field Office
280 Highway 191 North
Rock Springs, Wyoming 82901

Email: rock_springs_wymail@blm.gov (Please add "Bitter Creek Project" in the Subject line)

Initial Mailing List

The scoping notice in initial mailing distribution includes the following agencies, individuals, industries, organizations, and media:

Government Offices

Bureau of Land Management, Wyoming State Office (910, 912, 920, 930)
Bureau of Land Management, Rawlins Field Office
Office of the Governor
U.S. Department of the Army, Corps of Engineers
U.S. Fish and Wildlife Service
Wyoming State Clearinghouse
Wyoming Department of Environmental Quality
Wyoming Oil and Gas Conservation Commission
Wyoming Game and Fish Department (Cheyenne, Green River)

Elected and Other Officials

Mayors of Rock Springs, Green River, Superior
Postmaster, Farson
State Senators: Rae Lynn Job, Tex Boggs

State Representatives: Marty Martin, Fred Parady
Sweetwater County Commissioners
Sweetwater County Planner
Sweetwater County Libraries, Green River, Rock Springs
U.S. Congresswoman Barbara Cubin, Bonnie Cannon, Representative
U.S. Senator Mike Enzi, Lyn Shanaghy, Representative
U.S. Senator Craig Thomas, Pati Smith, Representative

Public Land Users and User Groups

Rock Springs Grazing Association
People for the West
Petroleum Association of Wyoming
Independent Petroleum Association of Mountain States
Native American Tribes: Eastern Shoshone, Northern Ute, Northern Arapaho, Shoshone-Bannock
Sierra Club, Northern Plains Representative
Southwest Wyoming Industrial Association
Wilderness Society
Rocky Mountain Elk Foundation
National Wildlife Federation
Wyoming Wildlife Federation
Wyoming Association of Professional Archaeologists
Wyoming Outdoor Council
Wyoming Public Lands Council
Wyoming Chapter of the Sierra Club
Environmental Defense Fund
Biodiversity Conservation Alliance

Newspapers

Pinedale Roundup
Sublette Examiner
Kemmerer Gazette
Rock Springs Daily Rocket-Miner
Casper Star-Tribune
Green River Star
Wyoming State Journal
Uinta County Herald

Radio Stations

KQSW/KRKK. Rock Springs
KMKX - Rock Springs
KUGR - Green River
KYCS - Rock Springs
KMER – Kemmerer
KRAL - Rawlins
KUWR - University of Wyoming

Television Stations

KTWO-TV - Casper

KCWY-TV - Casper

KFNB-TV - Casper

KGWC-TV - Casper

APPENDIX B:
RECLAMATION PLAN

APPENDIX B:
RECLAMATION PLAN FOR THE
BITTER CREEK SHALLOW OIL AND GAS PROJECT

Bureau of Land Management
Rock Springs Field Office
Rock Springs, Wyoming

June 2005

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ACRONYMS AND ABBREVIATIONS

APD	Application for Permit to Drill
BLM	Bureau of Land Management
BCSOGP	Bitter Creek Shallow Oil and Gas Project
LOP	Life of Project
POD	Plan of Development
PLS	Pure Live Seed
RMP	Resource Management Plan
SUP	Surface Use Plan

B-1.0 INTRODUCTION

This reclamation plan will serve as guidance to achieve successful reclamation on federal lands, administrated by the Bureau of Land Management (BLM), within the Bitter Creek Shallow Oil and Gas Project (BCSOGP) area. Alternate reclamation procedures may be implemented on federal lands as directed by the BLM or on private and state lands. This plan complies with BLM reclamation and management directives specified in the Rock Springs Field Office Resource Management Plan (RMP) (BLM 1992, 1996, 1997). This reclamation plan also complies with on *Executive Order* 13112 (control of invasive species).

B-2.0 RECLAMATION REQUIREMENTS AND SUCCESS STANDARDS

B-2.1 RECLAMATION REQUIREMENTS

BLM's reclamation requirements include the following major goals.

