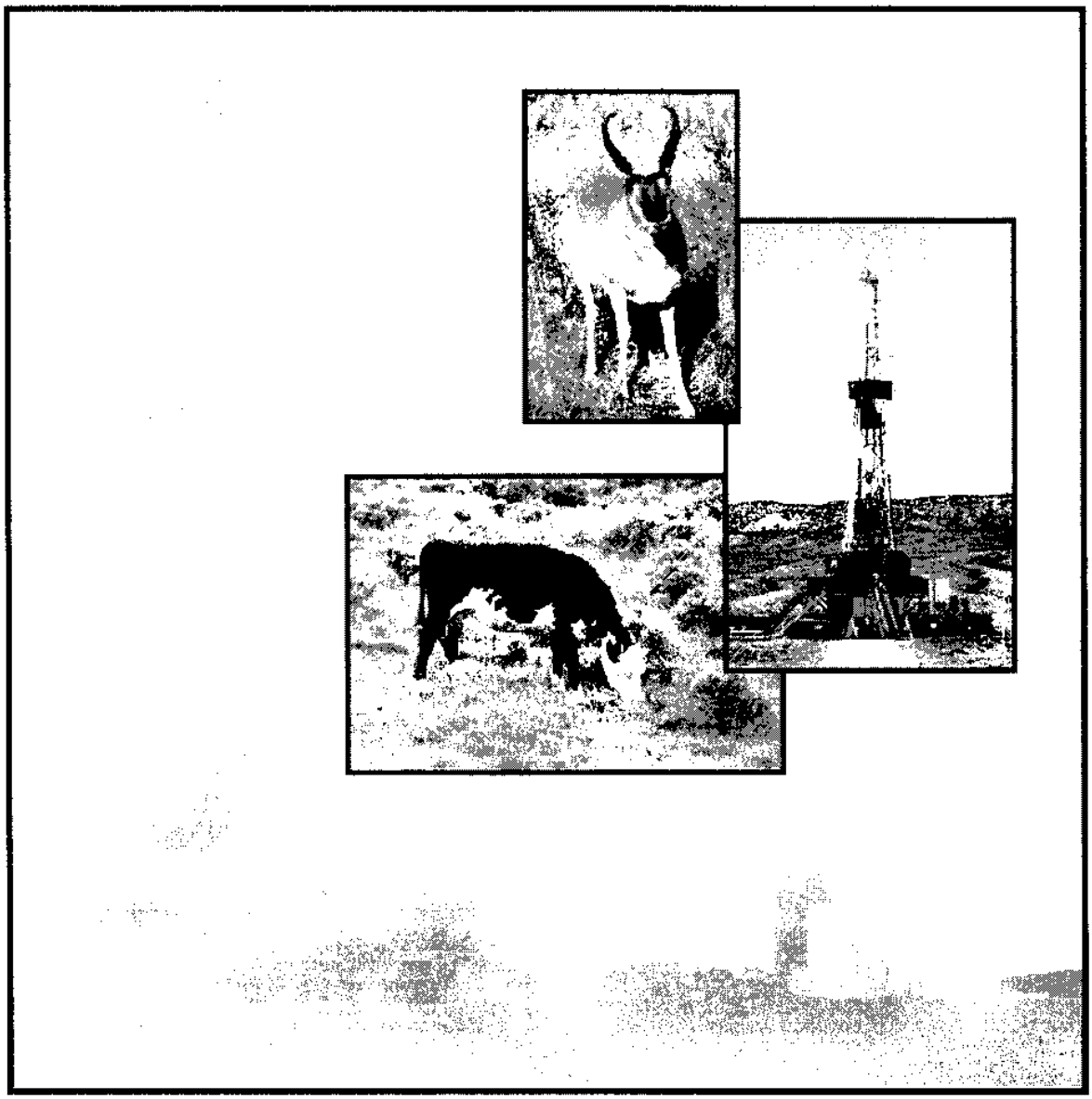
U.S. Department of the Interior
Bureau of Land Management
Wyoming State Office

Casper Field Office

February 2004

Environmental Assessment of Bill Barrett Corporation's Modified Cooper Reservoir Natural Gas Development Project

Natrona County, Wyoming



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WY-060-04-34

This Environmental Assessment was prepared by Anderson Environmental Consulting, an independent environmental consulting firm, with the guidance, participation, and independent evaluation of the Bureau of Land Management (BLM). The BLM, in accordance with Federal Regulation 40 CFR 1506.5 (a) & (b), is in agreement with the findings of the analysis and approves and takes responsibility for the scope and content of this document.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Casper Field Office
2987 Prospector Drive
Casper, Wyoming 82604-2968

1793/Modified
Cooper Reservoir
Natural Gas Development
Project

FEB 0 2 2004

Dear Reader:

Enclosed for your review and comment is the Environmental Assessment (EA) for Bill Barrett Corporation's Modified Cooper Reservoir Natural Gas Development Project. The project area is located in Natrona County approximately 50 miles west of Casper, Wyoming, and is situated southwest of Waltman, Wyoming.

To satisfy the requirements of the National Environmental Policy Act, this EA was prepared to analyze potential impacts associated with a modification to an EA prepared for the Cooper Reservoir Natural Gas Development Project and approved in the June 1998 Decision Record (DR) and Finding of No Significant Impact (FONSI).

A copy of this EA has been sent to affected government agencies and those who either participated in the 1998 EA or have subsequently expressed an interest in the modified project. The technical reports and other supporting material referenced in the EA are available for review at the above address.

Over the next 5 to 10 years, Bill Barrett Corporation (BBC) proposes to drill up to 92 additional natural gas wells from 42 additional well pads to obtain maximum recovery of natural gas from existing Federal, State, and private oil and gas leases in the project area. This activity would be in addition to 49 existing well locations (not including abandoned wells) which have been previously approved and subsequently drilled within the project area. Thirty-eight of the 49 wells were drilled subsequent to the 1998 DR/FONSI.

Additional roads would be required to provide for vehicle access and new pipelines would be necessary to link the wells with existing transportation pipelines. Expansion of the existing natural gas compression facility is also proposed.

The 30-day comment period ends on March 2, 2004. You may submit written comments to Linda Slone, Project Manager, Bureau of Land Management, Casper Field Office, 2987 Prospector Drive, Casper, Wyoming 82604-2986. You may also submit electronic comments to casper_wymail@blm.gov. Please refer to the Modified Cooper Reservoir Project in your comments.

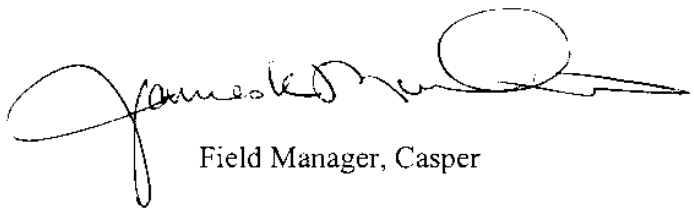
Comments, including names and street addresses of respondents, will be available for public review in their entirety at the above address during regular business hours (7:45 a.m. to 4:30 p.m.), Monday through Friday, except holidays. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your comments. Such requests will be honored to the extent allowed by law. All

submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

This EA is not the decision document. A decision record detailing the Bureau of Land Management's decision will be prepared and distributed following the end of the 30-day comment period. The decision on the proposed modified project will be based upon the analysis in the EA and on public comments. The decision is anticipated to be issued on March 3, 2004.

We appreciate the individuals, organizations, Federal, State, and local governments who participated in this environmental process. Should you have any questions, please contact Linda Slone at the above address or by phone at (307) 261-7520.

Sincerely,



Field Manager, Casper

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1.0 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

Bill Barrett Corporation (BBC), successor in interest to Intoil, Inc., has notified the Casper Field Office (CFO), Bureau of Land Management (BLM) of their intent to propose a modification to the Cooper Reservoir Natural Gas Development Project as originally proposed by Intoil, Inc. and subsequently approved in the June 1998 Decision Record (DR) and Finding of No Significant Impact (FONSI) issued for the Cooper Reservoir Natural Gas Development Project (CRNGDP) (BLM 1998). The DR and FONSI for the CRNGDP approved drilling, completion, testing, production, and reclamation of up to 73 additional natural gas wells in and adjacent to the Cooper Reservoir Unit at a maximum density of 16 well locations per section (i.e., a 40-acre well location density pattern).

BBC currently proposes to modify the original/authorized Proposed Action (BLM 1998) and develop a maximum of 32 well locations per 640-acre section (i.e., a 20-acre well location density pattern) in a 2,528 acre (+/-) core area of the original CRNGDPA. A maximum of 16 wells per section (i.e., a 40-acre well location density pattern) would be proposed throughout the remainder of the Modified Cooper Reservoir Natural Gas Development Project Area (MCRNGDPA) (see Figure 1.1). After additional development, it may be determined that a 10-acre well density pattern is necessary in order to fully and efficiently recover natural gas reserves within certain portions of the MCRNGDPA core area (see Figure 2.1). BBC would drill these 10-acre wells from existing well pads constructed in conjunction with wells drilled at the larger 20-acre and 40-acre well densities utilizing directional drilling techniques to achieve the desired bottom hole location. While economic conditions are such that the sustained drilling of wells at the 10-acre density is not currently justified, BBC seeks analysis of this contingency in anticipation of potential future improvements in both directional drilling technology and market conditions.

Consistent with the increase in well density, BBC now proposes to construct a maximum of 115 well locations within the MCRNGDPA, an increase of 42 over the 73 well locations analyzed in the original CRNGDP EA (BLM 1998). Including the potential for 10-acre density wells, the total number of well bores to be analyzed in the MCRNGDP EA would be 165, with these wells to be drilled on a maximum of 115 individual well pads. Approximately 2,080 acres that were originally included in the CRNGDP EA (BLM 1998) will be eliminated from the modified project description resulting in a revised project area encompassing approximately 4,082 acres or 62% of the original CRNGDPA. Development activity within the original CRNGDPA would be allowed to continue under the terms and conditions of the 1998 DR and FONSI until such time as this analysis has been completed and approved by BLM.

The proposed modification is designed to prevent the waste of the natural gas resource and maximize the recovery thereof in the CRU and adjoining areas and has been identified as geologically appropriate by BLM's Wyoming Reservoir Management Group (WRMG) (WRMG 2002). Geologic evaluations presented by Intoil and reviewed by the WRMG indicate that mean well drainage areas in the core area of the CRU average approximately 23 acres for geologic zones between 5,000 and 7,000 feet and 9 acres for those geologic zones below 7,000 feet (WRMG 2003a).

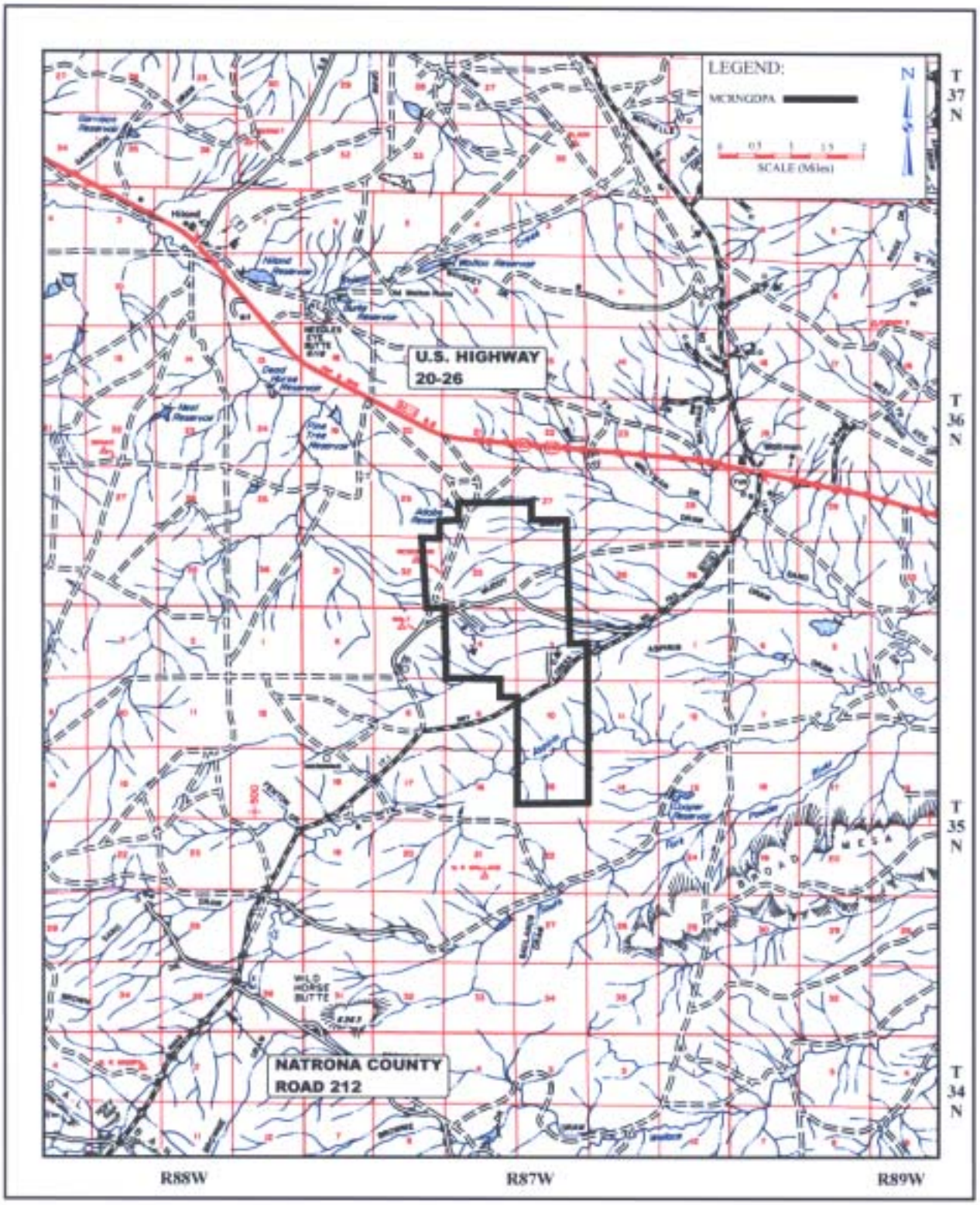

Figure 1.1: General Vicinity Map

The proposed project would enable the efficient recovery of federally-owned hydrocarbons (natural gas) by BBC pursuant to their rights under existing oil and gas leases issued by the BLM, thereby preventing the waste of these hydrocarbon reserves. National mineral leasing policies and the regulations by which they are enforced recognize the statutory right of lease holders to develop federal mineral resources in order to meet continuing national needs and economic demands as long as undue and unnecessary environmental degradation is not incurred.

Since the issuance of the DR and FONSI for the CRNGDP in 1998 both Intoil and BBC have drilled a combined total of 38 wells within the original CRNGDPA (as of December 1, 2003). Of the 18 active/proposed wells identified in Table 3.3 of the CRNGDPA EA (BLM 1998), 6 wells are currently producing gas wells, 4 wells are shut-in, 1 well remains a water disposal well, 6 wells have been plugged and abandoned, and 1 well was never drilled. There are currently 40 producing gas wells, 5 shut-in gas wells, 1 water injection well, and 3 wells recently drilled which are now waiting on completion operations within the MCRNGDPA (WOGCC 2003). Additional exploration and development within the Modified Cooper Reservoir Natural Gas Development Project Area would generally consist of the following component activities:

- construction of up to 42 additional well locations within the overall project area;
- construction of approximately 13,900 feet (2.64 miles) of access road necessary to provide access to the additional well locations proposed by BBC;
- installation of approximately 13,900 feet (2.64 miles) of buried natural gas and produced water pipelines for the gathering and transportation of gas and water produced from wells within the project area to compression (gas) and disposal (water) facilities;
- enlargement of field transmission capacity in existing gas trunk lines through the installation of approximately 17,300 feet (3.28 miles) of parallel (looped) pipeline within the field;
- installation of processing and production facilities, and the routine operation/maintenance of commercially productive wells within the field;
- expansion of existing gas compression to facilitate sales of natural gas produced within the project area; and
- abandonment and reclamation of individual well location and access roads as they are determined to be commercially non-productive.

As indicated above, the project area considered in the original CRNGDP EA (BLM 1998) encompassed approximately 6,282 acres. BBC now proposes to reduce the overall area considered for continued development by approximately 38% and will drill a maximum of 92 additional wells from a maximum of 42 additional well pads within the MCRNGDPA along with the roads, pipelines, and ancillary facilities necessary for the production of commercially successful wells drilled in conjunction with this modified development proposal. These activities are hereafter referred to as the Proposed Action. Those lands potentially affected by implementation of the

modified proposed action are defined as the "project area" and the boundaries of this project area are shown on Figure 1.2.

This modified Field Development EA incorporates the original CRNGDP EA (BLM 1998) by reference and expands upon that analysis as necessary to provide guidelines for the implementation of additional development within the modified project area on a reduced spacing pattern. Through interdisciplinary analysis and review, consideration of reasonable alternatives, and public participation, this EA will serve as a vehicle for:

- determining the significance of environmental impacts associated with the Proposed Action and alternatives;
- assisting in the decision-making process;
- deciding whether an Environmental Impact Statement (EIS) is necessary; and,
- identifying and developing appropriate mitigation measures to minimize the environmental impacts of the Proposed Action and alternatives.

1.2 PURPOSE AND NEED FOR THE PROPOSED ACTION

As indicated above, BBC proposes to drill up to a total of 92 additional natural gas wells from 42 additional well pads in the project area over a period of approximately 5 to 10 years. This activity would be in addition to the 49 existing well locations (not including abandoned wells) which have been previously approved and subsequently drilled within the project area as of December 1, 2003. Thirty-eight of these wells were drilled subsequent to the issuance of the DR and FONSI for the CRNGDP EA (BLM 1998). Implementation of the Proposed Action would allow for the efficient recovery of known hydrocarbon reserves (natural gas) within the MCRNGDPA.

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* (MLA) of 1920 as amended (30 U.S.C. 181, *et seq*), the *Federal Land Policy and Management Act* (FLPMA) of 1976 (P.L. 94-579), the *Federal Onshore Oil and Gas Royalty Management Act* (FOOGRMA) of 1982 (30 U.S.C. 1701, *et seq*), and the *Federal Onshore Oil and Gas Leasing Reform Act* (FOOGLRA) of 1987 (43 CFR Part 3100). The BLM's oil and gas leasing program is intended to encourage the development of domestic oil and gas reserves, thereby reducing national dependence upon foreign energy supplies.

1.3 NEPA COMPLIANCE

This Environmental Assessment was prepared pursuant to:

- the *National Environmental Policy Act* (NEPA) of 1969, as amended;

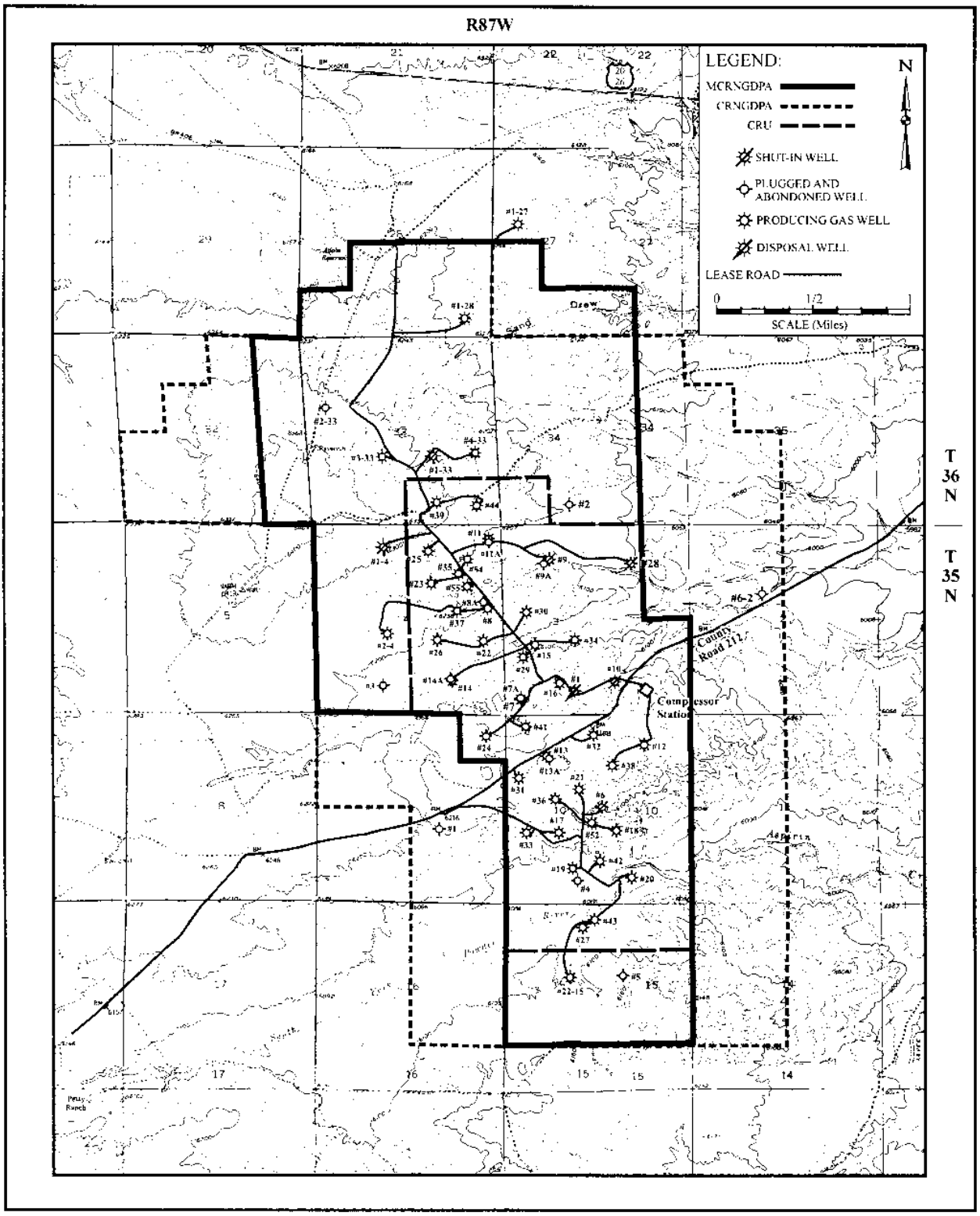

Figure 1.2: Map Showing the Modified Cooper Reservoir Natural Gas Development Project Area

- subsequent regulations adopted by the Council on Environmental Quality (CEQ) found in 40 CFR Part 1500-1508; and

- applicable Bureau of Land Management rules, regulations, and policies regarding implementation of NEPA and compliance with CEQ regulations.

This EA was prepared under a third-party contract with the guidance, participation and independent evaluation of the Bureau of Land Management, who is in agreement with the findings of this analysis, and who hereby approves and takes responsibility for the scope and content herein. This EA is intended to be a public document that analyzes the probable and known impacts upon components of the human environment that would result from implementation of the Proposed Action and alternatives, and reaches a conclusion regarding the magnitude of the impact(s). Furthermore, this EA was designed to provide the BLM with both documented evidence and a level of analysis sufficient to allow a determination of whether:

- the impacts from the Proposed Action (or project alternatives) on the human environment are significant, thereby triggering the preparation of an Environmental Impact Statement (EIS); or

- that a *Finding of No Significant Impact* (FONSI) is warranted.

If the BLM determines that impacts are insignificant, a *Finding of No Significant Impact* (FONSI) and *Decision Record* (DR) would be prepared and BBC would then be allowed to proceed with additional development within the CRU and any adjacent areas identified within this document. If, however, the BLM determines that impacts are significant, the agency would then be required to prepare an EIS.

This environmental assessment is not a decision document. It merely provides documentation of the process used to analyze the impacts of the Proposed Action and project alternatives, if any, on the human environment. Decisions regarding implementation of the Proposed Action or project alternatives will be fully documented in a *Decision Record* that will be issued by the BLM and will apply only to those lands and resources for which they have been granted specific management responsibility. Various additional aspects of the environment are regulated by other federal, state, and/or local agencies and this EA is not intended to eliminate the need for BBC to pursue permit approval(s) from these regulatory authorities. To the contrary, this document is also designed to provide these agencies with the information necessary to assist them in arriving at their own independent decisions regarding the issuance of permits and approvals necessary for BBC to proceed with the Proposed Action. In this regard, it is essential that these additional regulatory authorities carefully review this EA to ensure that impacts not under the authority of the BLM are disclosed and that possible mitigation measures are identified.

This EA considers direct, indirect, and cumulative impacts of the Proposed Action and the No Action Alternative. As stated above, the purpose of this analysis is to provide the decision-makers with information needed to make a final decision that is fully informed and based upon factors relevant to the proposal. It also serves as the summary documentation of analyses conducted on the proposal in order to identify environmental impacts and those mitigation measures that may be

necessary to address issues. Analyses in the EA are restricted to the potential environmental impacts associated with additional development of the federal leases in the MCRNGDPA including the effects of access road and drill pad construction, additional drilling activities, production testing, produced water disposal, site abandonment and subsequent reclamation. These analyses include the direct effects of construction and drilling activities at or near the proposed drill sites and along the access road corridors, the indirect environmental effects likely expected within a larger study area surrounding each individual drill site and access road corridor, as well as the cumulative impacts of the *Proposed Action* upon the human environment. Additionally, this environmental analysis will include:

- a determination as to whether the Proposed Action is in conformance with BLM policies, regulations, and approved land management direction pertaining to oil and gas exploration and development activities;

- a determination as to whether the Proposed Action is compatible with other resources and permitted land uses in the analysis area; and

- a determination as to whether locations exist for the proposed facilities that would be environmentally suitable, meet the needs of other resource management activities, and which acceptably mitigate surface resource impacts, while honoring the leaseholder's rights.

In compliance with NEPA and CEQ regulations, this EA also considers impacts associated with implementation of the No Action Alternative which would result from BLM denial of the individual permits and/or approvals necessary to develop those federal mineral leases included within the area of analysis. Although a decision to select the No Action Alternative for the MCRNGDP is available to the BLM through denial of any (or all) of the individual Applications for Permit to Drill, the right to drill and/or develop somewhere within the leasehold cannot be denied by the Secretary of Interior (see Section 2.4). Authority to completely deny can only be granted by Congress (*Union Oil Company of California vs. Morton*, 512 F. 2*nd* 743, 750-751; 9*th* Cir. 1975).

This Environmental Assessment contains six primary chapters, briefly described below, that are directly relevant to this analysis document. These six primary chapters are described as follows:

- Chapter One, Purpose Of and Need For Action: Provides an introduction and discusses the proposal's compliance with applicable Federal, State and local laws, regulations and land use plans.

- Chapter Two, Proposed Action and Alternatives: Provides a detailed description of both the Proposed Action and alternatives as analyzed in this EA.

- Chapter Three, Affected Environment: Provides a revised description of the environment in the project area as it exists today, and particularly where there have been changes to the environment subsequent to the original CRNGDP EA (BLM 1998).

- Chapter Four, Environmental Consequences: Describes the impacts associated with each alternative including the Proposed Action. Where appropriate, mitigation measures are identified to reduce impacts to an acceptable level. In some cases these mitigation measures may be outside of the regulatory authority vested with the BLM, but may be under another agency's authority, or can be implemented voluntarily by BBC.

- Chapter Five, Mitigation and Monitoring: Summarizes the mitigation measures identified to eliminate or minimize impacts associated with the Proposed Action and alternatives.

- Chapter Six, Consultation and Coordination: Provides a summary of those issues identified during both internal and public scoping during the preparation of this EA. This chapter also provides a list of the EA preparers, reviewers and persons who commented or provided data used in the preparation of the document.

A tiered approach was used in the preparation of this environmental analysis document and much of the information contained in the original CRNGDP EA (BLM 1998) has been incorporated into this document by reference, particularly in Chapter Two (Proposed Action) and Chapter Three (Affected Environment) where there have been no major changes from the information originally presented in the original analysis document.

1.4 GENERAL LOCATION AND LAND OWNERSHIP

Please refer to the CRNGDP EA (BLM 1998) for general information concerning the location of the MCRNGDPA and access thereto. The modified project area encompasses approximately 4,082 acres of mixed federal, state, and private lands. Of this total, approximately 1,440 acres are owned by the United States of America, 760 acres are owned by the State of Wyoming, and the remaining 1,882 acres are owned by private individuals. Table 1.1 summarizes surface ownership within the modified project area, while Table 1.2 summarizes the mineral ownership therein. Figure 1.3 depicts the surface ownership within the MCRNGDPA and Figure 1.4 depicts the mineral ownership within the MCRNGDPA.

Table 1.1

Surface Ownership within the MCRNGDP Area

Surface Ownership	Acres	Percent of Total
Federal (BLM)	1,440.00	35.28
Private (Fee)	1,881.74	46.10
State of Wyoming (State)	760.00	18.62
TOTAL	**4,081.74**	**100.00**

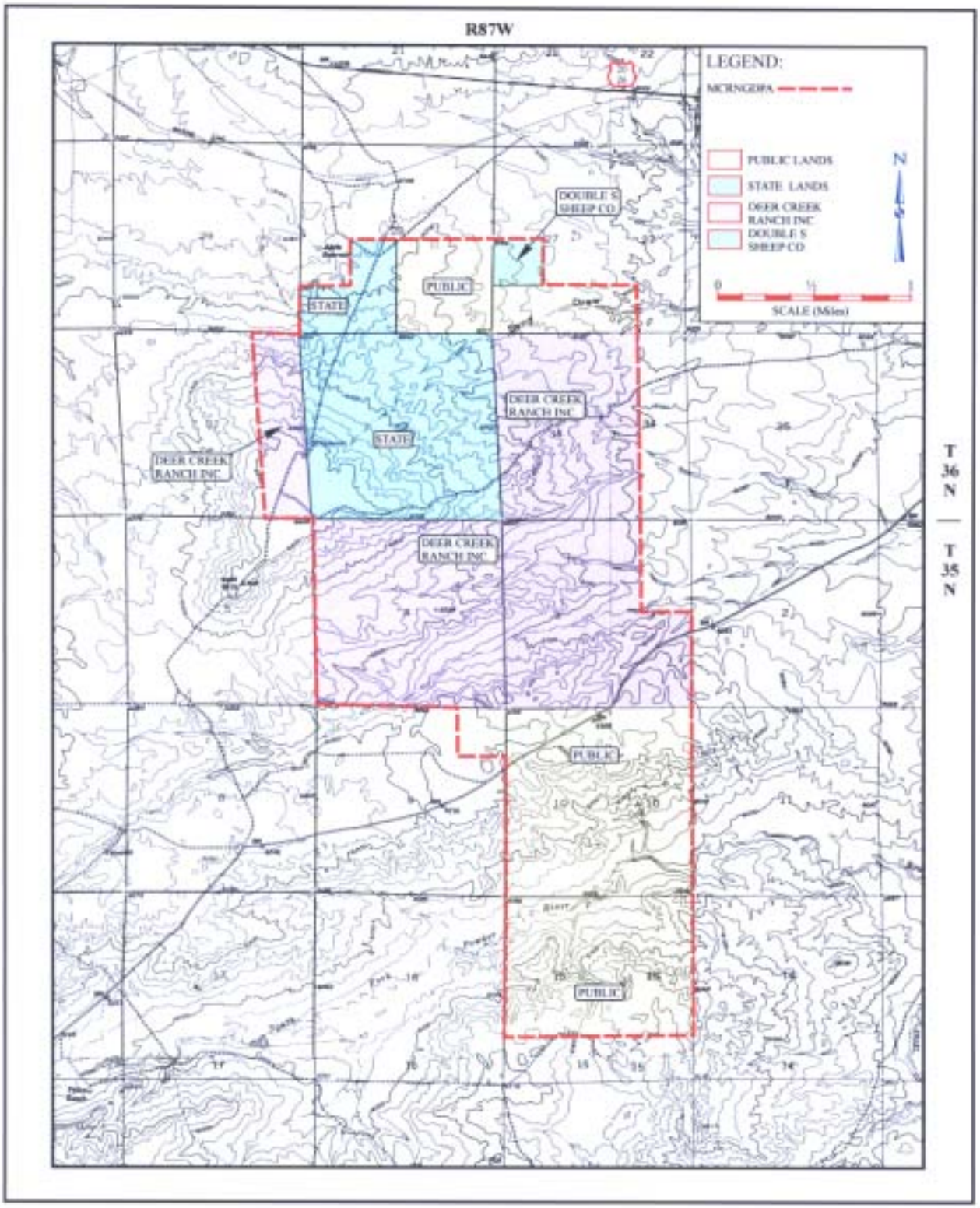

Figure 1.3: Surface Ownership within the MCRNGDPA

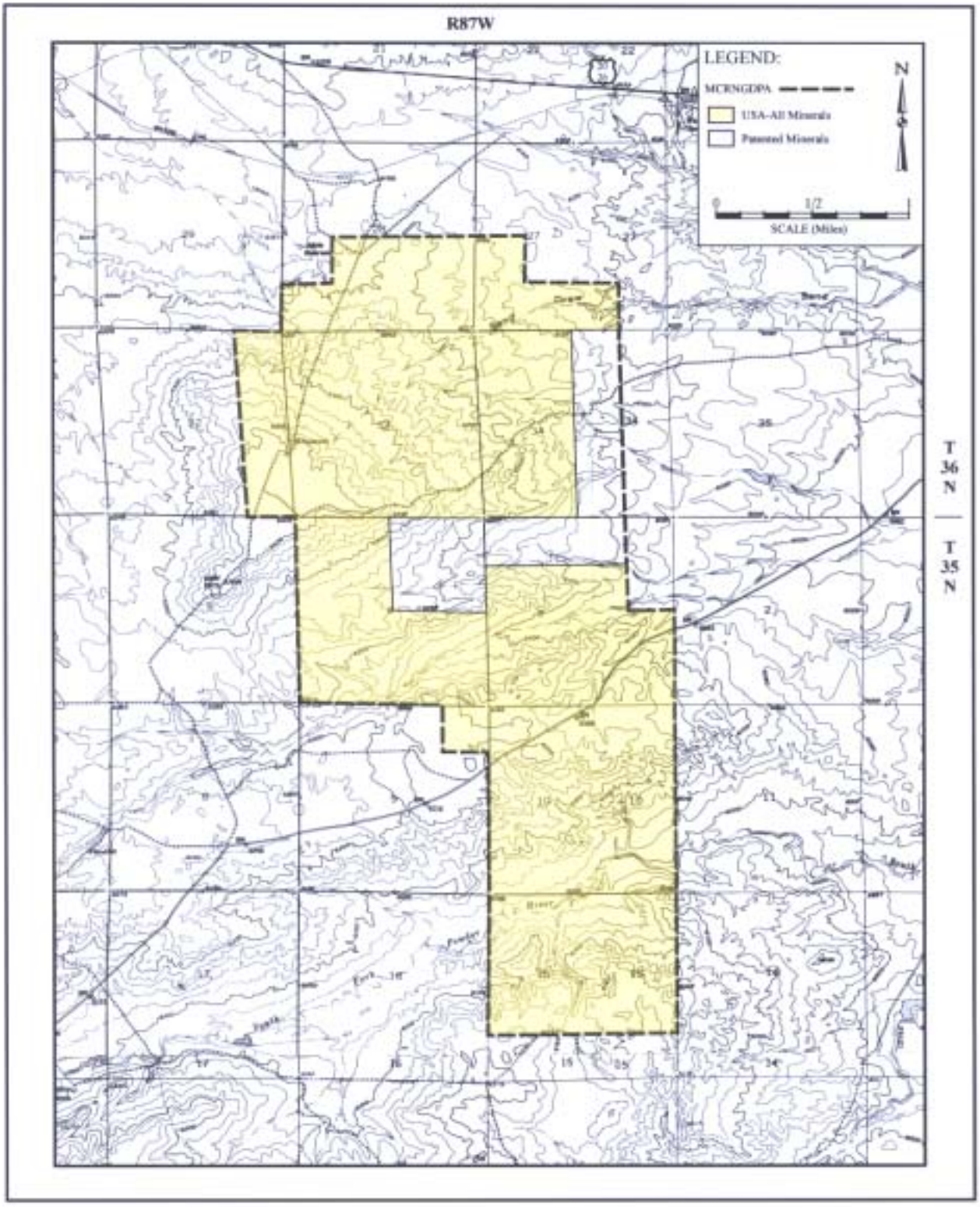

Figure 1.4: Mineral Ownership within the MCRNGDPA

Table 1.2

Mineral Ownership within the MCRNGDP Area

Mineral Ownership	Acres	Percent of Total
Federal (BLM)	3,799.37	93.08
State of Wyoming (State)	0.00	0.00
Private (Fee)	282.37	6.92
TOTAL	**4,081.74**	**100.00**

1.5 AUTHORIZING ACTIONS AND RELATIONSHIP TO STATUTES AND REGULATIONS, OR OTHER PLANS

Please refer to Section 1.5 of the CRNGDP EA (BLM 1998) for a discussion of authorizing actions and their relationship to statutes, regulations, and/or other plans.

1.5.1 Primary Federal Permitting Requirements

Please refer to Section 1.5.1 of the CRNGDP EA (BLM 1998) for a discussion of primary federal permitting requirements.

1.5.2 Primary State Permitting Requirements

Please refer to Section 1.5.2 of the CRNGDP EA (BLM 1998) for a discussion of primary state permitting requirements including the Wyoming Department of Transportation, Wyoming Oil and Gas Conservation Commission, Wyoming Department of Environmental Quality, and the Wyoming State Engineer.

1.6 CONFORMANCE WITH EXISTING LAND MANAGEMENT PLANS

The Modified Cooper Reservoir Natural Gas Development Project, as proposed by BBC, would be consistent with management direction contained in the Platte River Resource Area *Resource Management Plan* dated July 1985. Furthermore, all operations proposed by BBC would be conducted in full compliance with the terms and conditions of the federal leases involved in the Proposed Action or project alternatives, applicable Onshore Oil and Gas Orders, 43 CFR Part 2800 regarding right-of-way grants, and also with oil and gas leasing regulations as contained in 43 CFR Part 3100, specifically with subpart 3162 concerning Requirements for Operating Rights, Owners and Operators.

The Proposed Action and alternatives are not inconsistent with state and local government programs, plans, zoning, and applicable regulations.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

Bill Barrett Corporation (BBC) has proposed to modify an existing plan for the development of the Cooper Reservoir Unit (CRU) and adjacent federal oil/gas leases as approved in the Decision Record (DR) and Finding of No Significant Impact (FONSI) for the Environmental Assessment (EA) of Intoil, Inc.'s Cooper Reservoir Natural Gas Development Project (CRNGDP) (BLM 1998) to increase well densities within certain portions of the analysis area. Whereas the original CRNGDP EA analyzed a combination of 40-acre, 80-acre, and 160-acre well densities (16, 8, and 4 wells per section respectively), BBC is now proposing a 20-acre well density (32 wells per section) in the "core" area of the MCRNGDPA, with the remainder of the analysis area proposed for development at a 40-acre well density (16 wells per section).

After additional development, it may be determined that a 10-acre well density pattern is necessary in order to fully and efficiently recover natural gas reserves within certain portions of the MCRNGDPA. BBC would drill these 10-acre wells from existing well pads constructed in conjunction with wells drilled at the larger 20-acre and 40-acre well densities. The total number of wells that may be drilled at the 10-acre density is not precisely predictable at present, but is not expected to exceed 50 additional well bores over the life of the project. BBC proposes to utilize directional drilling techniques in conjunction with these 10-acre density wells. While economic conditions are such that the sustained drilling of wells at the 10-acre density is not currently justified, BBC seeks analysis of this contingency in anticipation of potential future improvements in both directional drilling technology and market conditions.

Consistent with the increase in well density, BBC also proposes to increase the total number of well locations proposed within the MCRNGDPA. Whereas the CRNGDP EA analyzed 73 total well locations, the current proposal would increase that number by 42 to a total of 115 locations. Including the potential for 10-acre density wells, the total number of well bores to be analyzed in the MCRNGDP EA will be 165, with the total number of well bores to be drilled on a maximum of 115 individual well locations. While the total number of wells proposed in conjunction with the MCRNGDP would be increased relative to the 1998 CRNGDP EA, the overall size of the analysis area would be reduced 35% from the 6,282 acres originally analyzed in 1998 to a current project area of approximately 4,082 acres.

Since the issuance of the DR and FONSI for the CRNGDP in 1998 both Intoil and BBC have drilled a combined total of 38 additional wells within the original CRNGDPA (as of December 1, 2003). These wells are identified in Table 3.3 (page #34). Of the 18 wells identified in Table 3.3 of the CRNGDPA EA (BLM 1998), 6 wells are currently producing, 4 wells are now shut-in, 1 well remains a water disposal well, 6 wells have been plugged and abandoned, and 1 well was never drilled. There are currently 40 producing gas wells, 5 shut-in gas wells, 1 water injection well, and 3 wells recently drilled which are now waiting on completion operations within the MCRNGDPA (WOGCC 2003).

Under this modified proposal, BBC would be allowed to continue with development activities within the modified project area boundary so long as the spacing parameters approved in the DR and FONSI for the CRNGDP EA (BLM 1998) are adhered to. These actions have been analyzed and future drilling proposals will continue to be approved on a case-by case basis during the preparation of the MCRNGDP EA.

The current proposal to modify the CRNGDP environmental analysis considers all foreseeable activities required for full and final development of the natural gas resource within the project area. This development would occur over a ten year period, with the bulk of the additional drilling activity to be conducted within the first few years following project approval. As with the original CRNGDP EA, the precise number of wells ultimately drilled at each density, exact locations of the proposed drill sites, and timing of drilling activities would be dictated by:

- the continued success of development wells drilled in the fringe areas surrounding (abutting) the existing CRU,

- future success of wells drilled at increased well densities,

- technological advances that allow for the efficient development of marginal resources, and

- future economic considerations including natural gas prices at the well head compared with the cost(s) to develop, what may prove to be, marginal properties on the fringes of the heretofore known geologic structure (KGS) within the Cooper Reservoir Field.

This environmental assessment (EA) addresses both the Proposed Action (modified from the original CRNGDPA EA) and the No Action alternative. Directional drilling operations were considered for wells proposed on a 20-acre spacing pattern but this alternative was not analyzed in detail (please refer to Section 2.5 for additional information in this regard.

- **Proposed Action.** This alternative would allow BBC to construct 42 additional well locations, drill up to 92 additional well bores, and install related production (ancillary) facilities within the Modified Cooper Reservoir Natural Gas Development Project Area (MCRNGDPA). An additional 158.79 (+/-) acres of initial (short-term) surface disturbance would occur in conjunction with the modified project proposal

- **No Action Alternative.** This alternative implies that both ongoing and previously approved natural gas exploration, development, and production activities would be allowed to continue by the Bureau of Land Management (BLM) in the overall project area, but activity beyond the level of activity analyzed in the original CRNGDP EA would not be allowed. Future Applications for Permit to Drill (APD's) and Right-of-Way (ROW) applications would be evaluated by the BLM on a case-by-case basis through site specific environmental analyses in accordance with management direction contained in Platte River Resource Area RMP and the DR and FONSI for the CRNGDP EA (BLM 1998).

2.2 PROPOSED ACTION

The proposed action entails the continued development of natural gas resources at an increased density within a modified project area which includes the Cooper Reservoir Unit and leases immediately adjacent thereto. The proposed development activities would commence in the winter of 2004 and would continue over a period of approximately 10 years, with the bulk of the proposed development activity expected to occur within the first few years following project approval. The productive life of wells drilled in the MCRNDGPA is estimated to be in excess 20 years.

Well densities would vary across the project area with wells generally being developed on both 40-acre and 20-acre densities, with the potential for 10-acre densities in limited areas of the MCRNGDPA. Figure 2.1 identifies the approximately 2,528 acre "core" area of the MCRNGDPA that has already proven to be commercially productive and which could see further development at increased well densities of both 10-acres and 20-acres. Twenty (20) acre well density has been shown to be both viable and necessary for the efficient production of the natural gas resource in the core area by a grouping of closely spaced wells. If warranted, development on 10-acre densities would most likely be focused within the core area referenced above. Various associated facilities (e.g., roads, pipelines, etc.) would also be constructed in conjunction with the continued development of the natural gas resource in the project area as previously described in the CRNGDP EA (BLM 1998).

The original CRNGDP EA evaluated an exploration/development program designed to test the productive potential of both the Lower Fort Union/Lance (LFU/L) undifferentiated and Lance Formation(s) and proposed twin wells (dual well bores on a single well pad) to that end (BLM 1998). Drilling activities within the CRNGDPA subsequent to the issuance of the DR and FONSI in June 1998 that tested the Lower Fort Union/Lance (LFU/L) undifferentiated horizons were unproductive. As a result, development of these shallower zones is not anticipated with the result that the proposal for twin wells designed to test the productive potential of both the LFU/L undifferentiated and deeper Lance Formation(s) has been eliminated from consideration in the MCRNGDP proposal. The primary focus of this modified project proposal will be to further develop hydrocarbon resources contained within the Lance Formation based upon previous exploration and development activities within the overall project area. BBC may elect to evaluate deeper formations such as the Mesaverde, Frontier, and Dakota at selected locations within the MCRNGDPA at some future date; however, they have no definite plans at this point to pursue exploratory drilling operations to test the productive potential of these deeper formations.

Surface disturbances associated with the modified proposal are not expected to vary dramatically from those presented in the CRNGDP EA (BLM 1998). However, it should be noted that BBC has adopted a well pad design for "dual" wells that is slightly larger than the design originally proposed by Intoil in the CRNDGP EA (BLM 1998). Considering an average of 2.79 acres of new surface disturbance per well location, the construction of an additional 42 individual well pads would result in approximately 117.18 acres of new surface disturbance within the MCRNGDPA. Additional disturbances within the MCRNGDPA would include the construction of approximately 13,900 feet (2.63 miles) of new access road (12.77 acres), the installation of approximately 31,200 feet (5.91 miles) of buried pipeline (27.84 acres), and the 1.0 acre expansion of the existing compressor site resulting in an additional 41.61 acres of initial (short-term) surface disturbance.

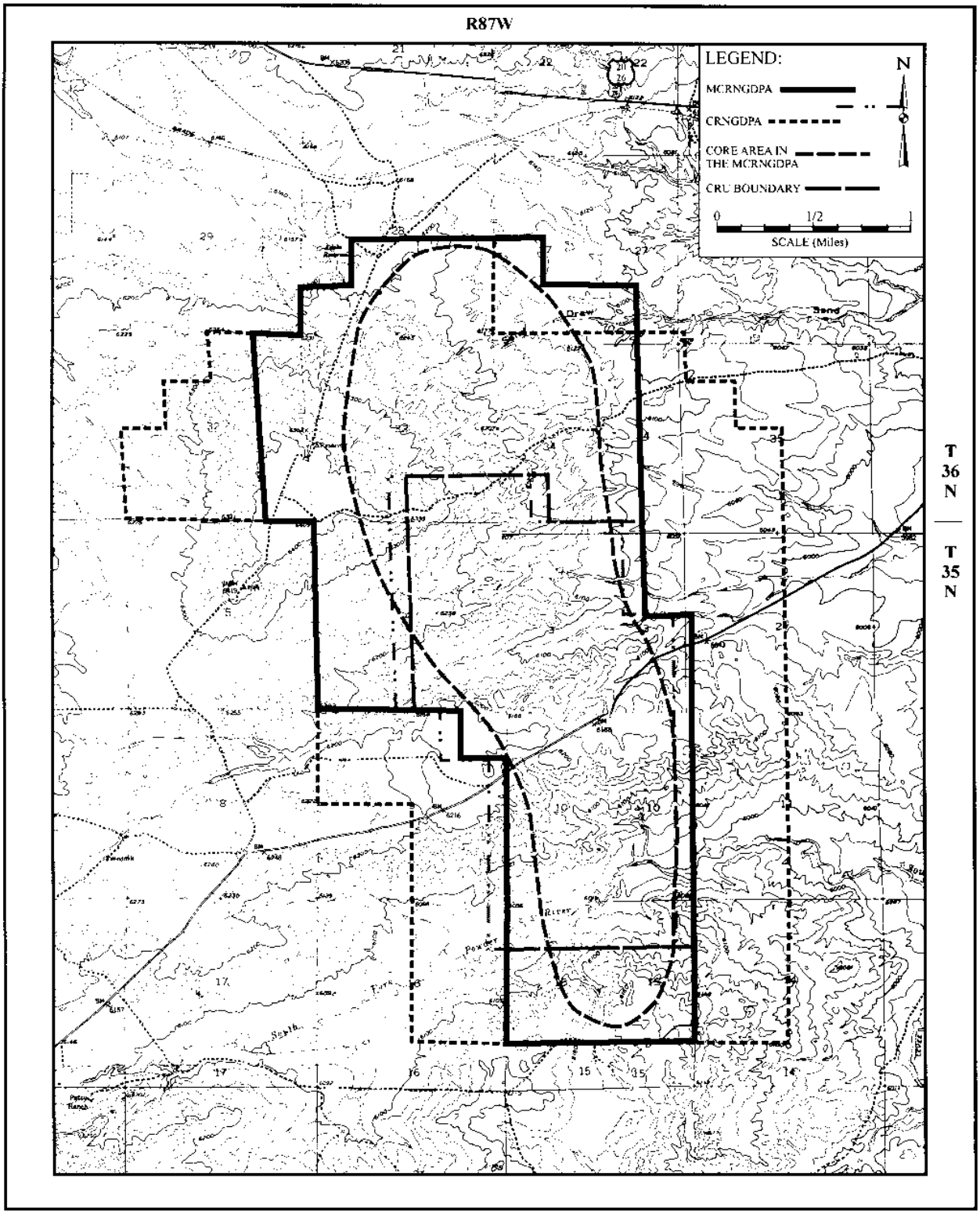

Figure 2.1: Map Showing the 2,528 Acre "Core" Development Area within the MCRNGDPA

Total new short-term and life of project (LOP) surface disturbance resulting from the modified Proposed Action would be 158.79 acres and 56.81 acres (respectively) resulting from approval of operations on the additional 42 wells as proposed in the MCRNGDPA (see Table 4.4).