- Recontour the land surface and implement other soil conservation, surface manipulation, and water management techniques to establish stable slopes, water courses, and drainage features to minimize erosion and sedimentation (also protecting surface and ground water resources).
- Revegetate disturbed areas to establish self-perpetuating native plant communities capable of supporting existing and future land uses.
- Minimize visual contrasts.

B-2.2 RECLAMATION SUCCESS STANDARDS

The following reclamation success standards are the measures that would be used to assess whether BLM's reclamation requirements are being met. The procedures presented below are designed to achieve the success standards and, in doing so, to meet BLM's requirements. Reclamation would be implemented, managed, and monitored by the Operators with BLM oversight/approval. Alternatives to all or portions of this reclamation plan may be implemented if the following standards would be met.

1. No contaminated materials would occur at or near the surface, and all buried undesirable materials would be encapsulated in impermeable material (e.g., sealed pit liners, concrete) and covered with at least 4 ft of spoil.
 2. The subsurface would be stable--holes would be plugged and no indications of subsidence, slumping, and/or significant downward movement of surface soil materials would be visible.
 3. Reclaimed areas would be free of solid waste (i.e., trash or debris).
-

-
4. Reclaimed areas would be stable and would not exhibit rills or gullies greater than 2 inches deep or are actively eroding, perceptible soil movement or head cutting in drainages, and/or slope instability on or adjacent to the reclaimed area.
 5. Soil surfaces would have adequate surface roughness to reduce runoff and to capture rainfall and snow melt.
 6. Vegetative canopy cover, production, and species diversity of desirable species would approximate the surrounding undisturbed areas. Vegetation would help stabilize the site, would support post-disturbance land uses, and would be self-sustaining. Revegetated areas would exhibit vegetative reproduction, either spreading by rhizomatous species or seed production, and would be free as practical of noxious, non-native, and invasive species.
 7. The reclaimed landscape would have characteristics that approximate the visual quality of adjacent areas with regard to location, scale (e.g., line, form, and texture), contour, color, and orientation of major landscape features and would support post-disturbance land uses.
-

B-3.0 RECLAMATION PLAN

B-3.1 PREDISTURBANCE PLANNING AND SITE PREPARATION

Predisturbance planning would minimize the amount of reclamation at a site by reducing land disturbance. In addition, preparing the site for construction while planning for reclamation (e.g., salvaging and stockpiling topsoil and spoil, separately; locating facilities away from cut-and-fill slopes; minimizing the area occupied by facilities) would facilitate achieving reclamation success.

B-3.1.1 Predisturbance Planning

During selection of drill site, road, pipeline, and ancillary facility locations, Operators would avoid the following areas, where practical:

- areas with high erosion potential (e.g., rugged topography, steep slopes [$>25\%$], stabilized sand dunes, floodplains);
- areas with saturated soils;
- areas within 500 ft of wetland or riparian areas; and
- areas within 100 ft of ephemeral channels.

Prior to disturbance and as part of the Application for Permit to Drill (APD) process, Operators would conduct on-site inspections with the BLM or other surface owner of each proposed disturbance area to determine the suitability of proposed facility locations and/or corridors with regard to the above-listed avoidance areas. In addition, Operators would submit for BLM approval Surface Use Plans and/or Plans of Development for each proposed surface disturbance area or corridor. These plans would include the following components:

- project administration, time frames, and responsible individuals;
 - a commitment to adhere to this reclamation plan;
 - detailed descriptions of all deviations from this plan required due to site-specific conditions and the rationale for changes; and
 - a commitment to meet the reclamation success standards described above.
-

B-3.1.2 Site Preparation

Topsoil would be salvaged from all proposed disturbance areas and stockpiled, unless the BLM deems that leaving topsoil in place would facilitate better reclamation. Vegetation would be salvaged and stockpiled with topsoil to incorporate native seeds and organic matter.

At each location to be disturbed, a qualified soil scientist or reclamation specialist would make a field-based determination on appropriate salvage depth(s). The volume of topsoil or other suitable plant growth material to be salvaged, proposed topsoil replacement depth, and topsoil storage areas would be specified in the APD. If less than 6 inches of topsoil are available, topsoil would be added to an appropriate quantity of suitable spoil, with BLM approval, so that a minimum of 6 inches of plant growth material would be available for use during revegetation operations. The Operators would sample and analyze all suitable subsoil to ensure that it is suitable for revegetation purposes. Only subsoil that tests suitable (refer to Table B-3.1) would be salvaged and used for revegetation purposes. No unsuitable materials would be used for revegetation purposes. Any suitable subsoil that might be used for revegetation would be stockpiled separately and would not be mixed with actual topsoil. Signs with the words topsoil and subsoil would be placed on each appropriate topsoil and subsoil pile.

Table B-3.1 Criteria to Establish Suitability as Topsoil (or Topsoil Substitutes).¹

Parameter	Suitability		
	Suitable	Marginal	Unsuitable
pH	5.5-8.5	5.0-5.5	<5.0 >9.0
EC (conductivity) mmhos/cm	0-4	8-12	>12
SAR	0-10	10-12	>12
Boron	<5.0 ppm		>5.0 ppm
Coarse Frag. (% volume)	<25%	25-35%	>35%

¹ Adapted from Wyoming Department of Environmental Quality Land Quality Division (1984).

Where cut-and-fill construction technique is required, Operators would (to the extent possible) balance the volumes of cut versus fill material to minimize the volume of excess spoil material that would be stockpiled and minimize the amount of disturbance created.

For pipelines and access roads constructed on slopes of less than 15%, topsoil would be salvaged from all areas to be disturbed and stockpiled in windrows within the construction right-of-way by sidecasting with a grader. Where pipelines and roads are to be constructed on slopes greater than 15%, the topsoil would be transported to more level terrain for stockpiling.

Topsoil and suitable subsoil stockpiles would be constructed to remain stable until they are used for reclamation. Whenever possible, topsoil would be replaced at the first seasonal opportunity. If topsoil or suitable subsoil is to be stockpiled for more than 2 years, the piles would be seeded with the appropriate seed mixture discussed below. Stockpile would have a maximum slope of 5:1 or less on the long axis and a maximum of 1:1 on the side slopes. If a topsoil stockpile is located on or adjacent to ground that slope 3:1 or more, runoff would be diverted around the stockpile via interceptor ditches. Interceptor ditches would be V-shaped--1 ft deep and 3 ft wide with gently sloping sides--and would empty onto native, undisturbed vegetation. All stockpiles would be located so as not to affect existing drainage channels.

B-3.2 RECLAMATION TIMING

Temporary and permanent reclamation would occur in the first seasonal opportunity (i.e., after October 15 to when the soil is frozen and before May 15). Spring seeding would only be conducted if fall seeding is not feasible following completion of required construction or production activities.

B-3.3 TEMPORARY RECLAMATION

Temporary reclamation would be conducted on areas that would be redisturbed (e.g., topsoil and suitable subsoil stockpiles) prior to final project abandonment. For pad cut-and-fill slopes on operating wells, Operators may elect to conduct either temporary or permanent reclamation. However, Operators would not use temporary reclamation as a means to delay permanent reclamation on areas that would not be redisturbed.

Temporary reclamation areas would be regraded and recontoured to slopes of 3:1 or less. Regraded surfaces would be ripped to a depth of 1 ft, if necessary (e.g., on road areas), to reduce soil compaction. Topsoil would not be replaced on any temporary reclamation areas. The temporary reclamation areas would then be seeded using the temporary seed mixture presented in Table B-3.2.

Table B-3.2 Temporary Seed Mixture.¹

Species	Approximate Seeding Rate (PLS/acre) ²
Western wheatgrass (<i>Elymus smithii</i>)	3.0
Slender wheatgrass (<i>Elymus trachycaulus</i>)	3.0
Streambank wheatgrass (<i>Elymus lanceolatus</i> var. <i>riparius</i>)	3.0
Total	9.0

¹ It is anticipated that this seed mixture primarily would be used on topsoil and subsoil stockpiles designated for long-term storage.

² PLS/acre = pounds of pure live seed per acre; alternate seeding rates may be applied in some areas as deemed appropriately by BLM and specified in the approved APD.