In all other respects, including drilling and completion methods, equipment and personnel requirements, gathering and compression, etc., the current proposal is generally consistent with that analyzed in the CRNGDP EA.

2.2.1 Project Schedule

Development activities within the MCRNGDPA have been moving forward on well locations that were previously approved by the CFO under the terms and conditions of the DR and FONSI for the CRNGDPA EA (BLM 1998). These wells are included in the 73 total wells referenced in Section 1.1 and are identified in Table 3.1.

As indicated in Sections 1.1 and 2.1, Intoil drilled a total of 26 additional wells within the original CRNGDPA subsequent to the completion of the CRNGDP EA and prior to their transfer of ownership to BBC. BBC has drilled an additional 12 wells since the transfer of ownership (as of December 1, 2003), for a total of 38 out of the 73 wells originally analyzed. As indicated in Section 2.1 (above), BBC is proposing to construct an additional 42 well pads within the MCRNGDPA in addition to the 35 wells remaining to be drilled under the previous analysis. Of these 77 total well pads, approximately 40% (31 wells) would be drilled on a 40-acre density (16 wells per section) and approximately 60% (46 wells) would be drilled on a 20-acre density (32 wells per section). An estimated 50 wells could be drilled at a 10-acre well density from existing well pads within the MCRNGDPA. The 20-acre and 10-acre well densities would predominately occur within the 2,528 acre (+/-) core area as defined by the productivity of those wells drilled therein to date.

As indicated above, operations on those wells to be drilled on a reduced spacing pattern within the MCRNGDPA would commence in the winter of 2004 and would continue over a period of approximately 5 to 10 years or until such time as:

- the total number of proposed wells have been drilled,
- the economic limits of the field have been fully defined, or
- current economic conditions deteriorate to the point that it is no longer economic to drill and complete wells in the project area.

Generally speaking, drilling operations would be expected to occur on a year-round basis utilizing two rotary drilling rigs. However, emphasis would be placed on conducting drilling operations during the late spring, summer, and early fall periods when weather conditions are generally more favorable for field operations.

2.2.2 Transportation and Workforce Requirements

Transportation and workforce requirements have not changed from the original CRNGDP Environmental Analysis (BLM 1998). Please refer to Section 2.2.2 of the CRNGDP EA (BLM 1998) for additional information in this regard.

2.2.3 Well Pad Construction

Subsequent to the completion of the CRNGDP EA (BLM 1998), BBC has somewhat refined the size of the single well location required for drilling and completion operations. A revised typical location layout for single well locations is shown on Figure 2.2. BBC would require a slightly larger well pad to accommodate those dual wells that would result from any 10-acre density infill drilling operations (see Figure 2.3).

Although the configuration of the single well pad has changed somewhat from Intoil's original proposal, the leveled area required for initial drilling and completion operations for each individual well (well pad) would still be approximately 1.72 acres in size (including the reserve pit) as compared to 1.73 aces in the CRNGDP EA (BLM 1998). Likewise, the area required for cut/fill slopes and topsoil/subsoil stockpiles associated with the BBC pad design would average approximately 0.91 as compared to 1.02 acres in the CRNGDPA EA (BLM 1998) resulting in a net saving of 0.12 acres per well location. Dual well pads would be slightly larger than single well pads and would require a 25 foot extension of the pad itself and a 10 foot extension of the reserve pit resulting in an additional 0.16 acres of surface disturbance per pad or 8.00 acres of total additional disturbance if all fifty 10-acre density wells were drilled. For the purposes of this analysis, the acreages associated with the larger, "dual" well pad were utilized exclusively to calculate disturbance for the 42 additional well locations proposed herein.

Please refer to Section 2.2.3 of the CRNGDP EA (BLM 1998) for a description of the major components of each individual single well pad and techniques to be utilized in the construction, stabilization and reclamation thereof. The major components of the dual well pads would be the same as proposed for the single well pads with the addition of a second set of production facilities (oil tank, produced water tank, production pack, and meter run) and a second well head assembly located approximately eight feet from the first (initial) well bore.

2.2.4 Access Roads

Exploration and development activities to date within and/or directly adjacent to the MCRNGDPA have resulted in the construction of approximately 70,085 feet (13.27 miles) of new access road therein. Generally speaking, previous exploration and development activities within the CRNGDPA have resulted in the construction of a road system that should be more than adequate to serve the needs of BBC for arterial traffic into and within the MCRNGDPA.

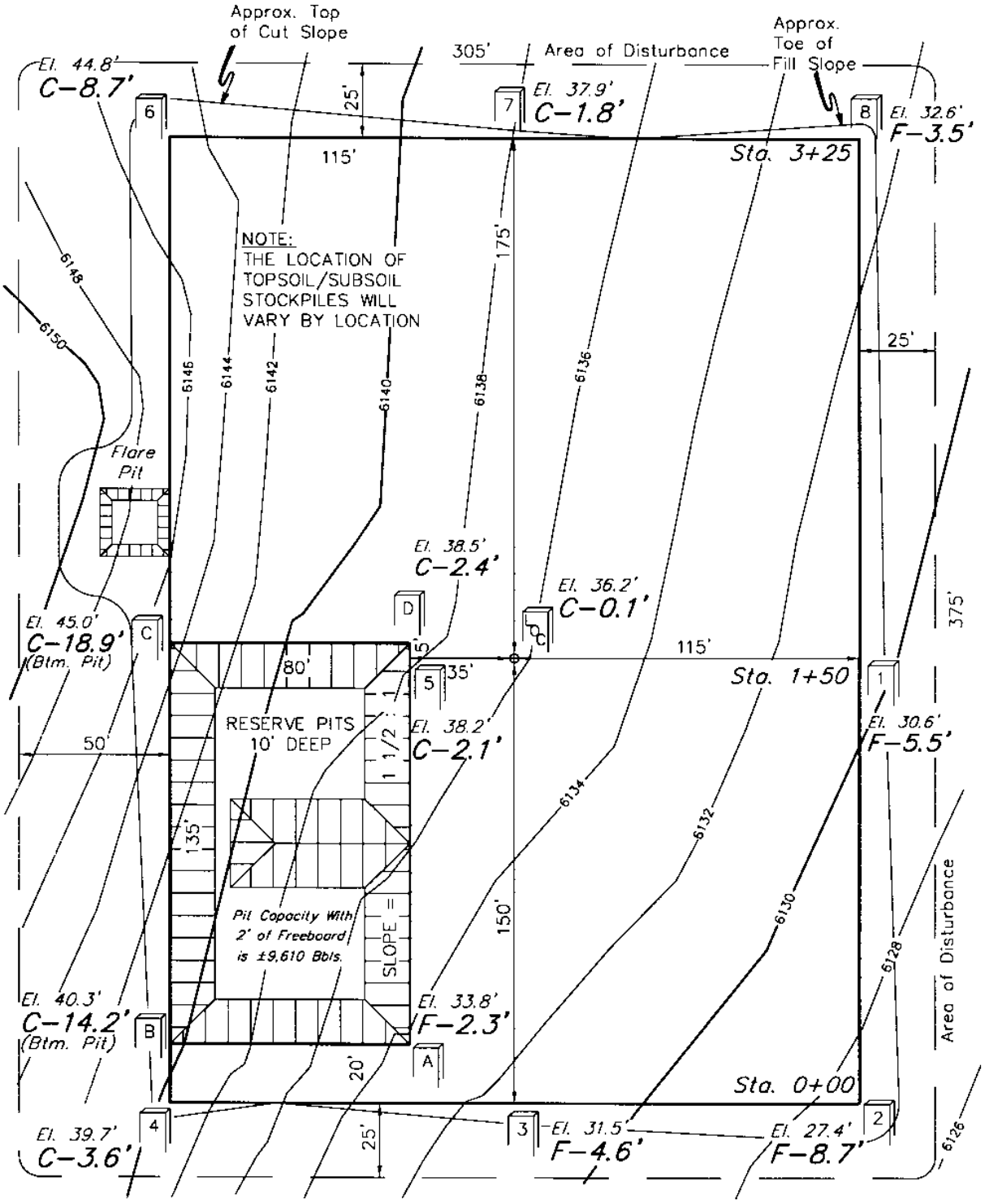

Figure 2.2: Typical Location Layout for a Well Pad with One Well Bore

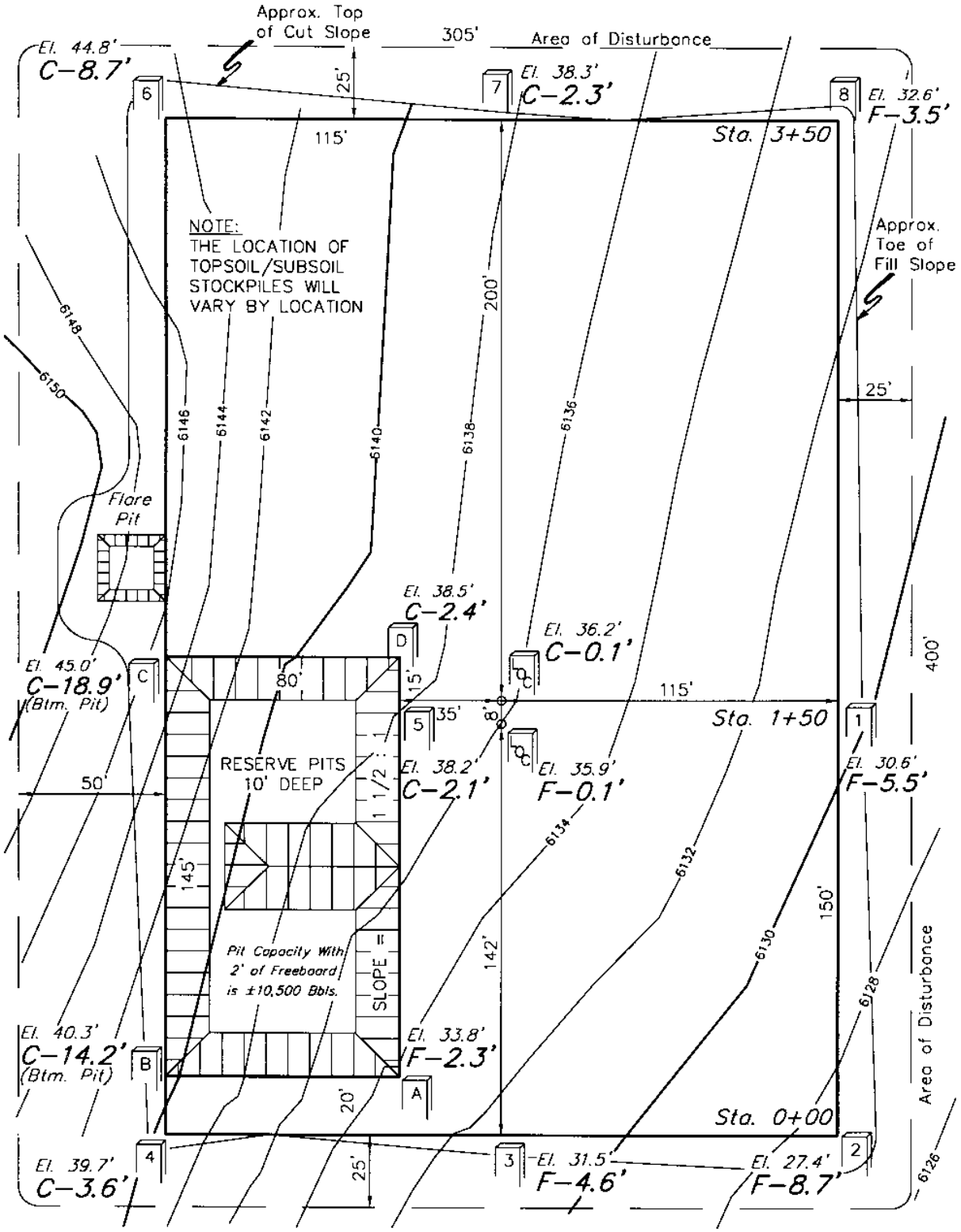

Figure 2.3: Typical Location Layout for a Well Pad with Two Well Bores

New road construction associated with additional exploration and development within the overall project area would generally average approximately 265 feet (0.05 miles) of new road per 20-acre well location and approximately 1,650 feet (0.313 miles) of new road per 40-acre well location. The relatively small amount of road associated with the 20-acre density wells is a direct result of previous activity within the "core" area and the fact that these 20-acre density wells would infill existing development within the project area where an existing, and extensive transportation system has already been constructed in conjunction with wells previously drilled by both Intoil and BBC on 40-acre densities. On the other hand, more road construction would be required for access to those wells proposed on 40-acre densities as these wells would typically be located on the periphery of the overall project area (e.g., outside of the core area) where previous exploration and development activities have been somewhat limited to date. As the 10-acre density wells would be drilled on existing well pads, no new road construction would be associated with the drilling of these wells.

Considering a total disturbed right-of-way (ROW) width that did not exceed 40 feet, this new road construction would result in additional surface disturbance equal to approximately 12.77 acres (calculated based upon 40 wells having 265' of road/well and 2 wells having 1,650' of road each). As indicated above, no new road construction would be required for wells drilled on 10 acre densities. Whenever possible, access roads would be designed and constructed to disturb less than the 40 foot ROW width referenced above, as long as traffic and safety concerns could be satisfied. The existing access roads would be maintained as necessary to accommodate appropriate year-round traffic and prevent unnecessary erosion.

Roads would be constructed in accordance with BLM Manual Section 9113 and/or the roading standards outlined in the joint BLM/USFS publication: *Surface Operating Standards for Oil and Gas Exploration and Development* and would be designed by a professional engineer as directed by the BLM.

2.2.5 Drilling Operations

As indicated in the CRNGDP EA, BBC would utilize a minimum of 1 and a maximum of 2 rotary drilling rigs rated for drilling operations within the MCRNGDPA. Please refer to Section 2.2.5 of the CRNGDP EA (BLM 1998) for a comprehensive description of proposed drilling operations in the MCRNGDPA.

2.2.5.1 Drilling Fluids System

BBC would utilize the same basic drilling fluids system identified in the CRNGDP EA and would obtain their fresh water for use in the mud system from those sources identified therein as well. No water would be diverted from the North Platte River or any of it's tributaries for use in construction, drilling, cementing, or completion operations within the MCRNGDPA.

Water to be utilized in drilling operations would be contained in a "reserve pit" constructed on each location (refer to Figure 2.2) and would serve as the base medium for the drilling mud system. The

reserve pit would be fenced on the three non-working sides during drilling, with the fourth side of the pit fenced immediately following removal of the drilling rig in order to protect wildlife and livestock. Fencing would be installed in accordance with guidelines contained in the joint BLM/USFS publication: *Surface Operating Standards for Oil and Gas Exploration and Development*, Third Edition and would be maintained until the reserve pit has been backfilled. Netting (1 inch mesh) would be placed over reserve pits containing hydrocarbons or other substances toxic to wildlife in compliance with BLM Information Bulletin Number WY-93-054.

Unlike Intoil, BBC intends to utilize a "semi-closed" mud system for drilling operations. Fluids would be contained in steel tanks on the well location and the cuttings would be deposited in the reserve pit. The reserve pit would also be utilized to make up and store conditioned drilling fluids for well control and would be used as a repository for any drilling fluids that could not be recycled. Upon completion of drilling operations, any remaining fluids would be disposed of in strict accordance with applicable state and/or federal rules and regulations pertaining thereto.

2.2.5.2 Casing & Cementing Operations

Please refer to Section 2.2.5.2 of the CRNGDP EA (BLM 1998) for a description of casing and cementing operations in the MCRNGDPA.

2.2.6 Completion and Evaluation Operations

Please refer to Section 2.2.6 of the CRNGDP EA (BLM 1998) for a comprehensive description of proposed completion and evaluation operations in the MCRNGDPA.

2.2.7 Production Operations

BBC proposes to conduct production operations as discussed in Section 2.2.7 of the CRNGDP EA (BLM 1998) with some exceptions as follows:

- Producing well locations will not be equipped with either a glycol regenerating unit, dehydrating contact tower (dehy) with integral scrubber or a 50 psi free water knockout. Production equipment will be limited to a three-phase separator/heater, produced water tank, and an oil tank. In the event that multiple well bores are drilled from a single well location, two (2) sets of production equipment may be necessary, but in most cases oil and produced water tanks would be shared between the two wells.

- BBC may elect to re-enter and convert one or more pre-existing, abandoned well bores within the MCRNGDPA for the disposal of produced water at some point in the future. These water injection/disposal wells would be permitted in full compliance with existing laws, rules and regulations pertaining to the re-entry and subsequent conversion of an abandoned well bore for water injection purposes. It should be noted that BBC has no firm plans at this time in this regard.

- Produced water would be transported via buried flowline to disposal wells located strategically within the MCRNGDPA for subsurface disposal. These produced water flowlines would generally consist of 3 to 10 inch polyethylene pipe buried at a depth of 6 feet and would parallel existing/proposed natural gas lines within the field.

Gas/condensate/water production rates are not expected to vary widely from the information presented in the CRNGDP EA (BLM 1998).

2.2.8 Pipeline Gathering System

Exploration and development activities to date within and/or directly adjacent to the MCRNGDPA have resulted in the installation of approximately 54,078 feet (10.24 miles) of pipeline/gas gathering system within the project area. Generally speaking, previous exploration and development activities within the CRNGDPA have resulted in the installation of gas gathering system "corridors" that should be sufficient for the transportation of additional natural gas produced from those wells proposed in conjunction with the Proposed Action.

The average length of pipelines required to serve individual wells proposed within the MCRNGDPA would decrease from an average 2,200 feet of buried pipeline predicted in the CRNGDP EA (BLM 1998) to an average of approximately 331 feet of buried pipeline/well due to the increased well densities proposed for future development in the MCRNGDPA. New gas pipelines serving individual wells would be 3 to 10 inches in diameter and would be buried to a depth of approximately 6 feet.

Development activities on a 20-acre well density would require significantly less pipeline construction as most of these infill wells would be located within the core of the CRU where an existing gas gathering system already exists. Pipelines would be installed directly adjacent to existing access roads within the MCRNGDPA and would require a slightly smaller overall right-of-way (ROW) width of 25 feet as BBC would be able to utilize the existing access road running surface as a staging area for pipe assembly and installation.

Considering a total disturbed right-of-way (ROW) width that did not exceed 25 feet, installation of pipelines to service individual wells drilled within the MCRNGDPA would result in additional surface disturbance equal to approximately 7.98 acres (calculated based upon 40 wells having 265' of pipeline/well and 2 wells having 1,650' of pipeline each). No new pipelines would be required for those "dual" wells drilled on 10 acre densities.

Water produced from each natural gas well would be transported via buried flowline to disposal wells within the MCRNGDPA for subsurface disposal. These produced water flowlines would generally consist of 3 to 10 inch polyethylene pipe buried at a maximum depth of 6 feet and would parallel existing/proposed roads and/or natural gas lines within the field to the greatest extent possible. We would anticipate that these parallel water lines could/would be buried in the same ROW required for installation of the gas gathering system designed to collect gas produced from the proposed wells within the MCRNGDPA.

In addition, BBC anticipates that the existing gas trunk or gathering lines will need to be "looped" at some point in the future to handle the volumes of gas expected to be produced from additional wells proposed for drilling within the MCRNGDPA. These existing pipeline(s) would be looped by installing up to a ten (10) inch steel line in each existing ROW parallel to the existing, buried line. Approximately 7,900 feet of line would be looped from the CRU #27 southeast to the compressor station and approximately 9,400 feet of line would be looped from the CRU #27 north to said compressor station. While both pipeline ROW's follow existing roads, the size of the pipe and the fact that the "loop" lines will be laid parallel to existing lines suggests that a 50 foot ROW would be required for the safe installation of thereof, which would result in an additional 19.86 acres of short-term surface disturbance.

Please refer to Section 2.2.8 of the CRNGDP EA (BLM 1998) for a discussion of pipeline installation techniques.

2.2.9 Ancillary Facilities

Existing compression (3,500 hp) within the CRU would be augmented on an as-needed basis to provide sufficient additional compression to move gas produced within the MCRNGDPA to market. BBC anticipates increasing compression in the CRU to 7,250 hp utilizing lean-burn engine technology from the 5,000 hp previously analyzed in the CRNGDP EA (BLM 1998). Compression would be utilized to move natural gas produced from the MCRNGDPA into the KN Energy, Inc. (KNE) sales pipeline. While no additional surface disturbance would be required solely for the installation of additional compressors, the existing site has been expanded by BBC to provide adequate space for additional production equipment related to the processing of hydrocarbons produced within the overall project area. As a result of this site expansion, the compressor site now occupies approximately 3.0 acres as opposed to the 2.0 acres previously analyzed in the CRNGDP EA (BLM 1998).

Please refer to Section 2.2.9 of the CRNGDP EA (BLM 1998) for additional discussion of additional (ancillary) facilities proposed in conjunction with further development within the MCRNGDPA.

2.2.10 Hazardous Materials

BBC has reviewed the EPA's Consolidated List of Chemicals Subject to Reporting Under Title III of the *Superfund Amendments and Reauthorization Act* (SARA) of 1986 (as amended) to identify any hazardous substances proposed for production, use, storage, transport, or disposal by this project, as well as the EPA's List of Extremely Hazardous Substances as defined in 40 CFR 355 (as amended) and determined that numerous materials listed as hazardous and/or extremely hazardous would be used or generated by this project. A summary of this information is available for review at the BLM's CFO in Casper.

Please refer to Section 2.2.10 of the CRNGDP EA (BLM 1998) for a more comprehensive discussion of hazardous materials and their use in the MCRNGDPA.

2.2.11 Abandonment

As producing wells within the gas field become commercially non-productive (estimated 20 to 40 year productive life), the Operator would obtain the necessary authorization(s) from the appropriate regulatory agencies to abandon the depleted well(s). All above ground facilities would be removed, the well bore would be physically plugged with cement as directed, and both the abandoned road and well location reclaimed according to BLM and/or WOGCC recommendations.

2.2.12 Reclamation

All disturbed surfaces would be reclaimed as soon as possible after the initial disturbance. This reclamation would consist primarily of backfilling the reserve pit, leveling and recontouring of disturbed areas, redistribution of stockpiled topsoil over the disturbed areas, installation of erosion control measures as appropriate, and reseeding as recommended by the appropriate regulatory agency (BLM or WOGCC). If the drilling of a directional well is anticipated soon after the initial well has been drilled and completed, reclamation would be delayed until such time as the second (directional) well had been drilled and completed. If drilling operations on the second (directional) well have not been initiated within twelve months, the well pad would then be reclaimed as indicated above.

Reclamation of the reserve pit would be accomplished when the pit is no longer required for completion and/or testing operations. Free standing water in the pit would be allowed to evaporate through natural means to the greatest extent possible prior to the commencement of backfilling; however, in some instances the pit contents may be mixed with suitable solid materials and the pit backfilled, as approved by the BLM or WOGCC. Prior to the mixing of reserve pit contents with approved stabilizing materials, the contents of the reserve pit would be tested for total petroleum hydrocarbons (TPH) and toxicity characteristics leaching procedure (TCLP) constituents, and appropriate closure permits would be obtained from the WOGCC and/or WDEQ. If necessary, reserve pit contents would be removed and disposed of at an approved disposal facility in a manner commensurate with all relevant county, state, and federal regulations and stipulations pertaining thereto.

Reclamation of the well location would be accomplished within a maximum of 2 years following the termination of drilling and completion operations (in the case of productive wells) or well abandonment (in the case of newly drilled dry holes).

2.2.12.1 Producing Well Location

During the production phase of operations, the unneeded (non-working) area(s) of the well pad would be reclaimed as soon as possible after conclusion of drilling and completion operations, weather permitting. Reclamation would consist of backfilling the reserve pit, reducing the cut/fill slopes by pushing the fill material back up into the cut, redistributing the stockpiled topsoil over these reclaimed areas, installing erosion control measures as appropriate, and reseeding the reclaimed areas as recommended by either the BLM or WOGCC depending upon jurisdiction. Restoration of these

previously disturbed areas would result in the reclamation of approximately 60% of each individual well pad, or 70.31 acres (42 wells x 2.79 ac/well = 117.18 ac x 0.60 = 70.31 ac) overall for the 42 wells proposed in conjunction with the MCRNGDP. As indicated above, this reclamation would be performed within 2 years of well completion and would reduce the long-term or LOP disturbance resulting from well pad construction under this proposal to 46.87 acres.

2.2.12.2 Access Roads

A minimum of 6 inches of topsoil would be stripped from the access road corridor (new construction portion only) prior to the commencement of construction activities and would be redistributed on the "outslope" areas of the borrow ditch after completion of road construction activities. These borrow ditch areas would then be reseeded as soon as practical thereafter. Likewise, any surface disturbances on/along the "outslope" areas of existing roads within the project area resulting from implementation of the Proposed Action would be reseeded as well. Please refer to Figure 2.2 in the CRNGDP EA (BLM 1998) for a typical access road cross-sectional diagram including those "outslope areas to be reseeded.

Restoration of those areas disturbed in conjunction with right-of-way clearing, topsoil salvage, and subsequent road construction would typically result in the reclamation of approximately 30% of the disturbed road ROW (for a road having a 16-foot running surface), not including any provision for the revegetation of the outslope portion of the borrow ditch. As indicated above, this reclamation would be performed within 2 years of well completion and would reduce the long-term or LOP disturbance resulting from access road construction under this proposal to approximately 8.94 acres.

2.2.12.3 Pipelines

A minimum of 6 inches of topsoil would be stripped from the pipeline ROW prior to the commencement of construction activities. Once trenching and pipe installation operations have been completed, the trench would be backfilled with the subsoil materials previously removed there from, the trench will be compacted to avoid settling, and the stockpiled topsoil redistributed over the disturbed ROW. The pipeline ROW would then be reseeded as soon as practical thereafter. Considering that all disturbances associated with pipeline construction would be reclaimed and reseeded as soon as practical following pipe installation, these disturbance are considered as short-term and are not included in the LOP cumulative disturbance totals.

2.2.12.4 Abandoned Well Location

Upon final abandonment, all existing surface facilities would be removed from the well location as stated in Section 2.2.11. The access road and remaining "work" areas of the well location would be scarified and recontoured, erosion control measures would be installed as necessary, and all recontoured (disturbed) areas would be reseeded as recommended by the BLM or WOGCC.

2.3 APPLICANT-COMMITTED ENVIRONMENTAL PROTECTION MEASURES

BBC would implement the applicant-committed practices, design features, and procedures presented in Section 2.3 of the CRNGDP EA (BLM 1998) in order to minimize impacts to the environment. Please refer to the CRNGDP EA and Chapter 5.0 of this document for additional information in this regard.

2.4 NO ACTION ALTERNATIVE

The *National Environmental Policy Act* of 1969 (NEPA) requires that the "No Action" alternative be considered in all environmental documents. Under the No Action Alternative, the BLM would deny further natural gas exploration and development on federal lands in the MCRNGDPA as currently proposed by BBC, while allowing other land and resource uses to continue without the impacts which would be associated with the development proposal. Denial of the modified development proposal is not, however, a denial of all natural gas development in the area. Under the No Action Alternative, development of lands in the CRU and adjoining areas could occur at levels similar to those which have occurred on the area in the past and could occur as authorized by existing management directives contained in the Platte River RMP, which includes the requirement for a site-specific NEPA analysis including the level of development approved in the DR and FONSI for the CRNGDP EA (BLM 1998).

Please refer to Section 2.4 of the CRNGDP EA (BLM 1998) for a more thorough discussion of the No Action Alternative.

2.5 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

The proposed action includes development within a core area on an increased density of 20-acres (32 wells per section). Directional drilling was considered as an alternative to the construction of two separate well pads per 40-acre subdivision. Under this alternative one well pad would typically be strategically located in each 40-acre subdivision in such a manner as to allow two wells to be drilled from a single well pad, with one well drilled vertically and one well directionally drilled to the preferred bottom hole location on a 20-acre spacing pattern (WRMG 2003b). Use of directional drilling techniques in this instance would conceivably reduce the overall number of well pads required to achieve extraction of natural gas from the Lance Formation on a 20-acre spacing pattern. Overall surface disturbances would decrease with the use of a single well pad to drill two individual wells to different bottom hole targets; however, these disturbances would not be reduced by one-half as may be expected considering that a larger well pad would be required in order to accommodate both well bores, associated production equipment and, perhaps more importantly, to provide sufficient room in which to conduct safe directional drilling operations there from. BBC estimates that a well pad designed to accommodate twin wells utilizing directional drilling techniques in the drilling thereof would be approximately 6% larger than a similar pad built for one single well.

Both technical and economic factors determine the feasibility of directional drilling in any given situation and directional drilling is considered to be technically feasible in the MCRNGDPA using current drilling technology. From a purely technical standpoint, directional wells have been drilled in

geologic environments similar to the Cooper Reservoir area. The second factor to be considered is the economic feasibility of directional drilling in the MCRNGDPA. Well economics are primarily dependant on the cost of drilling, which is influenced by drilling conditions and the amount of natural gas ultimately produced by the well. For example, at given ultimate natural gas recovery rates, a well which produces a relatively large amount of natural gas may yield an economic rate of return that justifies drilling the well with the increased costs of directional drilling . But at the same well cost, a well yielding less gas may be sub-economic. Conversely, with a fixed estimated ultimate recovery (EUR), as is typically the case for adjacent wells within a field, the economic feasibility of directional drilling can be adversely affected by the incremental cost of drilling using directional techniques. The volume of gas ultimately produced by the well must generate enough revenue to repay the cost of drilling the well and provide a rate of return sufficiently adequate to compel the operator to drill the well (Vigil 2003).

In this regard, the cost to drill a well using directional techniques/equipment is much greater than that for a vertical well. Incremental costs of directional drilling include the use of the specialized drilling tools, additional labor and drilling rig costs associated with a longer drill time, and the cost of potential and predictable problems that are uniquely associated with directional drilling operations. There are facility savings associated with directional drilling including shared well pad, access road and gathering lines that reduce the incremental cost of directional drilling; however, these costs are minor compared to directional drilling costs. Moreover, risks associated with the directional drilling of wells in the MCRNGDPA are increased due to the presence of relatively soft shales downhole. The potential for key seating, differential sticking and stuck pipe is increased as the drill pipe mechanically erodes the relatively soft shales of the Waltman Formation in the curved (deviated) portion of the well bore. In addition, hole instability increases in a directional well as gravity and the mechanical action of the drill pipe tend to cause sloughing of these shales off of the "high" side of the hole (Vigil 2003).

The costs of directionally drilling a 20-acre density well in the MCRNGDPA are estimated to be 14% higher than comparable costs for the drilling of a vertical well. These higher costs are a direct result of the additional time required to drill the well, the application of directional drilling technology, and the employment of mitigation techniques while drilling. The best-case increase in drilling costs for a directional well, net of facility savings, is approximately $179,233 and is not adjusted for risk associated with potential drilling problems likely to be encountered in the MCRNGDPA (Vigil 2003). The BLM Wyoming Reservoir Management Group also analyzed the feasibility of directionally drilling wells within the CRU on a 20-acre spacing pattern and determined that a typical vertical well would have a net present value (NPV) of $128,194 while a typical directional well would have a NPV of -$51,039 at a 10% discounted cash flow (DCF). Their conclusion was that "...prudent exploitation of the natural gas resources would require the proposed 20-acre spaced infill wells to be drilled vertically" (WRMG 2003b).

It is presently estimated that an additional 25 billion cubic feet (Bcf) of gas can be recovered by increasing well densities to 20-acres within the MCRNGDPA. However, the incremental reserves available in the MCRNGDPA can not be developed in paying well quantities based upon average well reserves of 0.71 Bcf if additional costs are incurred to directionally drill the well (Vigil 2003).

Although directional drilling costs have declined and the technical feasibility has significantly improved over the past decade, exclusive use of directional drilling for 20-acre wells is not currently economically feasible in the MCRNGDPA. Although widespread directional drilling is not feasible, some smaller proportion of the wells may be drilled using directional methods. These certain wells may be drilled directionally if the surface is inaccessible, the estimated natural gas recovery for the individual location is estimated to be high enough and/or natural gas prices are expected to offset the increased costs of directional drilling and provide a rate-of-return on investment sufficient to promote the drilling of the well (Vigil 2003).

BBC has proposed the drilling of up to fifty (50) well bores on 10-acre densities utilizing directional drilling techniques. Although directional drilling operations on 20-acre densities are not considered economic at this time, 10-acre density wells are expected to have a greater likelihood of becoming economic if pricing or technology improves due to the reduced lateral offset distance required to reach the proposed bottom hole target. However, the primary reason that BBC has included a discussion of 10-acre density wells utilizing directional drilling techniques is a matter of full disclosure and the subsequent analysis of a potential approach to long term development which would prevent waste by fully and effectively draining the natural gas reservoir.

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes the affected environment in the vicinity of the Proposed Action (the project area) as it exists today, where pertinent existing development, impacts, and disturbances which have occurred since the DR and FONSI for the CRNGDP EA was signed in 1998 are described. This description is organized by resource with descriptive information taken from a wide range of sources including the BLM and various other federal and state agencies.

A tiered approach was used in the preparation of this environmental analysis document and much of the information contained in the original CRNGDP EA (BLM 1998) has been incorporated into this document by reference. New information will be provided in this chapter where necessary and appropriate to reflect changes that have occurred in the human and natural environment since 1998. Otherwise, the reader will be directed to the narratives contained in Chapter 3.0 of the original CRNGDP EA (BLM 1998).

3.1.1 Environmental Elements Not Present Within the Project Area

For the purposes of this document, the following resources are still not present in the project area and, therefore, would not be adversely affected by implementation of the Proposed Action. Consequently, these resources will not be addressed in this chapter or in Chapter 4.0 (Environmental Consequences) to follow.

- **Floodplains, Wetlands and Prime or Unique Farm Lands**

  Floodplains and/or wetlands as defined in Executive Orders 11988 and 11990 would not be affected by the Proposed Action. Likewise, there are no prime or unique farm lands that would be affected by the Proposed Action.

- **Wilderness Areas, Wilderness Study Areas and Areas of Critical Environmental Concern**

  The project area is not located in either an existing or proposed wilderness/primitive area, a wilderness study area (WSA), or an area of critical environmental concern (ACEC).

- **Primary or Sole Sources of Drinking Water**

  The Proposed Action would not affect any primary or sole sources of drinking water.

- **Wild and Scenic Rivers**

  There are no designated or candidate wild and scenic rivers that would be affected by the Proposed Action.

3.1.2 Environmental Elements Considered With Minor Effects

The following resources would not be adversely affected by implementation of the Proposed Action. Consequently, these resources will also not be addressed in this chapter or in Chapter 4.0 *(Environmental Consequences)* to follow.

- Fisheries - there are no perennial streams in or adjacent to the MCRNGDPA; consequently, there are no fisheries that could be affected by the Proposed Action.

- Paleontology - while the Eocene Wind River Formation is known to contain scientifically significant fossils throughout the Wind River Basin, bedrock outcrops that could contain significant fossils are noticeably absent throughout the majority of the project area. Moreover, past construction activity within the CRU has failed to encounter bedrock deposits or paleontological remains. Mitigation recommended in Section 4.3.4 should prove adequate to protect any isolated paleontologic resources that might be encountered as a result of additional oil/gas exploration and development activity in the MCRNGDPA.

- Recreation - the project area consists of a mosaic of fee (46.10%), state (18.62%), and federal (35.28%) lands (see Table 1.1 and Figure 1.3), with the isolated tracts of federal land in the northern portion of the MCRNGDPA being effectively "landlocked" due to the general lack of a public easement (right-of-way) thereto. Access to a large block of federal lands in the south/southwest portion of the MCRNGDPA is provided by Natrona County Road 212. However, considering that there are no special recreation management areas or developed recreational sites within the project area combined with existing ownership patterns, recreational opportunities within the MCRNGDPA are somewhat limited and would not be adversely affected by the Proposed Action.

- Socioeconomics - neither the economy of Natrona County nor the quality of life for the residents thereof will be adversely affected by the Proposed Action. As described in Chapter 2.0, additional oil/gas exploration and development activity in the MCRNGDPA would not result in an increase in the local workforce, with a concomitant burden on the resources of Natrona County and the infrastructure thereof. In point of fact, implementation of the Proposed Action would actually have a positive impact on the economy of Natrona County through increased revenues generated by additional hydrocarbon production from leases within the project area.

- Vegetation - considering that there are no T/E or candidate plant species known to occur within the MCRNGDPA, the long-term disturbance of 56.81 acres (1.39% of the total surface acreage) over the LOP does not represent a significant impact to plant communities within the MCRNGDPA.

3.2 GENERAL SETTING

Please refer to Section 3.2 of the CRNGDP EA (BLM 1998) for a comprehensive discussion of the general project setting for the MCRNGDPA.

3.3 AIR QUALITY

3.3.1 Climate, Precipitation, and Winds

Please refer to Section 3.3.1 of the CRNGDP EA (BLM 1998) for a comprehensive discussion of climate, precipitation, and winds in the MCRNGDPA.

3.3.2 Air Quality

Current and complete monitoring data for ambient air quality are not available for the Cumulative Impact Study Area. However, based on data collected in similar locations and reviewed by the State of Wyoming, Department of Environmental Quality, Air Quality Division (WDEQ/AQD), air quality levels are assumed to be in attainment for all Wyoming Ambient Air Quality Standards (WAAQS) and National Ambient Air Quality Standards (NAAQS).

Estimation of background air pollutant concentrations (reported in micrograms per cubic meter, or $\mu g/m^3$) is necessary in order to compare potential total air quality impacts from the Proposed Action and Alternatives with applicable air quality standards. Thus, for comparison against an applicable standard, total impacts are the sum of the background concentration plus direct modeled impacts. It is important that individual background concentration values, model predictions, and applicable air quality standards are for the same averaging time period for each pollutant. Background air pollutant concentration data were provided by WDEQ/AQD (WDEQ 2003). Background concentrations of carbon monoxide (CO) are taken from representative data collected by WDEQ/AQD and commercial operators at Ryckman Creek for an 8-month period and summarized in the Riley Ridge EIS (BLM 1983). Sulfur dioxide (SO_2) gaseous air pollutant data were gathered at the Lost Cabin Gas Plant site in Fremont County (1986-87). Nitrogen dioxide (NO_2) and ozone data were collected at the Thunder Basin National Grasslands (2001-2002). Particulate matter less than 10 microns in diameter (PM_{10}) and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) were collected in an urban area at the Cheyenne State Office Building (2002). Background air pollutant concentrations and applicable air quality standards are summarized in Table 3.1 (WDEQ 2003).

3.4 CULTURAL RESOURCES

Approximately 698 acres (+/-) have been inventoried for cultural resources within the MCRNGDPA and surrounding areas (Brunette 2003) which represents 17% of the overall land area included within the project area. These inventories were conducted in compliance with the *National Historic Preservation Act* (NHPA) and included all lands that were potentially affected by surface disturbing activities within or directly adjacent to the MCRNGDPA. Table 3.2 provides a synopsis of the cultural inventories conducted in and/or adjacent to the MCRNGDPA by section. Copies of the individual cultural resource inventory reports are currently on file with both the BLM's Casper Field Office in Casper, Wyoming and the Wyoming State Historic Preservation Office (SHPO) in Laramie, Wyoming.

Table 3.1

Background Air Quality Concentrations, Ambient Standards and PSD Increments (µg/m^3)

Airborne Pollutant	Averaging Time [1]	Background Concentration	Air Quality Standards		PSD Increments	
			WAAQS	NAAQS	Class I	Class II
Carbon Monoxide (CO)	1-hour	3,336	40,000	40,000	None	None
	8-hour	1,381	10,000	10,000	None	None
Nitrogen Dioxide (NO_2)	Annual	5.0	100	100	2.5	25
Ozone (O3)	1 –hour	162	235	235	None	None
	8 –hour	150	157	157	None	None
Sulfur Dioxide (SO_2)	3-hour	93	1,300	1,300	25.0	512
	24-hour	32	260	365	5.0	91
	Annual	4	60	80	2.0	20
PM_{10}	24-hour	47	150	150	8.0	30
	Annual	16	50	50	4.0	17
$PM_{2.5}$	24-hour	15	65	65	None	None
	Annual	5	15	15	None	None

Source: WDEQ 2003.

1 Short-term concentrations reflect the maximum measured values during the entire period of record, except for ozone, which reflect the average of available 2001 and 2002 second high data (1-hour) and fourth-high data (8-hour). Short-term (1-hour, 3-hour, etc.) ambient standards allow not more than one expected exceedance per year. Long-term (annual) standards are not to be exceeded.

The cultural resource inventories referenced in Table 3.2 involved portions of 10 sections within the MCRNGDPA, 5 of which were located in T35N, R87W, with the remaining 5 sections located in T36N, R87W. These inventories identified 12 prehistoric and 5 historic cultural sites/properties. It should be noted that cultural sites identified in Section 9, T35N, R87W (prehistoric site) and Section 28, T36N, R87W (historic railroad grade) are located outside of the MCRNGDP area.

Please refer to Section 3.4 in the CRNGDP EA (BLM 1998) for information concerning cultural sites identified in conjunction with inventories conducted prior to June of 1998.

3.5 GEOLOGY AND MINERALS

Please refer to Section 3.5 of the CRNGDP EA (BLM 1998) for a general discussion of geology and minerals in the MCRNGDPA.

Table 3.2

Cultural Inventories within the MCRNGDPA and Adjacent Areas

Surveyed Areas			Survey Data		Total	Site Classification			Isolated
Section	Township	Range	Surveys	Acres	Sites	Eligible	Not Eligible	Unclassified	Finds
3	35 North	87 West	19	148	1	0	0	1	0
4	35 North	87 West	12	122	1	1	0	0	0
9	35 North	87 West	3	10	1	1	0	0	1
10	35 North	87 West	27	246	3	1	2	0	0
15	35 North	87 West	5	30	0	0	0	0	1
27	36 North	87 West	4	10	1	1	0	0	1
28	36 North	87 West	4	10	4	1	3	0	1
32	36 North	87 West	0	---	--	--	--	--	0
33	36 North	87 West	10	132	5	0	3	2	4
34	36 North	87 West	2	???	1	1	0	0	0
Totals			**86**	**698**	**17**	**6**	**8**	**3**	**8**

NOTE: The acreages presented above are approximate as the May 30, 2003 file search of the SHPO database does not provide actual acreages for 36 of 86 total inventories listed for the sections listed above. In many cases, these inventories were linear surveys conducted in association with seismic lines (10), pipelines (9), access roads (6), and powerlines (1). The remaining inventories involved the hydrostatic testing of a pipeline (1) and block inventories for well locations and access road routes (9). In some cases, the SHPO either may not have received the final report or may not have had time to enter the report data into the database.

3.5.1 Geology

Please refer to Section 3.5.1 of the CRNGDP EA (BLM 1998) for a comprehensive discussion of the geology in the MCRNGDPA.

3.5.2 Minerals

As indicated in Section 2.1, a combined total of 38 wells have been drilled within the Cooper Reservoir Field subsequent to the issuance of the DR and FONSI for the CRNGDP EA (BLM 1998). These wells are identified in Table 3.3 (below). Of the 18 active/proposed wells identified in Table 3.3 of the CRNGDPA EA (BLM 1998), 6 wells are currently producing, 4 wells are now shut-in, 1 well remains a water disposal well, 6 wells have been plugged and abandoned, and 1 well was never drilled. There are currently 40 producing gas wells, 5 shut-in gas wells, 1 water injection well, and 3 wells recently drilled which are now waiting on completion operations within the MCRNGDPA (WOGCC 2003).

Table 3.3

Wells Drilled in the MCRNGDPA Since the Issuance of the DR and FONSI for the CRNGDP EA in June 1998

Well Name and Number	Legal Location of Well				Spud Date	Current Well Status
	Quarter	Section	Township	Range		
Cooper Reservoir Unit #15	NW¼SW¼	3	35 North	87 West	09/07/1998	Producing
Cooper Reservoir Unit #16	SE¼SW¼	3	35 North	87 West	10/07/1998	Producing
Cooper Reservoir Unit #28	NW¼NE¼	3	35 North	87 West	01/07/2000	Shut-In
Cooper Reservoir Unit #29	NW¼SW¼	3	35 North	87 West	03/01/2000	Producing
Cooper Reservoir Unit #30	SW¼NW¼	3	35 North	87 West	02/28/2000	Producing
Cooper Reservoir Unit #34	NE¼SW¼	3	35 North	87 West	11/18/2000	Producing
Federal #2-4	NE¼SW¼	4	35 North	87 West	06/11/1999	Producing
Cooper Reservoir Unit #22	NE¼SE¼	4	35 North	87 West	01/29/1999	Producing
Cooper Reservoir Unit #23	SW¼NE¼	4	35 North	87 West	05/10/1999	Producing
Cooper Reservoir Unit #25	NW¼NE¼	4	35 North	87 West	06/25/1999	Producing
Cooper Reservoir Unit #26	NW¼SE¼	4	35 North	87 West	07/16/1999	Producing
Cooper Reservoir Unit #35	SW¼NE¼	4	35 North	87 West	08/10/2001	Producing
Cooper Reservoir Unit #37	SW¼NE¼	4	35 North	87 West	07/08/2002	Producing
Cooper Reservoir Unit #40	SE¼SE¼	4	35 North	87 West	04/02/2003	Producing
Cooper Reservoir Unit #54	NE¼NE¼	4	35 North	87 West	11/28/2003	WOC
Cooper Reservoir Unit #55	SE¼NE¼	4	35 North	87 West	11/13/2003	WOC
Cooper Reservoir Unit #24	NE¼NE¼	9	35 North	87 West	05/27/1999	Producing
Cooper Reservoir Unit #17	NW¼SW¼	10	35 North	87 West	06/28/1998	Producing
Cooper Reservoir Unit #18	NW¼SE¼	10	35 North	87 West	08/07/1998	Producing
Cooper Reservoir Unit #19	SE¼SW¼	10	35 North	87 West	08/24/1998	Producing
Cooper Reservoir Unit #20	SW¼SE¼	10	35 North	87 West	12/04/1998	Producing
Cooper Reservoir Unit #21	SE¼NW¼	10	35 North	87 West	12/26/1998	Producing
Cooper Reservoir Unit #31	SW¼NW¼	10	35 North	87 West	01/08/2000	Producing
Cooper Reservoir Unit #32	NE¼NW¼	10	35 North	87 West	10/26/2000	Producing
Cooper Reservoir Unit #33	NW¼SW¼	10	35 North	87 West	12/10/2000	Producing
Cooper Reservoir Unit #36	SW¼NW¼	10	35 North	87 West	08/30/2001	Producing
Cooper Reservoir Unit #38	SW¼NE¼	10	35 North	87 West	09/18/2001	Producing
Cooper Reservoir Unit #41	NW¼NW¼	10	35 North	87 West	04/27/2003	Producing
Cooper Reservoir Unit #42	SW¼SE¼	10	35 North	87 West	02/27/2003	Producing
Cooper Reservoir Unit #52	NE¼SW¼	10	35 North	87 West	08/16/2003	Producing
Cooper Reservoir Unit #27	NE¼NW¼	15	35 North	87 West	08/06/1999	Producing
Cooper Reservoir Unit #43	NW¼NE¼	15	35 North	87 West	04/16/2003	Producing
Stone Cabin Unit #22-15	SE¼NW¼	15	35 North	87 West	09/11/2003	WOC
Federal #1-28	SE¼SE¼	28	36 North	87 West	02/04/2003	Producing
Cooper Reservoir Unit #39	SW¼SE¼	33	36 North	87 West	05/26/2003	Producing
Cooper Reservoir Unit #44	SE¼SE¼	33	36 North	87 West	05/15/2003	Producing
Federal #3-33	NE¼SW¼	33	36 North	87 West	06/21/2002	Producing
Federal #4-33	NE¼SE¼	33	36 North	87 West	03/13/2003	Producing

Source: Wyoming Oil and Gas Conservation Commission (WOGCC) Computerized Well Files and Database

Of the 38 wells that have been drilled in the overall project area since the DR and FONSI were issued for the CRNGDP EA (BLM 1998), 23 of the producing well locations have been reclaimed as of December 1, 2003 with 15 locations awaiting reclamation once the reserve pit(s) have dried sufficiently to allow backfilling. Based upon an average disturbance of 2.79 acres per well location, the construction of these 38 wells has resulted in approximately 106.02 acres of short-term surface disturbance within the overall project area. Reclamation of the unneeded (non-working) areas of the 23 producing wells locations has reduced the long-term (unreclaimed) disturbance to 67.52 acres to date, with an additional 25.11 acres scheduled for reclamation within the next 2 years.

For the purposes of this analysis, we will assume that access road and pipeline ROW's have not been fully reclaimed as yet. As a consequence, construction of the 70,085' of access road has resulted in total surface disturbance equal to 64.36 acres (assuming a total disturbed ROW width of 40 feet) and installation of the 54,078' of buried pipeline ROW has resulted in an additional 39.88 acres of surface disturbance (see Table 4.2). Reclamation of existing roads and pipelines within the MCRNGDPA (30% of roads and 100% of pipelines) will result in a long-term or LOP disturbance equal to 45.05 acres.