B-3.4 PERMANENT RECLAMATION

Permanent reclamation would be conducted on all disturbed areas that are no longer required for ongoing field operations (e.g., portions or all of well pads, road out-slopes, and pipeline corridors). Because permanent reclamation would occur throughout the Life of Project (LOP), this plan does not differentiate between "interim" and "final" reclamation. All permanent reclamation is considered final unless monitoring shows that it needs to be augmented or repeated. Operators would completely reclaim all portions of well pads not required for operations, access road out-slopes, and pipeline corridors following construction operations or abandonment of a dry well. If reclamation involves facility removal, regrading and reseeding would occur at the first seasonal opportunity (either fall (preferred) or spring) following facility removal.

B-3.4.1 Facility Removal

Some facilities would reach the end of their operational life during the LOP, whereas others would remain in use until field production is complete. When the Operators determine that a well or other facility is no longer required for ongoing operations it would be removed and the area would be permanently reclaimed and revegetated.

All wells would be abandoned in accordance with BLM and/or Wyoming Oil and Gas Conservation Commission regulations. Well pads, pipelines, and water disposal facilities, including buildings, tanks, reserve pits, evaporation pits, and associated facilities would be dismantled, removed from BLM lands, and salvaged, re-used, recycled, or disposed of at approved sites. Underground pipelines would be purged of gas or liquid materials, plugged, and abandoned in place.

Liquid or solid wastes remaining at well locations would be tested and properly disposed in accordance with appropriate state and federal regulations. Reserve and evaporation pit liners would be disposed of at state-approved disposal facilities or buried on-site. Concrete foundations, pads, or footings would be broken-up and removed or buried on-site. Aggregates

used for well pad, road, and other facility construction activities also would be removed or buried on-site. Operators would obtain BLM approval for the on-site burial of any material.

Road reclamation would include the removal of fill material, any surface materials, culverts, sediment control structures, and signs not required for ongoing operations. Drainage-crossing sideslopes would be reduced to no more than 4:1 to reduce bank erosion and produce stable sideslopes. Barriers, such as water bars, would be used to discourage travel on the reclaimed roads and pipelines until permanent reclamation is deemed successful.

B-3.4.2 Surface Preparation

B-3.4.2.1 Backfilling and Grading

Areas to be backfilled include reserve pits, cut slopes, pipeline trenches, borrow ditches, and facility foundations. Pipeline trenches would be backfilled so that the spoil berm is approximately 3 inches higher than the natural ground. Spoil for backfill would be obtained from existing fill material and spoil stockpiles.

Areas to be reclaimed would be graded to approximate original contours to blend in with adjacent topography. Area-wide drainage would be restored so that surface runoff flows and gradients are returned to the predisturbance conditions. Graded surfaces would be suitable for the replacement of a uniform depth of topsoil/suitable subsoil which would promote cohesion between subsoil and topsoil layers, would reduce wind erosion, and would facilitate moisture retention. Specialized grading techniques would be applied at the Operators' discretion and may include slope rounding, bench grading, stair-step grading, and/or contour furrowing. Dozers, loaders, scrapers, and/or motor graders would typically be used for backfilling and regrading operations.

B-3.4.2.2 Ripping

Compacted areas such as roads and wellpads would be ripped to a depth of approximately 1 to 2 ft to improve soil aeration, water infiltration, and root penetration. Motor graders or tractors

equipped with ripping shanks would typically be used for ripping. Ripper shanks would be set approximately 3 to 4 ft apart.

B-3.4.3 Seedbed Preparation

Seedbed preparation maximizes seeding efficiency and improves reclamation success. It includes topsoil replacement and discing. Surface roughening procedures (e.g., pitting, gouging) also may be applied at the discretion of Operators.

B-3.4.3.1 Topsoil Replacement

Waterbars and erosion control devices would be installed on reclaimed areas prior to topsoil replacement, as necessary, to control topsoil erosion and reduce storm water runoff.