Please refer to Section 3.5.2 of the CRNGDP EA (BLM 1998) for a comprehensive discussion of the Cooper Reservoir Field including exploration and development activities conducted therein prior to June of 1998.

3.6 HYDROLOGY

3.6.1 Surface Hydrology

The MCRNGDPA encompasses portions of 5 separate watersheds (see Figure 3.1). These watersheds are identified in Table 3.4 (below) along with both the approximate acreages of each watershed and percentages thereof within the overall MCRNGDPA.

Table 3.4

Watersheds within the MCRNGDPA

Name of Watershed	Number of Acres	Percent of MCRNGDPA
Adobe Reservoir	374.71	9.18%
Poison Creek Tributary	59.59	1.46%
Sand Draw	2,221.69	54.43%
South Fork Powder River	978.80	23.98%
Upper Sand Draw	446.95	10.95%
TOTALS	4,081.74	100.00%

Source: CRNGDP EA (BLM 1998)

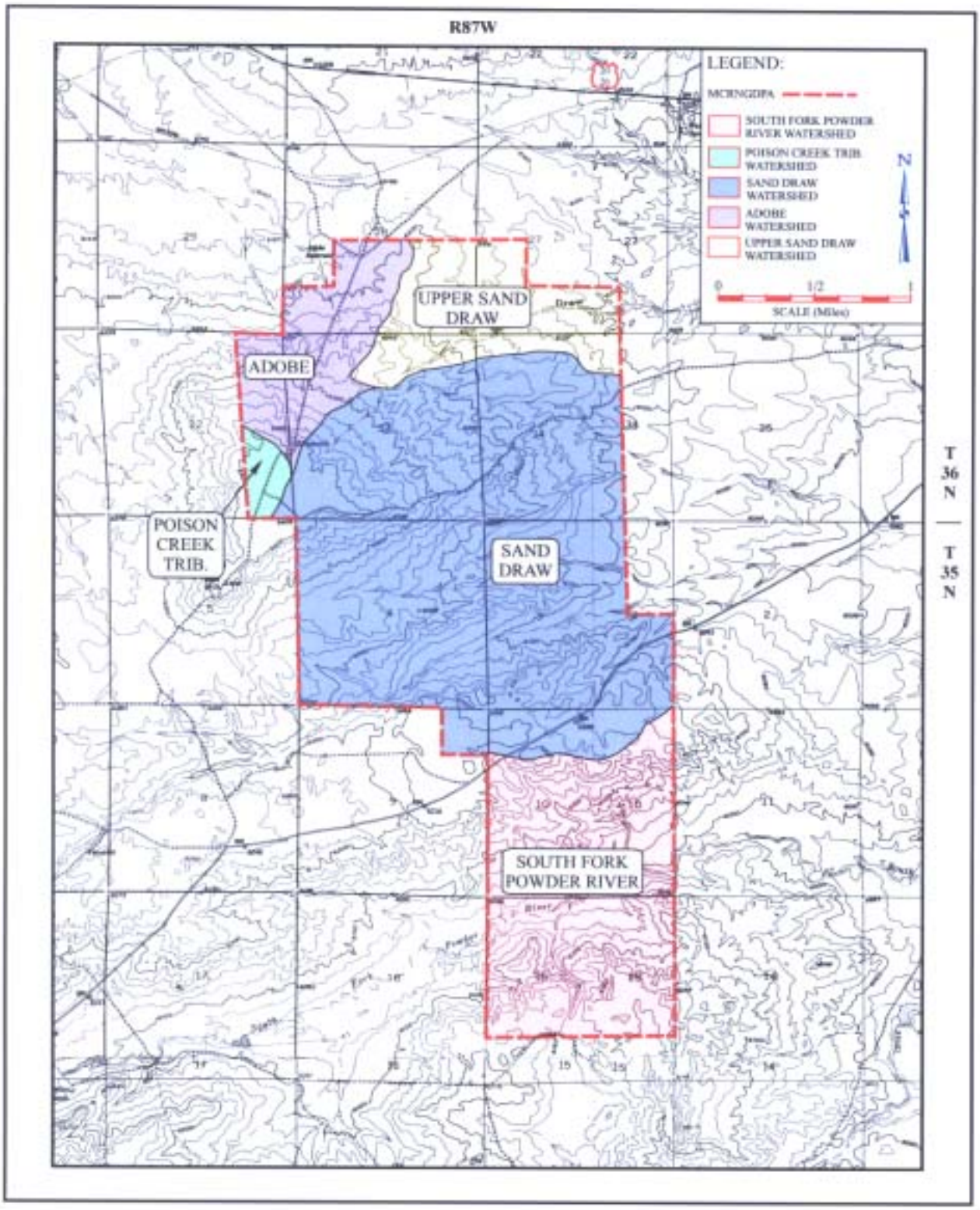

Figure 3.1: Watersheds within the MCRNGDPA

The 446.95 acres included in the Upper Sand Draw watershed were analyzed in the Cave Gulch-Bullfrog-Waltman Natural Gas Project EIS (BLM 1997).

Seventy-eight percent (3,200.40 acres) of the project area is located within the Sand Draw and South Fork Powder River watersheds (see Figure 3.1). As their names imply, these watersheds are drained primarily by ephemeral tributaries of both Sand Draw and the South Fork of the Powder River. The northwestern corner of the MCRNGDPA is included within the Adobe Reservoir and Poison Creek Tributary watersheds, which are drained by ephemeral tributaries of Poison Creek. All of these drainages are intermittent in nature and normally flow only during periods of spring runoff and/or localized periods of heavy rainfall. Runoff generated in the Sand Draw and South Fork Powder River watersheds would flow to the east/northeast out of the project area while runoff generated in the Adobe Reservoir and Poison Creek Tributary watersheds would flow to the west out of the project area. All four watersheds drain into the Missouri River system, which ultimately flows into the Gulf of Mexico via the Mississippi River. No runoff would flow into the North Platte River or any tributaries thereof.

Topographic maps of the MCRNGDPA reveal that 3 separate stock reservoirs (surface impoundments) existed within the project area at the time the area was originally mapped by the U.S. Geological Survey (ca. 1952). A review of aerial photographs taken of the overall project area on September 22, 2001 revealed that none of these 3 stock reservoirs were holding water at the time of the overflight. Please refer to Section 3.6.1 of the CRNGDP EA (BLM 1998) for additional information in this regard.

3.6.2 Sub-Surface Hydrology

There have been no new water wells drilled within the project area since 1998. Please refer to Section 3.6.2 of the CRNGDP EA (BLM 1998) for a comprehensive discussion of the sub-surface hydrology within the MCRNGDPA.

3.7 RANGE MANAGEMENT

Modifications to the boundaries of the CRNGDPA as presented in 1998 have resulted in the elimination of the Springsteen allotment from the MCRNGDPA. The 1,440 acres of public land included within the MCRNGDPA now encompass portions of two separate grazing allotments, each of which are currently subject to a separate grazing lease. Table 3.5 provides general information concerning each grazing allotment within the MCRNGDPA including allotment name and number, grazing lessee, lease number, total acres, and total Animal Unit Months (AUM's). Table 3.6 provides more specific information concerning both of these grazing leases including the legal description of each lease, the number of acres within each lease parcel, and the acres per AUM. On the average, the public rangelands within the project area have a carrying capacity of 6.53 acres per AUM for domestic livestock and are generally utilized as year-round pasture by the permittees.

Table 3.5

Grazing Allotments in the MCRNGDPA

Allotment Name	Allotment Number	Grazing Lessee(s)	Grazing Lease Number	Total Acres in MCRNGDPA	Total AUM's in MCRNGDPA
South Hiland	10030	Deer Creek Ranch, Inc.	496071	640.00	91.59
Skyline	10145	David O. Mackenzie	496179	800.00	129.08
TOTALS				**1,440.00**	**220.67**

Table 3.6

Description of Grazing Leases on Public Lands within the MCRNGDPA

Grazing Lessee	Lease Number	Legal Location of Grazing Lease				# Acres	Acres/ AUM
		Quarter	Section	Township	Range		
Deer Creek Ranch, Inc.	496071	NE¼NE¼	9	35 North	87 West	40.00	6.15
Deer Creek Ranch, Inc.	496071	N½	10	35 North	87 West	320.00	6.15
Deer Creek Ranch, Inc.	496071	S½SW¼, SW¼SE¼	27	36 North	87 West	120.00	8.47
Deer Creek Ranch, Inc.	496071	SE¼	28	36 North	87 West	160.00	8.47
David O. Mackenzie	496179	S½	10	35 North	87 West	320.00	6.27
David O. Mackenzie	496179	N½, N½S½	15	35 North	87 West	480.00	6.15

We may assume that similar, state and/or privately-owned, rangelands within the project area would also have an average carrying capacity of approximately 6.53 AUM's and that grazing practices would be similar to those currently being utilized on public lands. Range improvements within the MCRNGDPA consist primarily of cross fencing along property and/or allotment boundaries, as well as the stock reservoirs and water wells identified in Sections 3.6.1 and 3.6.2.

No site specific surveys have been conducted within the MCRNGDPA to determine the presence of invasive non-native species. However, it is possible that Canadian thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), cheatgrass (*Bromus tectorum*), Russian knapweed (*Acroptilon repens*), and halogeton (*Halogeton glomeratus*) occur on or adjacent to previously disturbed areas within the overall project area.

3.8 SOILS

As indicated in Section 1.1, approximately 2,200 acres originally included in the CRNGDP EA have been eliminated from the modified project description for the MCRNGDPA. This modification has resulted in the elimination of four of the soil mapping units (112, 236, 282, and 293) discussed in the

original CRNGDP EA (BLM 1998). Table 3.7 provides information concerning those soil mapping units which remain within the MCRNGDPA including total acres, the percentage of total acres, and sensitivity of these soils (refer to Figure 3.2).

As indicated in Table 3.7, sensitive soils constitute approximately 21% (842 acres) of the overall MCRNGDPA. A summary of the physical characteristics of individual soils within each soil mapping unit (SMU) was provided in Table 3.7 of the original CRNGDP EA (BLM) and these descriptions remain valid for the soils identified below.

Table 3.7

Soil Mapping Units within the MCRNGDPA

Map Unit	Name of Soil Mapping Unit	# Acres	% of Area	Sensitive Soil
130	Bosler-Alcova complex, 2 to 10% slopes	97.96	2.40	Yes
132	Bowbac-Hiland fine sandy loams, 3 to 10% slopes	978.80	23.98	No
194	Haverdad-Clarkelen complex, 0 to 3% slopes	15.10	0.37	No
201	Hiland sandy loam, 0 to 6% slopes	1,958.01	47.97	No
207	Keeline-Taluce-Rock Outcrop complex, 6 to 20% slopes	241.64	5.92	No
209	Keyner-Absted-Slickspots complex, 0 to 6% slopes	525.73	12.88	Yes
227	Orella-Cadoma-Petrie clay loams, 3 to 30% slopes	139.19	3.41	Yes
301	Vonalee-Hiland complex, 3 to 15% slopes	78.78	1.93	Yes
310	Zigweid loam, 2 to 9% slopes	46.53	1.14	No
TOTALS		**4,081.74**	**100.00**	

Please refer to Section 3.8 of the CRNGDP EA (BLM 1998) for more detailed information concerning soils within the MCRNGDPA.

3.9 VISUAL RESOURCES

As indicated in Section 3.9 of the CRNGDP EA (BLM 1998), the northern portion of the MCRNGDPA falls within a 3 mile buffer zone established along U.S. Highway 20-26 which was included within Visual Resource Management (VRM) Class III by the Platte River Resource Area (PRRA) Office in their *Oil & Gas Environmental Assessment* dated March, 1982. Under this VRM class, changes in the basic elements (form, line, color, or texture) may be evident in the characteristic landscape. However, the changes should remain subordinate to the visual strength of the existing (land) character. The natural landscape in this 3-mile corridor along either side of U.S. Highway 20-26 has been subjected to some extensive cultural modifications, all of which contribute to the degradation of the scenic values in the area directly north and east of the MCRNGDPA.

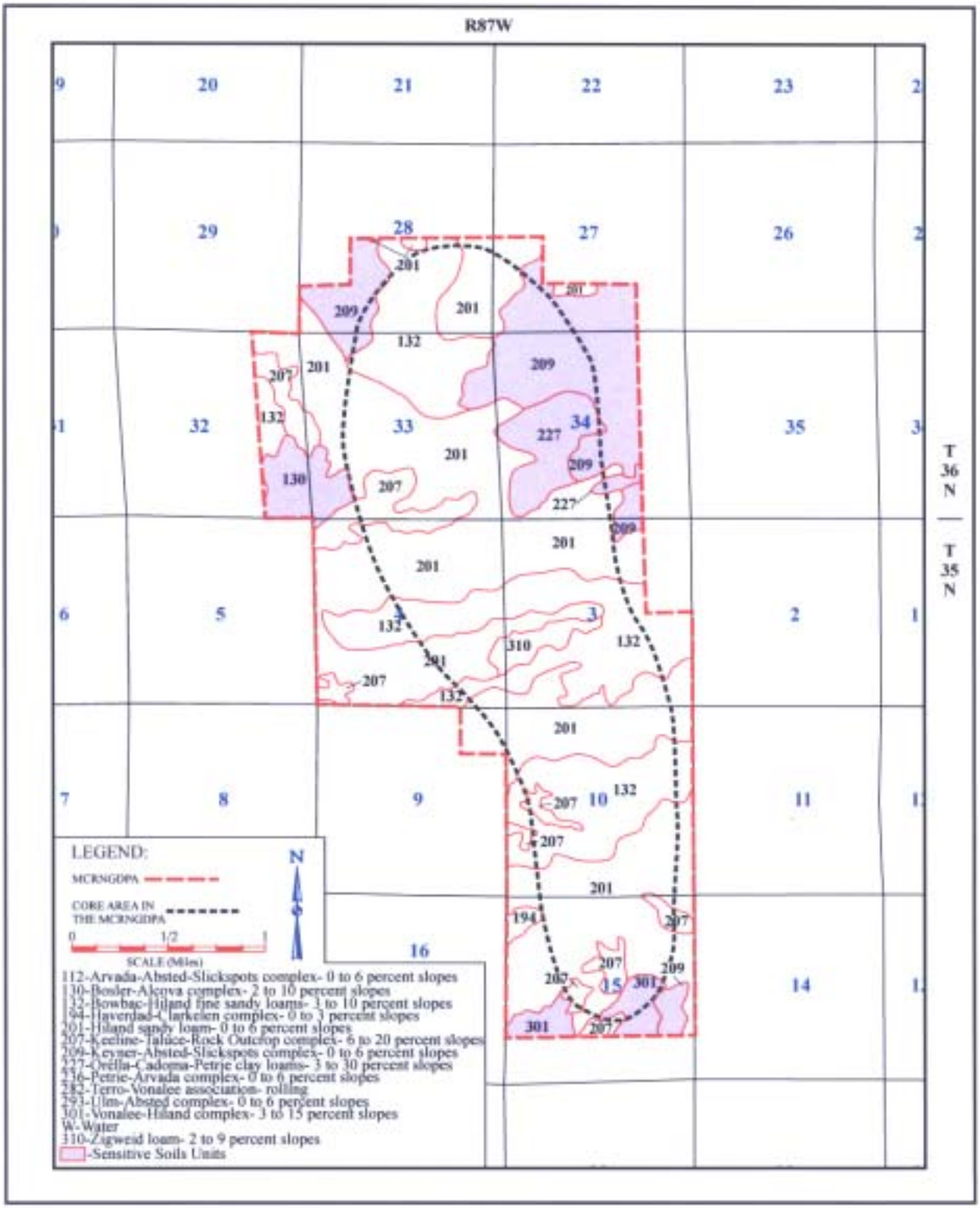

Figure 3.2: Soils within the MCRNGDPA

These cultural modifications include, but are not limited to, the facilities identified in the original CRNGDP EA (BLM 1998) as well as additional modifications as follows.

1. Installation of an extensive "man-camp" in conjunction with water hauling activities associated with the industrial water well located approximately 1/2 mile south of the community of Waltman in the NE¼SW¼ of Section 30, T36N, R86W.

2. An area of extensive rangeland vegetative treatment including tilling and probable dry land crop farming in an area directly south of U.S. Highway 20-26 and east of Natrona County Road 212.

The remaining portions of the MCRNGDPA that are outside of the 3-mile corridor along U.S. Highway 20-26 fall within VRM Class IV. Under this VRM Class, changes may subordinate the original composition and character of the landscape, but must reflect what could be a natural occurrence within the characteristic landscape (BLM 1982). Cultural modifications to the existing landscape along Natrona County Road 212 include many of the facilities listed above, in conjunction with existing development within the CRU (refer to Table 3.3 and Figure 1.2).

Please refer to Section 3.9 of the CRNGDP EA (BLM 1998) for additional information concerning existing visual intrusions within the overall project area.

3.10 WILDLIFE

Please refer to Sections 3.10, 3.10.1, and 3.10.2 of the original CRNGDP EA (BLM 1998) for introductory remarks (Section 3.10) and a comprehensive discussion of the two life zones (Sections 3.10.1 and 3.10.2) encountered within the MCRNGDPA.

3.10.1 Economically Important Wildlife Species

The economically important wildlife species discussed in Section 3.10.3 of the CRNGDP EA (BLM 1998) have not changed in the intervening period of time. Population objectives for both pronghorn antelope and mule deer in the Rattlesnake Herd Unit remain at 12,000 and 5,500 animals respectively (WGFD 2003a). Likewise, population objectives for both species in the Beaver Rim Herd Unit also remain at 25,000 and 2,600 post-hunt animals respectively (WGFD 2003b). Table 3.8 provides current population data for both antelope and mule deer in the Beaver Rim and Rattlesnake Herd Units. There are no population data estimates for sage grouse within the MCRNGDPA and there are no known leks within two miles of the MCRNGDPA boundary (WGFD 2002).

Please refer to Section 3.10.3 of the CRNGDP EA (BLM 1998) for additional information concerning economically important wildlife species that may occur within the MCRNGDPA, herd unit designations (as appropriate), and their respective habitats.

Table 3.8

Population Objectives, 2002 Post-Hunt Population Estimates, and Population Trends in Antelope and Mule Deer Populations in the Beaver Rim and Rattlesnake Herd Units

Herd Unit	Antelope			Mule Deer		
	Objective	Actual	Pop. Trend	Objective	Actual	Pop. Trend
Beaver Rim	25,000	18,263	↓ 27%	2,600	650	↓ 75%
Rattlesnake	12,000	15,260	↑ 27%	5,500	3,773	↓ 31%

Source: WGFD Annual Big Game Herd Unit Completion Reports for the Casper and Lander Regions (WGFD 2003a, 2003b)

3.10.2 Raptor Species

Please refer to Section 3.10.4 of the CRNGDP EA (BLM 1998) for a comprehensive discussion of raptors and historic raptor nesting activity within the MCRNGDPA. It should be noted that Intoil, Inc. installed three artificial nesting structures (ANS) within or directly adjacent to the overall project area subsequent to the completion of the CRNGDPA EA (BLM 1998). These ANS' are located as follows:

- CR #1: NE¼NE¼SW¼NW¼ of Section 9, T35N, R87W.
- CR #2: SW¼SW¼NE¼SW¼ of Section 9, T35N, R87W.
- CR #3: NW¼SE¼SW¼NE¼ of Section 3, T35N, R87W.

Inventories of raptor nesting activity at selected nests within the MCRNGDPA during the spring of 2003 indicated that CR #1 was occupied by a ferruginous hawk on April 27, 2003, with incubation still in progress as of May 28, 2003. These same inventories revealed that CR #2 showed some signs of past activity although a defined nest structure was not present, which would suggest that nest tending/construction activity had occurred prior to April 27. While nesting platforms were installed on both the CR #2 and CR #3 structures, field observations made during the spring of 2003 would suggest that nesting materials and/or replacement nests were apparently not included as an inducement to nesting upon installation thereof, which may explain why these ANS' have received little or no attention to date.

The historic raptor nests identified in conjunction with the CRNGDP EA (BLM 1998) and subsequently inventoried showed no signs of any tending/nesting activity during the 2003 nesting period with the following caveats:

- historic nest number 192 was a historic golden eagle (*Aquila chrysaetos*) nest which was constructed on a 400 barrel tank installed at the Federal #1-33 well location. Subsequent to

1998, the nest was taken over by a pair of common ravens (*Corvus corax*) who then utilized the nest for a period of several years. The 2003 inventory revealed that nest number 192 is now gone.

- historic nest numbers 168 and 171 were vestigial nests back in 1998 and consisted of a mere scattered collection of sticks with absolutely no nest cup definition or evidence of historic use. Subsequent inventories have failed to identify any nesting activity thereon and these nests are now considered to be relicts. As a consequence, these nests were not inventoried in 2003 and will no longer be included in any raptor nesting inventories within the overall analysis area.

- Nest numbers 140, 143, 195, 196, and 197 were not inventoried in 2003 as no development activity was proposed by BBC within a 0.25 mile radius of these nests during the nesting season.

3.10.3 Threatened, Endangered and Candidate Species

3.10.3.1 Threatened and Endangered Species

Threatened and/or endangered (T/E) species include those species which are in danger of extinction due to drastic population declines and which have subsequently been listed as threatened or endangered pursuant to the *Endangered Species Act* (ESA) of 1973 (as amended). Those T/E species identified by either the U.S. Fish and Wildlife Service (USFWS) or Bureau of Land Management which may potentially occur within the project area include:

- **Bald eagle** *(Haliaeetus leucocephalus)* - Status: Threatened.

  Migrant through the area during the fall and spring migrational periods, seasonal resident during the winter months along the North Platte River.

  Historic habitat for bald eagles migrating through or wintering in central Wyoming would include riparian area(s) along the North Platte River in Natrona County and both the Big and Little Wind Rivers in Fremont County, which provide roosting and perching areas for eagles foraging along the river course and their adjacent uplands. Roosting areas for bald eagles are also known to occur on the west end of Casper Mountain (Jackson Canyon) and on Pine Mountain (both of which are located in Natrona County).

  Survey flights during the early 1980's found a smaller portion of bald eagles along the river compared to the number of eagles within roosts on nights before the flights which would suggest that a larger number of bald eagles were foraging in the rangelands than along the river and other large water bodies. In this regard, open rangelands throughout east-central Wyoming are probably being used opportunistically by bald eagles for foraging; however, no bald eagles have been observed in the area in conjunction with BLM or BLM-approved inventories within the project area since 1998 (BLM 2004).

- **Black-footed ferret** *(Mustela nigripes)* - Status: Endangered.

  Potential resident in prairie dog *(Cynomys sp.)* colonies.

  As there are no known prairie dog towns within the MCRNGDPA, impacts to black-footed ferrets are not expected to occur.

- **Preble's meadow jumping mouse** *(Zapus hudsonius preblei)* - Status: Threatened.

  Potential resident in riparian habitats east of the Laramie Mountains and south of the North Platte River drainages.

  There are no perennial or intermittent streams with associated riparian habitats within the MCRNGDPA and the project area is not within the area of expected occurrence for the Preble's Meadow jumping mouse.

- **Ute ladies'-tresses** *(Spiranthes diluvialis)* - Status: Threatened.

  Potential resident in seasonally moist soils and wet meadows below 7,000 feet. Locally found in the North Platte River drainage below Alcova Reservoir and in the drainages of the Cheyenne and Niobrara Rivers in southeastern Wyoming.

  As indicated above, there are no perennial or intermittent streams with associated riparian habitats within the MCRNGDPA. Furthermore, as the MCRNGDPA does not occur in the drainages of the North Platte, Cheyenne, or Niobrara Rivers, the expected area(s) of occurrence, impacts to Ute ladies'-tresses are not expected to occur.

- **Colorado butterfly plant** *(Gaura neomexicana* spp. *coloradensis)* - Status: Threatened.

  Potential resident on sub-irrigated, alluvial soils on level or slightly sloping floodplains and drainage bottoms at elevations of 5,000-6,400 feet). Colonies are often found in low depressions or along bends in wide, meandering stream channels. Known populations of this species are restricted to approximately 1,700 acres of habitat in Laramie County, Wyoming, western Kimball County, Nebraska, and Weld County, Colorado within the drainages of both the North and South Platte Rivers (Fertig 2000a).

  As indicated above, there are no perennial or intermittent streams with associated sub-irrigated alluvial soils or floodplains within the MCRNGDPA. Furthermore, as the MCRNGDPA does not occur within the drainage of the North Platte River, the expected area of occurrence, impacts to the Colorado butterfly plant are not expected to occur.

- **Blowout penstemon** *(Penstemon haydenii)* - Status: Endangered.