Between 6 and 24 inches of stockpiled topsoil would be typically be redistributed uniformly on areas to be reclaimed using scrapers and motorgraders. The depth of topsoil/suitable subsoil to be replaced is dependant upon the amount of material that was previously salvaged and stockpiled. If the stockpile for a specific location contains insufficient topsoil to meet the required 6-inch minimum, suitable subsoil would be replaced first and then the available topsoil would be placed on the surface. To encourage vegetation establishment, topsoil and suitable subsoil would not be mixed prior to final placement.

B-3.4.3.2 Discing

After topsoil replacement, all newly retopsoiled areas would be disced or harrowed to reduce soil compaction, to break up soil clods, to improve root penetration and water retention/infiltration, and to provide a suitable seedbed. The surface would be rough to reduce wind and water erosion and to promote moisture retention and infiltration. Discing and harrowing would typically be accomplished using a tractor-drawn disc or harrow set approximately 2 inches deep.

B-3.4.4 Revegetation

B-3.4.4.1 Seeding

Once the seedbed has been prepared, seeding would occur within 2 weeks unless the ground is wet or frozen. In this circumstance, seeding would be delayed until the ground dries or thaws to the point where the soil is friable. Operators have the discretion to conduct soil fertility tests and/or use fertilizers; however, it would not be required for the first attempt at permanent reclamation because fertilizers generally are not effective in semi-arid climates and typically promote weed establishment and growth. Fertilizers would not be used near open water. In addition to fertilizer use, Operators have the discretion to use other soil amendments/techniques such as inoculation with soil microorganisms, organic matter, etc.

Reclaimed areas would be seeded using the permanent seed mixtures presented in Tables B-3.3 through B-3.5. These mixtures were developed based on the following criteria: general conditions within the analysis area, species adaptations to site conditions, usefulness of the species for rapid site stabilization, species success in past revegetation efforts, seed costs and availability, and compliance with *Executive Order* 13112 and BLM Manual Section 1745 (i.e., use of native species).

Alternative species and seeding rates may be used at Operator discretion, if warranted by site-specific conditions or seed availability, provided that the alternative species/seeding rates facilitate achieving reclamation success. All seeds used for revegetation purposes would be certified weed-free.

Table B-3.3 Permanent Reclamation Seed Mixture for Sagebrush-dominated Communities with Sandy Soils.¹

Species	Drill Seeding Rate (PLS/acre) ²
Grasses	
Thickspike wheatgrass (<i>Elymus lanceolatus</i> var. <i>lanceolatus</i>)	2.00
Western wheatgrass (<i>Elymus smithii</i>)	2.00
Bluebunch wheatgrass (<i>Elymus spicatum</i>)	2.00
Indian ricegrass (<i>Oryzopsis hymenoides</i>)	3.00
Needle-and-thread (<i>Stipa comata</i>)	3.00
Forbs (select one or more of the following forb species)	
Desert Indian paintbrush (<i>Castilleja chromosa</i>)	1.00
Scarlet globemallow (<i>Sphaeralcea coccinea</i>)	1.00
Shrubs (select 2 or more of the following shrub species)	
Wyoming big sagebrush (<i>Artemisia tridentata wyomingensis</i>)	0.25
Common winterfat (<i>Krascheninnikovia lanata</i>) ³	1.00
Four-wing saltbush (<i>Atriplex canescens</i>)	3.00
Antelope bitterbrush (<i>Purshia tridentata</i>)	1.00
Total	14.25-19.25

¹ Operators may submit for approval alternative site-specific seed mixtures.

² PLS/acre = pounds of pure live seed per acre. Seeding rates would be doubled if seed is to be broadcast.

³ Winterfat seed would be broadcast simultaneously with drill-seeding other species.

Table B-3.4 Permanent Reclamation Seed Mixture for Sagebrush-dominated Communities with Alkaline Soils.¹

Species	Approximate Seeding Rate (PLS/acre) ²
Grasses	
Western wheatgrass (<i>Elymus smithii</i>)	3.00
Thickspike wheatgrass (<i>Elymus lanceolatus</i> var. <i>lanceolatus</i>)	3.00
Alkaligrass (<i>Puccinellia distans</i>)	3.00
Alkali sacaton (<i>Sporobolus airoides</i>)	3.00
Forbs (select one or more of the following forb species)	
Scarlet globemallow (<i>Sphaeralcea coccinea</i>)	1.00
Evening primrose (<i>Oenothera</i> sp.)	1.00
Shrubs (select two or more of the following shrub species)	
Wyoming big sagebrush (<i>Artemisia tridentata wyomingensis</i>)	0.25
Common winterfat (<i>Krascheninnikovia lanata</i>) ³	1.00
Four-wing saltbush (<i>Atriplex canescens</i>)	3.00
Gardner saltbush (<i>Atriplex gardneri</i>)	1.00
Total	14.25-19.25

¹ Operators may submit for approval alternative site-specific seed mixtures.

² PLS/acre = pounds of pure live seed per acre. Seeding rates would be doubled if seed is to be broadcast.

³ Winterfat seed would be broadcast simultaneously with drill-seeding other species.

Table B-3.5 Permanent Reclamation Seed Mixture for Saltbush Communities.¹

Species	Approximate Seeding Rate (PLS/acre) ²
Grasses	
Sandberg bluegrass (<i>Poa sandbergii</i>)	1.0
Western wheatgrass (<i>Elymus smithii</i>)	2.0
Thickspike wheatgrass (<i>Elymus lanceolatus</i> var. <i>lanceolatus</i>)	2.0
Alkaligrass (<i>Puccinellia distans</i>)	3.0
Alkali sacaton (<i>Sporobolus airoides</i>)	3.0
Forbs (select one or more of the following forb species)	
Gooseberryleaf globemallow (<i>Sphaeralcea grossulariaefolia</i>)	1.0
Northern sweetvetch (<i>Hedysarum boreale</i>)	1.0
Evening primrose (<i>Oenothera</i> sp.)	1.0
Shrubs (select two or more of the following shrub species)	
Four-wing saltbush (<i>Atriplex canescens</i>)	3.0
Shadscale (<i>Atriplex confertifolia</i>)	1.0
Gardner saltbush (<i>Atriplex gardneri</i>)	1.0
Common winterfat (<i>Krascheninnikovia lanata</i>) ³	1.0
Total	16-20

¹ Operators may submit for approval alternative site-specific seed mixtures.

² PLS/acre = pounds of pure live seed per acre. Seeding rates would be doubled if seed is to be broadcast.

³ Winterfat seed would be broadcast seeded.

Operators would use a seed mixture approved by BLM to ensure only native species would be planted. Operators would determine which seed mixture to use and which substitute species may be appropriate to include in the mixture in consultation with BLM. Operators may also elect to use interseeding/reseeding techniques if initial vegetation establishment is not successful.

Seeding would be conducted in the fall after October 15, until the soil is frozen, or conditions prevent effective seeding operations is the preferred time seeding period. If fall seeding is not feasible, seeding may occur between spring thaw and May 15. Seeds would be planted on the contour using a rangeland-type seed drill equipped with an agitator and depth bands to mix seed and ensure proper seeding depths. Seeds would be planted 0.25 to 0.50 inch deep. Fluffy seeds (e.g., winterfat) would be broadcast seeded. Broadcast seeding may be used, at the Operators' discretion, for other shrub and forb species, utilizing either hand or specialized broadcast seeders.

When drill-seeding is not practical due to steep slopes, rocky surfaces, or wet soil conditions, seeding rates would be doubled, seeds would be broadcast, and the area would be raked or chained to cover the seed. Operators may also elect to broadcast seed after applying and crimping the mulch.

B-3.4.4.2 Mulching

All permanently revegetated areas would be uniformly mulched with certified weed-free native grass, hay, small grain straw at a rate of 2 tons/acre. Alternatively, cotton, jute, or synthetic netting could be applied in steep areas where erosion would be a problem. Mulch would be crimped into the soil, tackified, or incorporated into erosion control blankets to prevent it from blowing or washing away and from entering waterways. Mulch would protect the soil from wind and water erosion, raindrop impact, and surface runoff and would help hold seeds in place. Mulching may occur prior to or after broadcast seeding but must not occur before drill seeding.