  Potential resident in "blowouts" - sparsely vegetated depressions in active sand dunes created by wind erosion which typically form on windward sandy slopes where the vegetation has been

removed or disturbed (Fertig 2000b). In Wyoming, the only known populations of blowout penstemon are located at the eastern end of the Ferris sand dune system at the head of Schoolhouse Creek and the west side of Bradley Peak in Carbon County (BLM 2003).

As there are no active sand dunes within the MCRNGDPA, this species is not expected to occur within the overall project area.

- **North Platte River Species**

  In addition to the species listed above, the U.S. Fish and Wildlife Service also identified five T/E species which may occur in the downstream riverine habitats of the North Platte River in Nebraska as follows:

  1) Interior least tern *(Sterna antillarum)* - Status: Endangered;

  2) Piping plover *(Charadrium melodus)* - Status: Threatened;

  3) Pallid sturgeon *(Scaphirhynchus albus)* - Status: Endangered;

  4) Eskimo curlew *(Numenius borealis)* - Status: Endangered; and

  5) Western prairie fringed orchid *(Platanthera praeclara)* - Status: Threatened.

  These species could be adversely affected by water depletions (consumption) in the North Platte River system resulting from project-related activities.

3.10.3.2 Candidate Species

Species that are candidates for listing as threatened or endangered that may occur within the project area include:

- **Black-tailed prairie dog** *(Cynomys ludovicianus)*

  Expected occurrence includes grasslands generally east of the continental divide.

  As indicated in Section 3.10.3.1 (above), there are no known prairie dog towns within the MCRNGDPA; consequently, this species will not be addressed further in this analysis document.

3.10.4 Special Status Species

Special status species would include those plants/animals that do not currently warrant protection under the *Endangered Species Act* of 1973 (as amended), yet are considered by the Bureau of Land Management as sensitive species. The CRNGDP EA (BLM 1998) included a discussion of both

swift fox *(Vulpes nigripes)* and mountain plover (*Charadrius montanus*) as candidate species. While both species have since been removed from further consideration as T/E species by the USFWS, BLM considers these species to be "sensitive" and management decisions should consider impacts thereto. The discussions contained in Sections 3.10.5.2 and 4.9.3.6 of the CRNGDP EA (BLM 1998) regarding swift fox are considered more than adequate for the current proposal and we do not expect the revised project proposal to adversely affect swift fox. Regarding potential impacts to mountain plover, inventories of the MCRNGDPA by both BLM and AEC in 2002 and again in 2003 have revealed that there is no suitable mountain plover habitat within the modified project area. Consequently, we do not anticipate any impacts to mountain plover breeding or nesting activity within the MCRNGDPA as a result of project related activities. Considering the above, these two species will not be addressed further in this document.

3.10.5 Migratory and Non-Migratory Birds

Habitats in the MCRNGDPA and immediate vicinity are primarily sagebrush-dominated uplands (shrub-steppe) with interspersed shortgrass prairie. Wyoming Partners in Flight (PIF) priority species potentially occurring in the shrub-steppe (SS) and shortgrass prairie (SGP) habitat types are listed in Table 3.9 (Nicholoff 2003).

In this regard, the majority of the MCRNGDPA lies within an area directly north of latitude 43°00'N and west of longitude 107°12'30"W, with a small portion of the project area falling directly to the south of latitude 43°00'N. Species distribution as reported in *The Atlas of Birds, Mammals, Reptiles and Amphibians in Wyoming* (WGFD 1999) includes a compilation of observations mapped by latitude and longitude, with the State of Wyoming divided into 28 different regions, where these observations are reported within a specific region of the state. These regions are based upon a one degree separation of both latitude and longitude. As a consequence, the MCRNGDPA falls with Wyoming Distribution Areas (latilongs) 11 and 18 as defined by WGFD (1999). Avian distribution data contained in *The Atlas of Birds, Mammals, Reptiles and Amphibians in Wyoming* (WGFD 1999) for the PIF priority species potentially occurring within the MCRNGDPA is included in Table 3.9. Only those birds that have been classified by WGFD (1999) as confirmed breeders (nest and/or young observed), with circumstantial evidence of breeding (nest and/or young not located), or that have been observed at any time (season) within the general area (but without any evidence of breeding) are included in the list. Breeding Bird Survey (BBS) data for survey routes within Wyoming were included in this database (WGFD 1999). Definitions for those symbols used in Table 3.9 to report Wyoming distribution are as follows:

- B: Nest or young dependent upon parent birds observed.
- b: Circumstantial evidence of breeding.
- O: The species has been observed, but there was no evidence of nesting.
- N: The species has not been observed in the area.

Table 3.9

List of Partners In Flight (PIF) Priority Bird Species Potentially Found Within the MCRNGDPA

Common Name	Scientific Name	Habitat Type	WGFD Distribution	
			Area 11	Area 18
Level I Species (Conservation Action)				
Ferruginous Hawk	*Buteo regalis*	SS/SGP	B	B
Greater Sage Grouse	*Centrocercus urophasianus*	SS	B	B
Mountain Plover	*Charadrius montanus*	SS/SGP	B	B
Upland Sandpiper	*Bartramia longicauda*	SGP	N	B
Long-billed Curlew	*Numenius Americana*	SGP	O	b
Burrowing Owl	*Athene cunnicularia*	SGP	O	B
Short-eared Owl	*Asio flammeus*	SGP	O	O
Baird's Sparrow	*Ammodramus bairdii*	SGP	O	N
Brewer's Sparrow	*Spizella breweri*	SS	O	B
Sage Sparrow	*Amphispiza belli*	SS	O	B
McCown's Longspur	*Calcarius mccownii*	SS/SGP	B	B
Level II Species (Monitoring)				
Black-chinned Hummingbird	*Archilochus alexandri*	SS	O	N
Loggerhead Shrike	*Lanius ludovicianus*	SS	B	B
Sage Thrasher	*Oreoscoptes montanus*	SS	B	B
Vesper Sparrow	*Pooecetes gramineus*	SS	B	B
Lark Sparrow	*Chondestes grammacus*	SS	B	B
Lark Bunting	*Calamospiza melanocorys*	SGP	B	B
Grasshopper Sparrow	*Ammodramus savannarum*	SGP	N	O
Dickcissel	*Spiza Americana*	SGP	N	O
Bobolink	*Dolichonyx oryzivorus*	SGP	O	O
Level III Species (Local Interest)				
Common Poorwill	*Phalaenoptilus nuttallii*	SS	B	B
Say's Phoebe	*Sayornis saya*	SS	B	B

Source: Wyoming Bird Conservation Plan, Version 2.0 (Nicholoff 2003)

Note: Chestnut-collared Longspur *(Calcarius ornatus)* was removed from the PIF Level II list for SGP as the species has not been observed in either Area 11 or Area 18 (WGFD 1999)

Most of the birds listed in Table 3.9 typically nest either on the ground or in shrubs; thus activities associated with the Proposed Action may have the potential to destroy individual nests, eggs, and/or young of some of these species. Projected losses are indeterminate as there are no Breeding Bird Survey (BBS) routes located within the immediate vicinity of the MCRNGDPA which could provide information on breeding bird densities within the shrub-steppe and shortgrass prairie habitats encountered within the MCRNGDPA.

Concerns regarding the decline of both migratory and non-migratory bird populations both locally and on a continental scale have resulted in a nationwide bird conservation planning effort. Management goals and objectives for bird conservation are found in the following documents:

1) Land Bird Strategic Plan, and

2) Presidential Executive Order (EO) 13186 dated January 17, 2001; and

3) Proposed Memorandum of Understanding associated with the above Presidential EO.

Bird Conservation Plans prepared at the state and regional levels also include objectives for bird conservation. As evidenced by EO 13186, there has been national direction to implement actions that incorporate these goals.

3.11 ENVIRONMENTAL JUSTICE

Neither the Proposed Action nor the No Action Alternative would disproportionately affect minority or low income people, and is not discussed further in this EA. The proposed project would provide some additional employment opportunities for a small number of workers in Natrona County, and would add to the local economy.

4.0 ENVIRONMENTAL IMPACTS

4.1 Introduction

The potential environmental consequences of construction, drilling, completion, and maintenance activities associated with both the Proposed Action and No Action Alternative are discussed for each potentially affected resource. 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 can be beneficial or adverse; a primary (direct) result or a secondary (indirect) result of an action; long-term (more than five years) or short-term (less than five years); and can vary in degree from a slightly discernable change to a total change in the environment. In accordance with CEQ regulation 40 CFR 1502.16, this chapter includes a discussion of the significance of both direct and indirect effects of the Proposed Action and the No Action Alternative. Possible conflicts between the Proposed Action and No Action Alternative and the objectives of the Platte River RMP as well as state and local land use plans and policies are identified if such conflicts exist.

Potential impacts are quantified when possible; however, when impacts are not quantifiable appropriate adjectives are used to best describe the level of impact. Impact assessment assumes that all applicant-committed practices will be successfully implemented. If such measures are not implemented, additional adverse impacts may occur. Additional mitigation measures are suggested if such measures are appropriate, and BLM will decide whether to include such additional measures in the Decision Record. The Decision Record will be the decision document for this proposed project. Each resource discussed in this chapter will include a discussion of the following:

- impacts resulting from implementation of the Proposed Action;
- impacts resulting from the No Action Alternative;
- additional mitigation and monitoring measures;
- unavoidable adverse impacts; and
- cumulative impacts.

In addition, Section 4.5 discusses irreversible and irretrievable commitment of resources and Section 4.6 discusses short-term use of the environment versus long-term productivity.

4.2 Pre-Existing Disturbance within the MCRNGDPA

A discussion of cumulative impacts will accompany each particular resource discussed below. For those resources where disturbance calculations are necessary to compare and compute the cumulative effects of the Proposed Action with pre-existing and/or previously analyzed surface disturbing activities, it will be necessary to present a compilation of these pre-existing activities/approvals in order that the reader may track these impacts throughout Chapter 4.0 of this document. For the

purposes of this Environmental Assessment, a Cumulative Impacts Analysis Area (CIAA) was defined for both the surface hydrologic (watershed) and soil resource components potentially affected by additional oil/gas development within the MCRNGDPA which corresponds with the CIAA defined for the CRNGDP EA (BLM 1998). The CIAA was defined by watersheds as depicted in Figure 4.1 of the CRNGDP EA. These watersheds encompass a total of approximately 20,515.45 acres, 16,433.71 acres (80%) of which are located outside of the MCRNGDPA boundary. Cumulative Impact Analysis areas for the remaining resources were defined as follows:

- Air Quality - Johnson, Washakie, Big Horn, Sheridan, and Natrona counties;
- Cultural - the MCRNGDPA;
- Range - the MCRNGDPA; and
- Wildlife - the CIAA for big game species will be based upon the WGFD Rattlesnake and Beaver Rim Herd Units for both antelope/mule deer. The CIAA for raptors will be based upon the Greater Cave Gulch Raptor Analysis Area (GRAA). Other species will be the MCRNGDPA.

Existing surface disturbance within the CIAA for both surface hydrology and soils was quantified for the CRNGDP EA (BLM 1998) from aerial photographs of the area taken on June 7, 1996. These existing surface disturbances, combined with any additional surface disturbances which have occurred in the area since the June 7, 1996 overflight, are quantified in Table 4.1. Table 4.2 quantifies linear surface disturbances within the overall CIAA.

Table 4.1

Summary of Total Surface Disturbance in the CIAA by Watershed [1]

Name of Watershed	Facilities (acres)	Co. Road (acres)	Resource Roads (acres)	Pipelines (acres)	2-Tr. Trails (acres)	TOTAL (acres)
Adobe	0.00	0.00	4.41	0.00	3.91	8.32
Poison Creek Tributary	0.00	0.00	0.00	0.00	2.22	2.22
Sand Draw	47.97	24.91	39.78	27.11	25.60	165.37
S. Fork Powder River	23.99	14.18	15.39	7.26	10.44	71.26
Upper Sand Draw	5.58	0.00	4.78	5.51	2.92	18.79
TOTALS	**77.54**	**39.09**	**64.36**	**39.88**	**45.09**	**265.96**

1 Figures presented for facilities include the presence of 16 reclaimed/9 unreclaimed well locations in Sand Draw (including the Federal #1-27 well location), 9 reclaimed/5 unreclaimed well locations in South Fork Powder River, and 2 unreclaimed well locations in Upper Sand Draw watersheds, the 3.0 acre compressor site in the Sand Draw watershed, as well as 2.0 acres in the Sand Draw watershed which have been carried over from the CRNGDPA and which are unaccounted for.

Table 4.2

Linear Surface Disturbance in the Cumulative Impacts Analysis Area

Disturbance Class	Total Length	Width	Area (acres)
Natrona County Road 212	28,378'	60'	39.09
Pipeline ROW's	15,400'	50'	17.68
Pipeline ROW's	38,678'	25'	22.20
Resource Roads	70,085'	40'	64.36
Two-Track Trails	327,367'	6'	45.09
TOTAL			**188.42**

NOTE: The Linear Surface Disturbance presented in above is also included in the Total Disturbance listed in Table 4.1.

For the purposes of this analysis, two disturbance figures were carried over from the original CRNGDP EA (BLM 1998) for each watershed and include the amount of two-track trail originally reported therein, as well as the length of Natrona County Road 212 - neither of which has changed in the intervening period of time. The 9.49 acres of pipeline disturbance which appeared in Table 4.6 of the CRNGDP EA (BLM 1998) has been eliminated from consideration in this analysis as we assume that the referenced pipeline ROW has been successfully reclaimed and thereby no longer represents either a short-term, long-term or LOP disturbance within the CIAA. Likewise, the existing wells within the CIAA were broken down into two basic categories, with those categories being producing wells which either have been or have not been reclaimed. Of the 40 active wells within the MCRNGDPA, 25 have been reclaimed, leaving the 15 wells most recently drilled by Intoil/BBC unreclaimed. Again, for the purposes of this document, acres of disturbance for these well pads was calculated at 2.79 acres per well location for initial (unreclaimed) disturbance, and 1.116 acres for those producing wells which have subsequently been reclaimed. Regarding access roads and pipelines, clearly there are both roads and pipelines within the CIAA that have experienced some degree of reclamation since 1998. A measurement of the actual amount of disturbed area which has been reclaimed has not been made; consequently, erosion estimates were based on the total amount of disturbance listed in Tables 4.1 and 4.2.

Considering that the original CRNGDP analysis area has been reduced in size by approximately 38%, it would be inappropriate to utilize the disturbance figures generated in the 1998 document for the forthcoming cumulative impacts analysis as BBC has revised the original Intoil project proposal. The currently proposed wells have been redistributed within the modified project area based upon a percentage of development within each respective watershed to date combined with a somewhat subjective assignment of wells to watersheds by spacing based upon previous patterns of exploration and development within the area. In this regard, we will assume that of the 35 wells remaining from the 1998 analysis, 29 will be drilled at a 40-acre density with the remaining 6 wells drilled at a 20-acre density pattern. This coincides with information presented in Section 2.2.1 which states that approximately 40% of the remaining 77 wells (31 wells) would be drilled on a 40-acre density (16

wells per section) and approximately 60% of the remaining 77 wells (46 wells) would be drilled on a 20-acre density (32 wells per section). Considering that 40 of the 42 total wells proposed in conjunction with the MCRNGDP analysis were considered to be 20-acre density wells and 2 were considered to be 40-acre density wells, these numbers will accurately represent the cumulative impacts of the Proposed Action. As a consequence, the remaining 35 wells left over from the CRNGDP EA (BLM 1998) have been allocated to watersheds as shown in Table 4.3 along with a compilation of surface disturbance associated therewith. One 20-acre density well was assigned to each of the four primary watersheds (Adobe, Sand Draw, South Fork Powder River, and Upper Sand Draw), with one additional 20-acre density well allocated to both the Sand Draw and South Fork Powder River watersheds.

Table 4.3

Projected Surface Disturbance by Watershed Attributable to those Wells Remaining to be Drilled under the Original CRNGDP Analysis

Name of Watershed	Well Locations		Access Roads		Pipelines		Total Disturbance
	Number	Acres	Feet	Acres	Feet	Acres	
Adobe	5	13.95	6,865'	6.30	6,865'	3.94	24.19 acres
Poison Creek Tributary	0	-----	0'	-----	0'	-----	0.00 acres
Sand Draw	17	47.43	25,280'	23.21	25,280'	14.51	85.15 acres
S. Fork Powder River	4	11.16	3,830'	3.52	3,830'	2.20	16.88 acres
Upper Sand Draw	9	25.11	13,465'	12.37	13,465'	7.73	45.21 acres
TOTALS	**35**	**97.65**	**49,440'**	**45.40**	**49,440'**	**28.38**	**171.43 acres**

With the above information, long-term or LOP disturbance can be determined for the MCRNGDPA based upon pre-existing disturbance defined in Tables 4.1 and 4.2, combined with a projection of remaining disturbance from the CRNGDP EA (BLM 1998) and proposed disturbances associated with the currently Proposed Action. These LOP disturbances are presented in Table 4.4.

4.3 AIR QUALITY

4.3.1 Introduction

Air pollutant emissions would occur from the Proposed Action during well site construction activities and well production, and these emissions would impact air quality in the project area. An extensive air quality impact assessment was prepared for this project as it was proposed in the 1998 CRNGDP EA, documented in the 1998 *CRNGDP Cumulative Air Quality Impact Analysis Technical Support Document* (TRC 1998).

Table 4.4

Cumulative Long-Term (LOP) Surface Disturbance within the MCRNGDP CIAA

Development Stage	Well Locations [1]	Resource Roads [2]	Ancillary Facilities	County Roads [3]	2-Track Trails [4]	Total Acres
Pre-Existing [5]	49	70,085'	0 ac	28,378'	327,367'	183.91
CRNGDP	35	49,440'	2 ac	0'	0'	72.84
MCRNGDP	42	13,900'	1 ac	0'	0'	56.81
TOTALS	**126**	**133,425'**	**3 ac**	**28,378'**	**327,367'**	**313.56**

1 Calculated based upon a 1.116 acre working area and includes the 12 active wells drilled before the CRNGDP EA
2 Calculated based upon a 28' total disturbed ROW width
3 Calculated based upon a 60' total disturbed ROW width
4 Calculated based upon an estimated 6' of total surface disturbance
5 Includes the Federal #1-27 which was drilled by Intoil in the SW¼NW¼ of Section 27, T36N, R87W

NOTE: Pipeline calculations are not included in the long-term (LOP) disturbance figures presented above as we assume that pipeline ROW's would be successfully reclaimed within five years of initial disturbance. While reclamation of these pipeline ROW's may not return the disturbed area(s) to pre-disturbance vegetative successional levels, we must assume that the reclamation will be such that the reclaimed areas are stabilized, and that native vegetation (e.g., grasses and forbs) have become established thereon.

The current project scope differs from the 1998 project scope in well numbers, well location densities, well-site equipment, and compression horsepower requirements, and each of these changes result in a concomitant change in projected air emissions. Both the air emissions projected to be emitted from the current Proposed Action and the relative change in air emissions and impacts from levels analyzed in the 1998 analysis are documented in the *Technical Support Document - Analysis of Relative Air Quality Impacts, Cooper Reservoir NGDP Environmental Assessment* (Compliance Partners 2003).

A summary of differences in project scope is provided in Table 4.5. This summary provides a basis for emissions inventory and ambient impact comparisons provided later in this section.

4.3.2 Significance Criteria

The primary pollutants emitted would be particulate matter less than 10 microns in diameter (PM_{10}), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOC), sulfur dioxide (SO_2), and hazardous air pollutants (HAPs) including benzene, toluene, ethylbenzene, xylene, and formaldehyde. 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 State of Wyoming laws, as administered by Wyoming Department of Environmental Quality - Air Quality Division (WDEQ/AQD).

Table 4.5

Summary of Changes to CRNGDP Project Scope

Project Parameter	CRNGDP EA (original scope)	MCRNGDP EA (proposed scope)
Total Wells	85	115
Well Location Density	40-acre well spacing	Single well pads: 20-acre well density in the core area, 40-acre well density outside of core area. Dual well pads: 10-acre well density in the core area.
Well Site Equipment	Dedicated well site glycol dehydration; two separators with heaters	Centralized glycol dehydration at separate location; one separator (production unit) + heater [1]
Compression Horsepower	5,000 hp	7,250 hp

Source: Compliance Partners 2003

1 All well locations would be equipped with 1 separator/heater per well bore (2 separator/heaters for those well locations having both 20-acre and 10-acre wells on a shared well pad).

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. As such, significant impacts to air quality from project-related activities would result if it is demonstrated that:

- National Ambient Air Quality Standards (NAAQS) or Wyoming Ambient Air Quality Standards (WAAQS) would be exceeded; or
- Class I or Class II PSD Increments would be exceeded; or
- Air Quality Related Values (AQRVs) would be impacted beyond acceptable levels.

4.3.3 Direct and Indirect Impacts

4.3.3.1 Emissions Inventory - Construction

Air pollutant emissions from the construction phase of the Proposed Action would result from construction of well pads and access roads, travel on unpaved roads, heavy construction equipment, well drilling engines, and well completion. Specifically, PM_{10} and $PM_{2.5}$ emissions would result from well pad and access road construction and travel on unpaved roads, and NO_x, CO, VOC, and/or

SO_2 emissions would occur from drilling engine operation, tailpipe emissions from heavy construction equipment, and flaring operations during completion. Air pollutant impacts from each well would be temporary, occurring during the 52-day well construction period, and would occur in isolation without significantly impacting other well locations being constructed.

Emissions resulting from well site construction as calculated in the 1998 EA remain unchanged (Compliance Partners 2003), and are shown in Table 4.6 for a single well and on an annual basis at the proposed development rate of 24 wells per year.

Table 4.6

Well Site Construction Emissions Summary

Activity	Pollutant	Emission Rate per Well (lb)	Emission Rate per 24 Wells (tpy)
Resource Road/Well Pad Construction	PM_{10}	570.36	6.84
	$PM_{2.5}$	285.18	3.42
	VOC	8.11	0.097
	CO	22.10	0.270
	NO_x	49.65	0.600
	SO_2	5.20	0.062
Rig-Up, Drilling, Rig-Down	PM_{10}	1,591.90	19.10
	$PM_{2.5}$	795.95	9.55
	VOC	490.52	5.89
	CO	1,326.02	15.91
	NO_x	6,103.45	73.24
	SO_2	403.79	4.85
Completion and Testing	PM_{10}	805.98	9.67
	$PM_{2.5}$	402.99	4.84
	VOC	4.52	0.054
	CO	11.73	0.14
	NO_x	8.32	0.10
	SO_2	0.68	0.0082

Source: TRC 1998

4.3.3.2 Emissions Inventory - Production

Emissions of PM_{10}, $PM_{2.5}$, NO_x, CO, VOC, SO_2, and HAPs would also occur from well equipment during gas production operations and from ancillary facilities including gas dehydration and compression. Emissions-generating well site equipment proposed for each well would include:

- one 3-phase separator/heater;

- one additional 3-phase separator/heater (at up to fifty 10-acre well sites); and
- miscellaneous piping and connections.

These equipment requirements vary from the configuration analyzed in the 1998 EA in the elimination of the well site glycol dehydration unit. Those well site units have been replaced with a centralized glycol dehydration facility to be co-located with the centralized compressor station. Specifications for the compressor station have also changed, from 5,000 hp total compression proposed in 1998 to 7,250 hp total compression as part of this Proposed Action. Advancements in the Best Achievable Control Technology (BACT) required under WDEQ-AQD regulations have resulted in a reduction of unit compressor engine emissions. Total production emissions calculated for the proposed action and a summary of the change in emissions from emission levels calculated in the 1998 EA are provided in Table 4.7 (Compliance Partners 2003). All emissions calculations have been performed in accordance with accepted methods and are documented in the 2003 Technical Support Document (Compliance Partners 2003).

4.3.3.3 Emissions Inventory - Wind Erosion

Emissions of particulate matter from wind erosion of disturbed areas were calculated for the 1998 EA and reflected emissions from surface disturbance which is overstated when compared to the current Proposed Action (TRC 1998). As a consequence, these emissions remain unchanged from those calculated for the 1998 CRNGDP Air Quality Technical Support Document (Compliance Partners 2003). $PM_{2.5}$ emissions are assumed to equal 40% of PM_{10} emissions based on guidance contained in AP-42 Chapter 13.2.5, Industrial Wind Erosion. Wind erosion emissions are 0.40 lb/hour PM_{10}, and 0.16 lb/hr $PM_{2.5}$.

4.3.3.4 Ambient Impacts

A near-field analysis was performed for the 1998 EA to predict maximum potential concentrations in the CRNGDPA for comparison to ambient air quality standards. A representative well site layout was modeled with the ISCST3 model and 1991 Casper surface station meteorological data to quantify impacts of PM_{10} and SO_2 emissions from construction and NO_x, CO, and HAP emissions during production. The results of this analysis were reviewed in the 2003 Technical Support Document to assess potential changes to ambient impacts due to changes in the Proposed Action (Compliance Partners 2003). A review was conducted of both construction and production impacts. Ambient background concentrations reflective of existing conditions in the region, which are added to modeled concentrations to determine total impacts, have been updated to current recommended values for all pollutants and are shown in Table 4.8. Pollutant concentration data have been collected at several other regional sites in addition to the sites shown in Table 4.8. Specifically, SO_2 concentration data has been collected near Pinedale, Wyoming (approximately 140 miles west of the MCRNGDPA) since 1999, and NO_x concentrations have been collected northeast of the project area at several Powder River Basin surface coal mines since 2001.

Table 4.7

Production Emissions

Activity	Pollutant	Production Emissions (tpy)	Emission Change from 1998 (tpy)
Well Equipment - Single Well	PM_{10}	0.00	0.00
	$PM_{2.5}$	0.00	0.00
	VOC	4.90	- 23.06
	CO	0.05	- 0.18
	NO_x	0.22	- 0.76
	SO_2	0.00	0.00
	Total HAPs [1]	0.06	- 1.04
Centralized Glycol Dehydration	PM_{10}	negligible	0.0
	$PM_{2.5}$	negligible	0.0
	VOC	19.0	+ 19.0
	CO	5.3	+ 5.3
	NO_x	1.8	+ 1.8
	SO_2	negligible	0.0
	Total HAPs	6.5	+ 6.5
Compressor Station	PM_{10}	< 0.01	0.00
	$PM_{2.5}$	< 0.01	0.00
	VOC	68.00	+ 29.00
	CO	96.30	+ 52.30
	NO_x	99.80	+ 2.80
	SO_2	< 0.01	0.00
	Formaldehyde	4.90	+ 4.80
	Other HAPs [2]	6.50	+ 6.50
	Total HAPs [3]	11.40	+ 11.40
Total Annual Production Emissions [4]	PM_{10}	< 0.01	0.00
	$PM_{2.5}$	< 0.01	0.00
	VOC	650.50	- 1,765.10
	CO	107.40	+ 43.80
	NO_x	126.90	- 53.40
	SO_2	< 0.01	0.00
	Total HAPs	24.80	- 68.70

Source: Compliance Partners 2003

1 Production emissions for HAP constituents including benzene, toluene, ethylbenzene, xylenes, and n-hexane were all less than 0.01 tons per year (tpy) and declined 1.04 tpy from 1998.
2 Other HAPs include n-hexane and BTEX.
3 Total HAPs including formaldehyde + other HAPs defined in 1, above.
4 Production emissions calculated assuming 115 wells producing. Emission change from 1998 calculated assuming per-well emissions change at 85 wells and per-well production emissions occur at remainder of wells (30).

Table 4.8

Pollutant Background Concentration Summary

Pollutant	Averaging Period	1998 Background Concentration [1]	Current Background Concentration [1]	Data Source Current Background	Current Value Collection Period
CO	1-Hour	3,500	3,336	Amoco Ryckman Creek	1978 - 1979
	8-Hour	1,500	1,381		
NO_2	Annual	2	35.0	WDEQ: Thunder Basin	01/02 - 12/02
Ozone (O_3)	1-Hour	110	162	WDEQ: Thunder Basin	01/01 - 12/02
	8-Hour	----	150		
SO_2	3-Hour	93	93	Lost Cabin	1986 - 1987
	24-Hour	32	32		
	Annual	4	4		
TSP	24-Hour	70	N/A	N/A	----
PM_{10}	24-Hour	42	47	WDEQ: Cheyenne	01/02 - 12/02
	Annual	19	16		
$PM_{2.5}$	24-Hour	N/A	15	WDEQ: Cheyenne	01/02 - 12/02
	Annual	N/A	5		

1 Background concentrations measured in micrograms per cubic meter ($\mu g/m^3$)

Pinedale SO_2 measurements have been conducted since 1989; however, these data are weekly filter pack estimates of SO_2 which are not readily comparable to gaseous measurements which are normally sampled hourly. NO_x measurements at the Antelope, Belle Ayr, and Black Thunder mines are greater than those measured at the Thunder Basin National Grasslands, but are believed to be influenced by NO_x emissions from the significant locomotive traffic at the mines and are therefore not considered to be representative of regional background.

Construction emissions would be short-term and localized in nature, occurring at individual construction sites for the construction periods shown in Section 2.0. Construction impacts calculated in 1998 remain representative of a reasonable worst-case scenario (Compliance Partners 2003). PM_{10}, $PM_{2.5}$, and SO_2 construction-specific and total concentrations are shown in Table 4.9.

Air quality impacts during production were quantified in 1998 for NOx, CO, and HAP emissions from the well sites and compressor engines. These impact assessments were revised in the 2003 Technical Support Document based on the source-specific change in emissions for each these pollutants as shown in Table 4.7. The resulting estimated air quality impacts from NO_x and CO emissions resulting from production activities, expressed as nitrogen dioxide (NO_2) and CO are shown in Table 4.10.

Table 4.9

Construction Impact Summary ($\mu g/m^3$)

Pollutant	Averaging Period	1998 Modeled Impact ($\mu g/m^3$)	Current Background Concentration	Total Concentration	WAAQS/ NAAQS
PM_{10}	24-Hour	24.5	47	71.5	150
	Annual	6.7	15	21.7	50
$PM_{2.5}$	24-Hour	12.3 [1]	15	27.3	65
	Annual	3.4 [1]	5	8.5	15
SO_2	3-Hour	26.2	93	119.2	1300/1300
	24-Hour	10.7	32	42.7	260/365
	Annual	0.4	4	4.4	60/80

Source: Compliance Partners 2003.

1 $PM_{2.5}$ concentrations estimated as 50% of PM_{10} modeled concentrations in the absence of modeling results for this pollutant.

Table 4.10

Maximum NO_2 and CO Concentrations ($\mu g/m^3$)

Pollutant	Averaging Period	Revised Modeled Impact	Background Concentration	Total Concentration	WAAQS/ NAAQS	PSD Class II Increment
CO	1-Hour	427.7	3,336	3,763	40,000	--
	8-Hour	183.1	1,381	1,564	10,000	--
NO_2	Annual	19.2	5.0	24.2	100	25

Source: Compliance Partners 2003.

Emissions of well site HAPs (n-hexane, benzene, toluene, ethylbenzene and xylene) as calculated in the 1998 analysis were modeled and found to be well below corresponding short-term (acute) exposure levels utilized at that time. As discussed in the 2003 Technical Support Document and shown in Table 4.5, well site HAP emissions have decreased significantly due to the removal of well site glycol dehydration and installation of a centralized dehydration facility at the compressor location. As a result, modeled short-term HAP concentrations from well sites, quantified in 1998, are assumed to represent a conservative estimate of impacts which would occur under the Proposed Action and are shown in Table 4.11.

Table 4.11

Short-Term HAP Concentrations ($\mu g/m^3$)

Pollutant	Modeled 8-Hour Concentration	Modeled 1-Hour Concentration	REL/IDLH [1]
Benzene	19.1	27.3	1,300
Toluene	4.4	6.3	37,000
Ethylbenzene	1.0	1.4	35,000
Xylene	11.7	16.7	22,000
n-hexane	11.6	16.6	39,000
Formaldehyde	10.3	515.0	94

1 EPA Air Toxics Database, Table 2 (EPA 2002).

As shown in Table 4.7, formaldehyde emissions from compressor engines would increase from levels analyzed in 1998 due to the use of a more conservative, realistic emission factor and higher engine horsepower. The impacts assessed in the 1998 analysis were revised in the 2003 Technical Support Document to reflect the increase in formaldehyde emissions, and the resulting ambient concentration is shown in Table 4.11. 8-hour concentrations of benzene, toluene, ethylbenzene, xylene, n-hexane, and formaldehyde are converted to 1-hour concentrations using standard conversion guidance and compared to 1-hour EPA Reference Exposure Levels (RELs) for benzene, toluene, xylene, and formaldehyde and to 1-hour EPA Immediately Dangerous to Life or Health (IDLH) values for ethylbenzene and n-hexane, in accordance with current HAP analysis guidance. All short-term concentrations are compared to the applicable REL or IDLH in Table 4.11.

Long-term (annual) exposures to emissions of the suspected carcinogens (benzene and formaldehyde) were modeled in the 1998 study. Cancer risks for the MLE (most likely exposure) and the MEI (maximally exposed individual) were calculated from the modeled concentrations. The predicted annual concentrations were 0.07 $\mu g/m^3$ (benzene) and 0.0003 $\mu g/m^3$ (formaldehyde). Using the benzene concentration from the 1998 study and adjusting the formaldehyde concentration for the increase in emissions since 1998, the estimated MLE scenario cancer risk for benzene (6e-08), formaldehyde (1.4e-8) and the total MLE cancer risk (7.4e-8) are well below the acceptable range of 1e-04 to 1e-06. Under the MEI scenario, both the individual cancer risks for benzene and formaldehyde (2e-7 and 3.5e-8) are less than 1e-6, and the total cancer risk for the inhalation pathway is less than 1e-6.

In addition long term exposures to HAPs are compared to Reference Concentrations for Chronic Inhalation (RfCs) for non-carcinogenic effects on human health. These are shown in Table 4.12. Modeled 8-hour concentrations of toluene, xylene, ethylbenzene and n-hexane from the 1998 study are converted to annual concentration values using standard conversion guidance. The annual formaldehyde concentration has been adjusted for the increase in emissions since 1998. All concentrations are below the applicable RfC as presented in Table 4.12.

Table 4.12

Non-Carcinogenic HAP RfCs ($\mu g/m^3$)

Pollutant	Annual Concentration	Non-Carcinogenic RfC [1]
Benzene	0.07	30.0
Toluene	0.50	400.0
Ethylbenzene	0.11	1,000.0
Xylenes	1.34	430.0
n-Hexane	1.33	200.0
Formaldehyde	0.01	9.8

1 EPA Air Toxics Database, Table 1 (EPA 2002).

Ozone (O_3) is formed as a result of chemical reactions involving ambient concentrations of VOCs and NO_x. The 1998 air quality study demonstrated that VOC and NO_x emissions resulting from a patch of wells and a nearby compressor station would not cause or contribute to an exceedance of the hourly NAAQS for ozone (235 $\mu g/m^3$). In addition, since overall field emissions of NO_x and VOCs will be less than what was analyzed in the 1998 study, there would be less potential for ozone formation and lower expected ozone concentrations.

4.3.4 The No Action Alternative

Under the No Action Alternative, there would be no additional impacts to ambient air quality beyond those previously analyzed in the CRNGDP EA (BLM 1998).

4.3.5 Mitigation and Monitoring

Please refer to the CRNGDP EA (BLM 1998) for both Applicant-Committed Practices (Section 2.3.5) and Suggested Mitigation Measures (Section 4.2.5) designed to reduce impacts to air quality within the overall analysis area. In addition, BBC would apply Best Available Control Technology (BACT) for reciprocating internal combustion engines, condensate storage, and other applicable emission sources to reduce air emissions in accordance with Wyoming Air Quality Standards and Regulations (WAQSR) Section 2(c)(v) and WDEQ/AQD guidance for oil and gas sources.

4.3.6 Unavoidable Adverse Impacts

The mitigation measures identified herein would minimize potential adverse effects; however, some increase in air pollutant emissions would occur as a result of the Proposed Action. However, dispersion modeling of these air pollutant emissions has predicted impacts below applicable significance thresholds.

4.3.7 Cumulative Impacts

A cumulative air quality impact assessment was performed for this project as it was originally proposed in the 1998 CRNGDP EA, documented in the 1998 *CRNGDP Cumulative Air Quality Impact Analysis Technical Support Document.* The analysis assessed the potential cumulative air quality impacts resulting from emissions of NO_x and SO_2 from the CRNGDP and 34 emission sources (identified from WDEQ/AQD air permitting records) located within the study area, which included Johnson, Washakie, Big Horn, Sheridan, and Natrona counties. Modeling of potential cumulative air quality impacts was performed to quantify NO_2 and SO_2 impacts at the Cloud Peak Wilderness Area (CPWA) boundary (a PSD Class II area) and at a USDA Forest Service (USFS) identified sensitive lake (Florence Lake). Potential nitrogen and sulfur deposition and regional visibility impacts at the CPWA, and change in acid neutralizing capacity (ANC) at Florence Lake, were calculated. Note that PSD Class II areas such as CPWA have no visibility protection under state or federal law.

As discussed in the 2003 Technical Support Document (Compliance Partners 2003), a net overall decrease in NO_x emissions will be achieved through revisions to the CRNGDP project scope. Therefore the analysis that was performed in 1998 resulted in predicted impacts that are larger than those that would be expected from the current project design and when combined with identical regional sources. The 1998 analysis demonstrated that the maximum predicted change in visibility resulting from cumulative emissions impacts would be 0.3 deciview which is below the current Federal Land Managers' (FLMs') Air Quality Related Values Workgroup (FLAG) cumulative analysis threshold of a 1.0 deciview or 10% change in light extinction. The maximum potential change in ANC at Florence Lake was predicted to be 0.5%, well below the USFS threshold value of 10%.

The maximum cumulative atmospheric deposition was predicted to be 0.02 kilograms per hectare-year (kg/ha-yr) of nitrogen and 0.005 kg/ha-yr of sulfur in comparison to USFS deposition threshold values of 3 kg/ha-yr for nitrogen, and 5 kg/ha-yr for sulfur (Fox *et al* 1989).

4.4 CULTURAL RESOURCES

4.4.1 Introduction

Please refer to Section 4.3.1 of the CRNGDP EA (BLM 1998) for introductory remarks concerning cultural resources within the MCRNGDPA.

4.4.2 Significance Criteria

Please refer to Section 4.3.2 of the CRNGDP EA (BLM 1998) for a discussion of the guidelines for determining adverse impacts to any site currently on, or eligible for, the NRHP.

4.4.3 Direct and Indirect Impacts

As indicated in Section 3.4, the records of the Wyoming State Historic Preservation Office (SHPO) indicate that approximately 698 acres have been inventoried for cultural resources within or directly adjacent to the MCRNGDPA. Seventeen cultural sites were identified in conjunction with these inventories including 6 sites which were considered as eligible for nomination to the NRHP, an additional 8 sites which were considered as not eligible for nomination to the NRHP, and 3 sites which were unclassified as of May 30, 2003 (Brunette 2003). From these numbers, we may predict a site density of one cultural site per 41 acres and one potentially eligible cultural site per 116 acres. Considering that approximately 159 additional acres will be disturbed in conjunction with operations within the MCRNGDPA, we would expect the discovery of approximately 4 cultural sites, only one of which (35%) would be potentially eligible for nomination to the NRHP. In this regard, a Class III cultural resource inventory will be completed on all areas that would be disturbed in conjunction with continued operations in the MCRNGDPA and any cultural resources identified would either be avoided or mitigated according to standard procedures.

Any unanticipated discoveries of cultural resources made during construction activities would be mitigated according to standard procedures and project personnel would be prohibited from collecting any artifacts or disturbing any significant cultural resources in the area. As a consequence, impacts to cultural resources would likely be negligible to nonexistent.

4.4.4 The No Action Alternative

Under the No Action Alternative, there would be no project-related surface disturbance beyond those levels previously analyzed in the CRNGDP EA (BLM 1998), and impacts to cultural resources would remain at current levels.

4.4.5 Mitigation and Monitoring

Please refer to the CRNGDP EA (BLM 1998) for both Applicant-Committed Practices (Section 2.3.3) and Suggested Mitigation Measures (Section 4.3.4) designed to reduce impacts to cultural resources within the overall analysis area. No additional mitigation is recommended.

4.4.6 Unavoidable Adverse Impacts

Some buried cultural resources could inadvertently be disturbed by construction activities.

4.4.7 Cumulative Impacts

The Class III cultural resource inventories that have been/would be conducted in the overall project area would add to our knowledge of the distribution of such resources within the area. Because all

cultural resources would either be avoided or potential impacts thereto mitigated in accordance with BLM/SHPO recommendations, no adverse cumulative impacts would occur to the resource.

4.5 GEOLOGY AND MINERALS

Please refer to Section 4.4 of the CRNGDP EA (BLM 1998) for a brief discussion of oil/gas exploration/development impacts upon the mineral resource within the MCRNGDPA. At this time, there are no other known mineral resources within the project area which are considered to be economically recoverable.

4.5.1 No Action Alternative

Under the No Action Alternative, exploration for and development of the hydrocarbon resource within the MCRNGDPA would not occur beyond those levels previously analyzed and subsequently approved in the DR and FONSI for the CRNGDP EA (BLM 1998). Other mineral actions within the MCRNGDPA would be allowed to proceed on a case-by-case basis.

Based upon information concerning reservoir characteristics and the recoverability of the hydrocarbon resource within the overall project area, implementation of the No Action alternative would result in the ultimate waste of existing hydrocarbon resources as said resources would not be optimally developed at a time when active development is occurring in the area (Vigil 2003). Failure to fully develop and recover the hydrocarbon reservoir at this particular moment in time could render these resources unrecoverable resulting in the complete loss of the remaining resource in future years.

4.5.2 Mitigation and Monitoring

Please refer to the CRNGDP EA (BLM 1998) for Applicant-Committed Practices (Section 2.3.4) designed to reduce impacts to subsurface mineral resources within the overall analysis area. No additional mitigation is recommended.

4.5.3 Unavoidable Adverse Impacts

We do not anticipate any unavoidable adverse impacts to the geology or mineral resources of the overall project area as a result of project approval.

4.5.4 Cumulative Impacts

BLM has not received any proposals for additional resource development in or directly adjacent to the MCRNGDPA other than the Proposed Action as presented in Section 2.2 of this document. As a

consequence, we do not anticipate the occurrence of any cumulative impacts (significant or otherwise) to existing mineral resources within the analysis area as a result of activities associated with the Proposed Action.

4.6 HYDROLOGY

4.6.1 Introduction

Please refer to Section 4.5.1 of the CRNGDP EA (BLM 1998) for introductory remarks concerning potential impacts to both surface and subsurface hydrology within the MCRNGDPA.

4.6.2 Significance Criteria

Please refer to Section 4.5.2 of the CRNGDP EA (BLM 1998) for a discussion of the guidelines utilized in determining adverse impacts to both surface and subsurface hydrologic resources within the MCRNGDPA.

4.6.3 Direct and Indirect Impacts

4.6.3.1 Surface Hydrology

Because there are no perennial streams or other sources of permanent surface water (stock water reservoirs) known to exist within the project area, the potential for significant degradation of existing surface water quality in or adjacent to the MCRNGDPA resulting from implementation of the proposed action is considered to be remote. As indicated in Section 2.3.5 of the CRNGDP EA (BLM 1998), water produced in association with additional oil/gas exploration and development within the MCRNGDPA would be disposed of in strict accordance with both WDEQ/WQD and WOGCC rules and regulations for the surface/subsurface disposal of produced water. A summary of proposed surface disturbances by watershed (as defined in Section 3.6.1 and subsequently illustrated in Figure 3.2) is presented in Table 4.13.

The above summary of projected surface disturbance in the MCRNGDPA does not include the one additional acre of surface disturbance associated with the expansion of the existing compressor site. Table 4.14 provides the percentage of surface disturbance in each watershed which would result from additional oil/gas exploration and development activity within the MCRNGDPA including the one-acre expansion of the compressor site mentioned above.

The potential for off-site erosion and sedimentation throughout the MCRNGDPA would be further reduced through the incorporation of site specific reclamation requirements directly into the conditions of approval for those actions within the MCRNGDPA requiring federal authorization.

Table 4.13

Summary of Proposed Surface Disturbance by Watershed

Name of Watershed	Well Locations		Access Roads		Pipelines		Total Disturbance
	Number	Acres	Feet	Acres	Feet	Acres	
Adobe [1]	1	2.79	1,650'	1.52	1,650'	0.95	5.26 acres
Poison Creek Tributary	0						0.00 acres
Sand Draw [2]	28	78.12	7,420'	6.81	24,720'	24.12	109.05 acres
S. Fork Powder River	9	25.11	2,385'	2.19	2,385'	1.37	28.67 acres
Upper Sand Draw [1]	4	11.16	2,445'	2.25	2,445'	1.40	14.81 acres
TOTALS [3]	**42**	**117.18**	**13,900'**	**12.77**	**31,200'**	**27.84**	**157.79 acres**

1 Includes one well spaced on a 40 acre well density with estimated access road equal to 1,650 feet/well
2 Includes 17,300 feet of "loop" pipeline with a 50' ROW width
3 Does not include the one additional acre attributable to the expanded compressor site

Table 4.14

Percentage of Surface Disturbance in Each Watershed

Watershed Name	Total Acres in Watershed	Acres of Disturbance	Surface Disturbance as Percent of Total
Adobe	767.20	5.26	0.69%
Poison Creek Tributary	1,779.57	0.00	0.00%
Sand Draw	8,159.74	110.05	1.35%
S. Fork Powder River	6,734.94	28.67	0.43%
Upper Sand Draw	3,074.00	14.81	0.48%
Totals	**20,515.45**	**158.79**	**0.77%**

Typically, these reclamation requirements would be developed during the permit review process (on-site inspection) and would be based upon site-specific concerns identified during the course thereof. Consequently, the potential for increased erosion and sedimentation within or directly adjacent to MCRNBGDPA is considered to be insignificant when one considers the following:

- the total amount of surface disturbance which would result over the LOP from additional oil/gas exploration and development activity within the MCRNGDPA (158.79 acres of short-term disturbance) represents only 3.89% of the total land area within the MCRNGDPA;

- successful reclamation of disturbed areas not required for on-going production operations (101.98 acres) would result in an approximate 63% overall reduction in long-term or LOP

surface disturbance, thereby further reducing the potential for erosion and off-site sedimentation (LOP disturbance for the MCRNGDP = 56.91 acres);

- the implementation of site specific "Best Management" reclamation practices designed to stabilize disturbed areas as quickly as possible, would result in a 93% overall reduction in erosion after the first year and a 99% reduction in erosion after five years (refer to Section 4.8.3); and

- surface disturbance resulting from additional oil/gas exploration and development activity would not exceed the 10% significance threshold in any of the 5 affected watersheds.

4.6.3.2 Sub-Surface Hydrology

Please refer to Section 4.5.3.2 of the CRNGDP EA (BLM 1998) for a discussion of potential impacts to the sub-surface aquifers within the MCRNGDPA. As indicated in Section 2.2.5.1 of this analysis document, BBC has elected to employ a semi-closed mud system in conjunction with drilling operations within the MCRNGDPA. Use of this type of mud system should further reduce the potential for contamination of near-surface fresh water aquifers within the impact area.

4.6.3.3 Comments Received in the Scoping Process

The CFO/BLM received a comment from A.V. Tharp, Jr., General Manager of Powder River Agri-Organics, LLC (PRAOL), who own approximately 6,000 deeded (fee) acres south of Waltman and east of Natrona County Road 212. In his comments, Mr. Tharp stated that they (PRAOL) had "...reason to believe that current drilling operations in the area have already impacted the water flow in the area of our farming operations. Further, we have reason to believe that continued and expanded drilling/exploration efforts in the area will have an even greater detrimental impact on our irrigation program". PRAOL is engaged in the business of operating an irrigated and dry land certified organic farm (see comments in Section 3.9 regarding an area of extensive rangeland vegetative treatment including tilling and probable dry land crop farming in an area directly south of U.S. Highway 20-26 and east of Natrona County Road 212).

Subsequent conversations between BLM and PRAOL personnel identified concerns regarding both surface and sub-surface waters within the general area as follows:

- Cooper Reservoir (N½SW¼ of Section 13, T35N, R87W) has not filled since the initiation of drilling activities in the CRU; and

- inter-aquifer communication in well bores within the CRU is resulting in depletion of near surface aquifers and impacting water wells being utilized by PRAOL for irrigation. No specific information was provided by PRAOL concerning the location/depths of their irrigation wells.

Considering the on-going drought and the distance from the project area to Cooper Reservoir (approximately 1.25 miles east of the extreme southeastern corner of the MCRNGDPA), it is highly unlikely that oil/gas exploration and development activities within the CRU or proposed activities within the MCRNGDPA would have any impact upon Cooper Reservoir whatsoever. As indicated in Section 3.61 of this document, the existing stock reservoirs within the MCRNGDPA have not held appreciable amounts of water except on an intermittent basis for some time - as indicated in Section 3.6.1 of the CRNGDP EA (BLM 1998). Furthermore, fresh water used in drilling/completion operations within the CRU and surrounding areas has and will continue to be obtained from a commercial water well owned and operated by Mel's Water Service, Permit Number UW-107461. There is no surface water being diverted for oil/gas operations anywhere within the overall analysis area by BBC.