On steep slopes where it is unsafe to operate equipment, at sites where soils have 35% or more surface rock content, or on notably unstable areas, hydromulch, biodegradable erosion control netting, or matting would be firmly attached to the soil surface.

B-3.5 EROSION CONTROL

All reclaimed surfaces would be left rough and would be mulched as described above, to reduce wind and water erosion. Erosion and sediment control structures would be installed on reclaimed areas wherever slope gradients exceed 3:1 and where monitoring demonstrates that erosion control structures are needed.

Runoff from reclaimed areas on hillsides with 3:1 or greater slopes (and where monitoring suggests that it is warranted) would be controlled using standard structures including, but not limited to, waterbars, silt fences, geotextile, and/or energy dissipaters. Areas with concentrated development with closely spaced pads (more than 1/40 acres) would be subject to reclamation efforts that address cumulative runoff, regardless of slope. Waterbars would be installed in accordance with standard BLM specifications and would drain into undisturbed vegetation.

Waterbars generally will be 12-18 inches in height with a 2% grade. Waterbars would be installed after ripping and prior to topsoil placement. Silt fences would be placed downhill from reclaimed areas where erosion may impact a waterbody and would be installed according to manufacturers' instructions. Energy dissipaters would be used wherever water is channelized (e.g., by a waterbar or an interceptor ditch) to slow flows. All runoff and erosion control structures would be inspected, maintained, and cleaned-out by Operators on a regular basis until the site is deemed stable.

B-3.6 WEED CONTROL

Operators would be responsible for the control of non-native, invasive, and noxious weeds from all project activities for the LOP. Weed control could include one or more of the following techniques:

- 1) cultural controls, such as prompt seeding, plowing, reseeding, and use of certified weed-free revegetation materials (e.g., seed and mulch);
- 2) physical controls, such as hand-pulling, hoeing, or mowing with weed cutting machines or tractor mower; and
- 3) chemical controls, such as use of herbicides.

If use of herbicides is deemed necessary by the Operators or BLM, a Pesticide Use Permit application would be submitted to the BLM for approval. All herbicides would be used only in the season or growth stage during which they are most effective. Herbicides would be applied only by certified personnel using approved precautions and application procedures in compliance with all applicable federal, state, and local regulations. Herbicides would not be used within 100 ft of open water or during extremely windy conditions. Use of certified weed-free seeds and mulches would also minimize the potential for weed introduction. Prompt reclamation of disturbed sites would also minimize potential for weed infestations.

B-4.0 RECLAMATION SUCCESS MONITORING**B-4.1 MONITORING TEMPORARY RECLAMATION**

Temporary reclamation would be monitored annually and would include visual inspections for vegetation establishment, soil stability, the effectiveness of erosion control practices, and weed invasion. When practical, the Operators would correct notes problems within 3 weeks of discovery and when necessary, reseeding and/or interseeding would be conducted at the first seasonal opportunity utilizing the procedures presented above.

B-4.2 MONITORING PERMANENT RECLAMATION

For permanent reclamation, reclamation success would be monitored annually and would include visual inspection for vegetation establishment, soil stability, effectiveness of erosion control practices, and weed invasion. When practical, the Operators would correct the problem within 3 weeks of discovery and when necessary, reseeding and/or interseeding would be conducted at the first seasonal opportunity utilizing the procedures presented above.

B-5.0 REFERENCES

- Bureau of Land Management. 1992. Green River Resource Area Resource Management Plan and Draft Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Rock Springs District, Rock Springs, Wyoming. BLM-WY-ES-92-019-4410. 910 pp.
- _____. 1996. Green River Resource Area Resource Management Plan and Final Environmental Impact Statement. U.S. Department of Interior, Bureau of Land Management, Rock Springs District, Rock Springs, Wyoming, and Green River Resource Area, Rock Springs, Wyoming.
- _____. 1997. Record of Decision for the Green River Resource Area Management Plan and Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Rock Springs District, Rock Springs, Wyoming.
- Wyoming Department of Environmental Quality, Land Quality Division. 1984. Guideline No. 1, Topsoil and Overburden. Wyoming Department of Environmental Quality, Cheyenne, Wyoming. 23 pp.
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