Regarding the potential for communication within the well bores, each individual gas well is being cased to approximately 1,000 feet with cement circulated back to surface to isolate and protect any near-surface fresh water aquifers as indicated in Section 2.2.5.2 of the CRNGDP EA (BLM 1998). The setting of casing and cementing thereof is typically witnessed by one of BLM's Petroleum Engineering Technicians to ensure that these near-surface fresh water aquifers are protected. Considering the resource protection measures being incorporated into the drilling program and the relative distance of the MCRNGDPA from PRAOL's agricultural operations, it is highly unlikely that there is any downhole communication problems within the CRU that would cause contamination or depletion of these aquifers resulting in either a direct or indirect impact upon irrigation wells owned/operated by PRAOL.

4.6.4 The No Action Alternative

Under the No Action Alternative, there would be no additional impacts to either the surface or sub-surface hydrology of the overall project area beyond those levels previously analyzed and subsequently approved in the DR and FONSI for the CRNGDP EA (BLM 1998).

4.6.5 Mitigation and Monitoring

Please refer to the CRNGDP EA (BLM 1998) for both Applicant-Committed Practices (Section 2.3.5) and Suggested Mitigation Measures (Section 4.5.4) designed to reduce impacts to hydrologic resources within the overall analysis area. No additional mitigation is recommended.

4.6.6 Unavoidable Adverse Impacts

The short-term disturbance of approximately 159 acres of surface estate within the MCRNGDPA would result in minor amounts of erosion and sedimentation in area drainages that would not otherwise occur if the No Action Alternative were selected. Likewise, the diversion of water from sub-surface aquifers for use in drilling operations would represent an unavoidable impact directly

associated with operations as proposed in the MCRNGDPA. Use of this water for drilling operations would divert this amount of water from other potential uses within the area.

4.6.7 Cumulative Impacts

4.6.7.1 Surface Hydrology

Additional oil/gas exploration and development activity within the MCRNGDPA would not result in a significant impact upon either surface water or watersheds within the CIAA. In this regard, Table 4.15 presents a summary of the cumulative surface disturbance which would be expected within each individual watershed and would include the surface disturbance associated with the construction and subsequent drilling of the 35 wells remaining to be drilled under the original CRNGDP analysis (BLM 1998). As indicated above, implementation of the Proposed Action would not increase the total surface disturbance in any of the affected watersheds above the 10% threshold of significance identified in Section 4.5.2 of the CRNGDP EA (BLM 1998). Surface disturbing activities associated with the Proposed Action would increase total surface disturbance in the 20,515.45 acre CIAA by approximately 0.78% from 2.13% to 2.91%. An increase of less than 1% in overall surface disturbance within the CIAA can not be considered as a significant impact upon the affected watersheds.

As there are no permanent sources of surface water within the MCRNGDPA or the CIAA, we do not anticipate any cumulative impacts (either significant or otherwise) to surface waters or the surface hydrology of the CIAA resulting from surface disturbing activities associated with the Proposed Action.

4.6.7.2 Sub-Surface Hydrology

There are no activities (either currently ongoing or proposed) within the CIAA which would result in a significant cumulative impact to the ground water resources thereof.

4.7 RANGE MANAGEMENT

4.7.1 Introduction

Please refer to Section 4.6.1 of the CRNGDP EA (BLM 1998) for introductory remarks concerning potential range impacts within the MCRNGDPA. For the purpose of assessing impacts to range resources within the MCRNGDPA, acres of surface disturbance were converted to a reduction in AUMs based upon an average of 6.53 acres/AUM for the overall project area.

Table 4.15

Summary of Existing and Proposed Short-Term Surface Disturbance by Watershed [1]

Name of Watershed	Total Acres in Watershed	Existing Disturbance		Proposed Disturbance		Total Disturbance	
		Acres	Percent	Acres	Percent	Acres	Percent
Adobe	767.20	8.32	1.09	29.45	3.84	37.77	4.92
Poison Creek Tributary	1,779.57	2.22	0.13	0.00	0.00	2.22	0.13
Sand Draw	8,159.74	165.37	2.03	195.20	2.39	360.57	4.56
S. Fork Powder River	6,734.94	71.26	1.06	45.55	0.68	116.81	1.73
Upper Sand Draw	3,074.00	18.79	0.61	60.02	1.95	78.81	2.56
TOTALS	**20,515.45**	**265.96**	**1.30**	**330.22**	**1.61**	**596.18**	**2.91**

1 The proposed disturbance figures include 171.43 acres associated with the remaining 35 wells to be drilled under the CRNGDP EA (BLM 1998). Although these 35 wells have not yet been drilled, they still represent a cumulative impact as the CRNGDP EA analyzed the impacts of these wells and this surface disturbance would be in addition to both existing disturbance and future disturbance proposed in conjunction within the MCRNGDP.

4.7.2 Significance Criteria

Please refer to Section 4.6.2 of the CRNGDP EA (BLM 1998) for a discussion of the guidelines utilized in determining adverse impacts to range resources within the MCRNGDPA.

4.7.3 Direct and Indirect Impacts

4.7.3.1 Animal Unit Months (Native Vegetation/Forage)

The primary impact to range resources would be the initial loss of vegetation and vegetative (forage) production resulting from oil/gas exploration and development activity within the overall project area. As indicated in Section 2.2, routine activities associated with oil/gas exploration and development in the MCRNGDPA would result in approximately 158.79 acres of additional surface disturbance as follows:

- 117.18 acres associated with the construction of 42 additional well locations;
- 12.77 acres associated with new road construction;
- 27.84 acres associated with installation of the gas gathering system; and
- 1 acre associated with the expansion of the existing compressor site.

As indicated in Section 2.2, the LOP disturbance resulting from the Proposed Action would equal approximately 56.91 acres. Under these assumptions, the initial loss of approximately 158.79 acres of forage would result in the short-term loss of 24.32 AUM's, which represents approximately 3.89% of the total AUMs available on surface lands within the MCRNGDPA (4,081.74 acres ÷ 6.53 avg. AUM's = 625.08 AUM's available project-wide). Reclamation of those areas not required for ongoing production and operations would place approximately 101.88 acres back into forage production within 1 to 2 years following the initial disturbance. Reclamation of these areas would result in a long term (LOP) loss of 8.72 AUM's, which represents approximately 1.40% of the total AUM's available on surface lands within the overall MCRNGDPA.

In this regard, it should be noted that the bulk of the surface disturbance proposed within the MCRNGDPA will occur in the 2,528 acre core area identified in Figure 2.1, rather than being evenly dispersed throughout the entire 4,082 acre project area. Short-term disturbances resulting from project related activities in the core area would result in a 6.28% reduction in available AUM's, while long-term (LOP) disturbances would result in a 2.25% reduction in available AUM's.

Considering that short-term surface disturbances associated with project related activities would primarily occur over a five year period rather than all at once, the potential loss of forage on an annual basis within either the overall MCRNGDPA or the core area thereof would not exceed the 5% significance criteria established in Section 4.7.2 and therefore is not considered as a significant impact upon the range resource.

4.7.3.2 Invasive Non-Native Species (Noxious Weeds)

The invasion of newly disturbed areas by invasive non-native species (noxious weeds) would be a potential impact resulting from oil/gas exploration and development activity within the MCRNGDPA. As indicated in Section 3.7, several species of noxious weeds have become established on disturbed sites throughout Wyoming and the MCRNGDPA and include Canadian thistle, Russian knapweed, musk thistle, cheatgrass, and halogeton.

As presented in Section 4.6.3.1, surface disturbances associated with pad and road construction and pipeline installation would affect less than 4% of the combined surface acreage within the MCRNGDPA. Considering the somewhat limited amount of surface disturbance which would be associated with oil/gas exploration and development activities within the overall project area, and that weedy species would not be expected to invade all of the newly disturbed areas, these potentially increased levels of invasive non-native species would not be considered as a significant impact upon the range resource.

4.7.3.3 Existing Range Improvements

Please refer to Section 4.6.3.3 of the CRNGDP EA (BLM 1998) for a discussion of existing range improvements which could be affected by additional development activity within the MCRNGDPA.

4.7.4 The No Action Alternative

Under the No Action Alternative the loss of native vegetation (forage) and the concomitant reduction in available AUM's would not increase beyond the levels predicted in the CRNGDP EA (BLM 1998) as no additional development would occur in the overall project area. Likewise, the invasion of disturbed areas by non-native species would be restricted to areas disturbed in conjunction with activities approved in the DR and FONSI for the CRNGDP EA.

4.7.5 Mitigation and Monitoring

Please refer to the CRNGDP EA (BLM 1998) for both Applicant-Committed Practices (Section 2.3.6) and Suggested Mitigation Measures (Section 4.6.4) designed to reduce impacts to the range resource within the overall analysis area. No additional mitigation is recommended.

4.7.6 Unavoidable Adverse Impacts

The removal of existing native vegetation would result in an overall reduction in available AUM's and an increase in the occurrence of invasive non-native species within the project area.

4.7.7 Cumulative Impacts

For the purposes of this analysis, the cumulative impacts analysis area (CIAA) for the Range Management resource will be confined to the MCRNGDPA. Table 4.16 summarizes the loss of forage and AUM's within the 4,082 acre analysis area resulting from project related activities and shows that long-term (LOP) disturbance resulting from development activity within the MCRNGDPA would result in the loss of approximately 48.02 AUM's or 7.69% of the total AUM's available in the 4,082 acre project area.

As indicated in Section 4.7.3.1, most of the proposed development has/would occur within a 2,528 acre core area identified in Figure 2.1. Using the long-term disturbance figures presented above, forage loss in the core area of the MCRNGDPA would equal approximately 12.40% of the total AUM's available therein - assuming that all of the surface disturbance associated with the 35 wells remaining from the CRNDGP EA (BLM 1998) and all of the surface disturbance associated with the 42 wells proposed herein occurred within the core area. Thus, the 12.40% reduction of AUM's in the core area is a "worst-case" scenario. Based upon a projection of proposed exploration and development activity remaining/proposed within the MCRNGDPA, we believe that it is reasonable to assume that a minimum of 7 wells would be drilled on 40-acre densities outside of the core area, which would reduce the LOP disturbance within the core area by approximately 15.24 acres, with a concomitant decrease in the percentage of AUM's lost therein from 12.40% to 11.80% of the total estimated AUM's available within the core area.

Table 4.16

Summary of Cumulative Forage Loss within the MCRNGDPA [1]

Type of Disturbance	Short-term Disturbance	AUM's Lost	% of AUM's Available [2]	Long-Term Disturbance	AUM's Lost	% of AUM's Available [2]
Pre-Existing [1]	265.96	40.73	6.52	183.91	28.16	4.51
CRNGDP	171.43	26.25	4.20	72.84	11.16	1.79
MCRNGDP	158.79	24.32	3.89	56.81	8.70	1.39
TOTALS	**596.18**	**91.30**	**14.61**	**313.56**	**48.02**	**7.69**

1 Inclusive of existing disturbances attributable to two-track trails and Natrona County Road 212 (Tables 4.1 and 4.2)
2 Based upon a projected total of 625.08 AUM's available within the 4,082 acre MCRNGDPA

Because non-native invasive plant species would be controlled by BBC, it is unlikely that the Proposed Action would have any adverse cumulative impacts. However, any area(s) within the MCRNGDPA subjected to new surface disturbance would represent an opportunity for the establishment of these invasive non-native species.

4.8 SOILS

4.8.1 Introduction

Please refer to Section 4.7.1 of the CRNGDP EA (BLM 1998) for introductory remarks concerning potential impacts to the soil resource within the MCRNGDPA.

4.8.2 Significance Criteria

Please refer to Section 4.7.2 of the CRNGDP EA (BLM 1998) for a discussion of the guidelines utilized in determining adverse impacts to soil resources within the MCRNGDPA.

4.8.3 Direct and Indirect Impacts

Removal of native vegetation and disturbance of the underlying soil material as a result of surface disturbing activities associated with the Proposed Action would increase the potential for loss of the existing soil resource through erosion. This potential would increase proportionately as degree of slope increases. Overall, soils within the overall project area generally have an adequate amount of topsoil available to ensure satisfactory reclamation, assuming the use of proper techniques designed to control erosion and ensure revegetation of the reclaimed areas are utilized in the reclamation process and slopes throughout the project area are relatively gentle. Additional oil/gas exploration and development activity within the MCRNGDPA would result in the overall disturbance of

approximately 158.79 acres of the soil resource, or less than 3.89% of the total surface estate included within the proposed project area (see Section 4.6.3.1). If all project related activities were confined solely to the core are identified in Figure 2.1, 6.28% of the total surface estate would be impacted. In either case, this level of short-term soil disturbance would not be considered as a significant impact upon soil resources within the MCRNGDPA.

As indicated in Table 3.7, sensitive soils comprise approximately 842 acres or 21% of the surface estate within the MCRNGDPA. The bulk of these sensitive soils occur in the northeastern corner of the overall project area along Sand Draw and tributary drainages thereof (see Figure 3.2). These soils are primarily loams and clay loams derived from sodic shale which exhibit slow to very slow permeabilities, making them both susceptible to erosion resulting from runoff and poor candidates for reclamation. Fortunately, sensitive soils in the northern portion of the CRNGDPA typically occur on flat to gently sloping terrain, which would minimize the potential for erosion and sedimentation as a result of unchecked runoff and maximize reclamation efforts thereon. Approximately 71% (596 acres) of the sensitive soils within the MCRNGDPA lie outside of the core area proposed for intensive development within the MCRNGDPA. In those instances where surface disturbing activities are proposed on sensitive soils, special reclamation techniques identified as mitigation in Section 4.7.4 of the CRNGDP EA (BLM 1998) should be employed to prevent undue and unnecessary degradation of the environment.

A detailed analysis of projected soil erosion rates was conducted for the Cave Gulch-Bullfrog-Waltman Natural Gas Development Project (BLM 1997). The Modified Soil Loss Equation (MSLE) was used to calculate soil erosion. Erosion rates were determined based on general assumptions of conditions and operating procedures for the comparison of alternatives and these values are presented in Section 4.7.3 of the CRNGDP EA (BLM 1998). These calculations suggest that soil erosion within the MCRNGDPA could be reduced to non-significant levels with the application of Best Management Practices (BMP). A summary of the estimated erosion which would result from surface disturbing activities associated with/arising from additional oil/gas exploration and development activity within the MCRNGDPA is provided in Table 4.17.

Implementation of BMP for reclamation and erosion control would result in a 93% reduction in erosion in the first year and a 95% reduction in erosion by the fifth year, with implementation of BMP resulting in an overall 99% reduction in erosion after 5 years. These calculations suggest that soil erosion resulting from additional oil/gas exploration and development activity in the MCRNGDPA could be reduced to non-significant levels with the application of BMP for reclamation and stabilization of disturbed soils - particularly where sensitive soils are involved.

4.8.4 The No Action Alternative

Under the No Action Alternative there would be no project-related disturbance of soils and soils would remain in their current state.

Table 4.17

Estimated Erosion Rates With and Without Application of Best Management Practices in the Reclamation of Disturbed Soils within the MCRNGDPA

Project Facility	Acres	Year 1				Year 5			
		Without BMP		With BMP		Without BMP		With BMP	
		t/ac/yr	t/yr	t/ac/yr	t/yr	t/ac/yr	t/yr	t/ac/yr	t/yr
Well Pads	117.18	13.8	1,617.08	1.5	175.77	3.1	363.26	0.2	23.44
Access Roads	12.77	5.8	74.07	2.3	29.37	1.5	19.16	0.5	6.39
Gathering Pipelines	27.84	73.7	2,051.81	2.3	64.03	16.4	456.58	0.5	13.92
Compressor Station	1.00	----	-----	----	----	----	----	----	----
TOTALS	**158.79**	**----**	**3,742.96**	**----**	**269.17**	**----**	**839.00**	**----**	**43.75**

Legend: t/ac/yr = tons per acre per year
t/yr = tons per year

4.8.5 Mitigation and Monitoring

Please refer to the CRNGDP EA (BLM 1998) for both Applicant-Committed Practices (Section 2.3.7) and Suggested Mitigation Measures (Section 4.7.4) designed to reduce impacts to soil resources within the overall analysis area. No additional mitigation is recommended.

4.8.6 Unavoidable Adverse Impacts

Some very small amount of soils would move off disturbed areas; however, such movement would likely cease once the soils reach undisturbed areas.

4.8.7 Cumulative Impacts

As indicated in Sections 4.2 and 4.7.7, surface disturbances associated with the Proposed Action will result in the cumulative, short-term disturbance of approximately 596.18 acres of the soil resource within the MCRNGDPA, or approximately 14.61% of the overall project area, and approximately 2.91% of the CIAA as defined in Section 4.2.

Considering that oil/gas exploration activities within and directly adjacent to the CRU, and directly under the control of BBC, represent the primary surface disturbing activity within the CIAA, quantification of these existing and proposed impacts will present a fairly accurate view of impacts to the soil resource within the cumulative impact analysis area and will allow for a determination of significance. In this regard, the information presented in Table 4.17 has been expanded to include pre-existing oil/gas related surface disturbances within the CIAA, surface disturbances projected in

conjunction with the 35 wells remaining to be drilled under the CRNGDP EA (BLM 1998), and the 158.79 acres of short-term surface disturbance proposed in conjunction with the MCRNGDP (see Table 4.18). Existing disturbances identified in Table 4.1 for the existing county road (39.09 acres) and existing two-track trails (45.09 acres) were not considered in estimating cumulative erosion rates in Table 4.18 as no reclamation will be afforded to these pre-existing attributes.

Table 4.18

Estimated Cumulative Erosion Rates With and Without Application of BMP in the Reclamation of Disturbed Soils within the CIAA

Project Facility	Acres	Year 1				Year 5			
		Without BMP		With BMP		Without BMP		With BMP	
		t/ac/yr	t/yr	t/ac/yr	t/yr	t/ac/yr	t/yr	t/ac/yr	t/yr
Well Pads	290.37	13.8	4,007.11	1.5	435.56	3.1	900.15	0.2	58.07
Access Roads	122.53	5.8	710.67	2.3	281.82	1.5	183.80	0.5	61.27
Gathering Pipelines	96.10	73.7	7,082.57	2.3	221.03	16.4	1,576.04	0.5	48.05
Compressor Station	3.00	----	-----	----	----	----	----	----	----
TOTALS	**512.00**	**----**	**11,800.35**	**----**	**938.41**	**----**	**2,659.99**	**----**	**167.39**

Legend: t/ac/yr = tons per acre per year
t/yr = tons per year

Implementation of BMP for reclamation and erosion control within the CIAA would result in a 92% reduction in erosion in the first year and a 94% reduction in erosion by the fifth year, with implementation of BMP resulting in an overall 99% reduction in erosion after 5 years. These calculations suggest that cumulative soil erosion within the CIAA would not become significant with the addition of the 158.79 acres of short-term disturbance associated with the Proposed Action.

4.9 VISUAL RESOURCES

4.9.1 Introduction

Please refer to Section 4.8.1 of the CRNGDP EA (BLM 1998) for introductory remarks concerning potential impacts to the viewshed within and adjacent to the MCRNGDPA.

4.9.2 Significance Criteria

Please refer to Section 4.8.2 of the CRNGDP EA (BLM 1998) for a discussion of the guidelines utilized in determining adverse impacts to visual resources within the viewshed of the MCRNGDPA.

4.9.3 Direct and Indirect Impacts

4.9.3.1 Introduction

As indicated in Section 3.9 of the CRNGDPA EA (BLM 1998), the northern portion of the MCRNGDPA falls within a 3-mile buffer zone along U.S. Highway 20-26 which has been designated as a Class III VRM area. Within this VRM class, changes in the basic environmental (topographic) elements caused by additional oil/gas exploration and development may be evident in the characteristic landscape; however, the changes should remain subordinate to the visual strength of the existing (land) character. The southern portion of the project area has been designated as a Class IV VRM area. Under this VRM Class, changes may subordinate the original composition and character, but must reflect what could be a natural occurrence within the characteristic landscape (BLM 1982).

The following analysis of visual impacts will focus on a discussion of the visual landscape in terms of viewer proximity to intrusions related to additional oil/gas exploration and development from a foreground, middleground, and/or background perspective. Please refer to Section 4.8.3.1 of the CRNGDP EA (BLM 1998) for a definition of the terms *foreground*, *middleground* and *background*.

4.9.3.2 Impacts to Travelers Along U.S. Highway 20-26

The northern boundary of the MCRNGDPA (see Figure 1.1) is located more than one-half mile south of U.S. Highway 20-26; consequently, oil/gas exploration and development activities within the project area would not affect the foreground perspective of travelers along said highway.
From a middleground perspective, activities within the MRNGDPA would be almost completely screened from viewers by existing topography on that portion of the highway located to the west of the community of Waltman. The most notable exception would be the derrick(s) of both drilling and completion rigs, which would be partially, if not completely, visible to these travelers for the duration of drilling and completion operations. However, this impact would be short-term in nature and would not result in a permanent or long-term alteration in the existing landscape. Activities within the MCRNGDPA would be most notable to those motorists east of the community of Waltman who are traveling west on U.S. Highway 20-26.

Considering the level of activity proposed in the MCRNGDPA, and the fact that exploration and development activities at a reduced well density are proposed in the northern portion of the project area, modifications to the landscape created as a result of activities associated with the proposed action would be primarily visible to viewers traveling west along U.S. Highway 20-26 from both a middleground and background perspective. From this perspective, the overall landscape is dominated topographically by the Rattlesnake Hills and Beaver Rim, which would diminish the visual impact of surface disturbing activities within the MCRNGDPA. Moreover, the foreground perspective along U.S. Highway 20-26 in this area is dominated by existing facilities along both sides of the highway [see Section 3.9 of the CRNGDP EA (BLM 1998) and Section 3.9 of this document]. These existing facilities would tend to distract the viewer, thereby minimizing the

impact of disturbances within the MCRNGDPA as these disturbances would only be visible in the middleground and background settings, whereas the visual intrusions around Waltman are directly in the foreground, are all within one-half mile or less of the highway, and combine to appreciably diminish the aesthetic experience of the viewshed in this particular area.

Short-term disturbances associated with development activities within that portion of the MCRNGDPA included within the Class III VRM corridor along U.S. Highway 20-26 will clearly be evident and, depending upon the level of activity ultimately proposed within this corridor, may well dominate the viewshed in the short-term while drilling and completion operations are underway. Removal of drilling/completion rigs and successful reclamation of the disturbed areas within the corridor would serve to reduce the long-term visual impact(s) of existing wells, but may not reduce the visual contrast (form and texture of the landscape) to a level that is subordinate to the visual strength of the existing, natural landscape. However, the existence of unrelated, strong visual intrusions within the Class III corridor referenced above (e.g., junk yard at Waltman, man camp directly south of Waltman, overhead powerlines, agricultural operations, etc.), when combined with the relatively short overall viewing period to motorists traveling west along the highway, would serve to minimize the visual intrusions resulting from activities proposed in conjunction with the proposed MCRNGDP. Moreover, mitigation measures carried over from the CRNGDP EA (BLM 1998) would further minimize the visual impacts of additional oil/gas exploration and development activity to viewers both from the middleground and background perspective.

The MCRNGDP would not violate existing visual resource management direction for the area or produce contrasts beyond the degree allowed for in the stated VRM guidelines from either a foreground, middleground, or background perspective.

4.9.3.3 Impacts to Travelers Along Natrona County Road 212

Please refer to Section 4.8.3.3 of the CRNGDP EA (BLM 1998) for a discussion of the visual impacts of the proposed project upon motorists traveling along Natrona County Road (NCR) 212. We do not envision any significant changes to this discussion or the impacts disclosed therein resulting from this modified project proposal. Consequently, considering the magnitude and extent of pre-existing visual intrusions along NCR 212, implementation of the Proposed Action would not violate existing visual resource management direction for the area or produce contrasts beyond the degree allowed for in the stated VRM guidelines.

4.9.4 The No Action Alternative

Under the No Action Alternative there would be no project-related degradation of the viewshed resulting from the proposed action.

4.9.5 Mitigation and Monitoring

Please refer to the CRNGDP EA (BLM 1998) for Suggested Mitigation Measures (Section 4.8.4) designed to reduce impacts to the viewshed within the overall analysis area. No additional mitigation is required.

4.9.6 Unavoidable Adverse Impacts

Implementation of the proposed action will result in impacts to the viewshed that are unavoidable. These impacts would include a change in the texture of the landscape primarily from a middleground perspective, but from a background perspective as well.

4.9.7 Cumulative Impacts

As indicated in Section 3.9, the viewshed(s) along both U.S. Highway 20-26 and Natrona County Road 212 have been substantially altered by previous human activity in this area. While implementation of the Proposed Action would increase the overall number of facilities within the viewshed, the cumulative impact of these facilities upon the landscape would remain consistent with the stated VRM designation for the area.

4.10 WILDLIFE

4.10.1 Introduction

Please refer to Section 4.9.1 of the CRNGDP EA (BLM 1998) for introductory remarks concerning potential impacts to wildlife populations within and adjacent to the MCRNGDPA.

4.10.2 Significance Criteria

Please refer to Section 4.9.2 of the CRNGDP EA (BLM 1998) for a discussion of the guidelines utilized in determining adverse impacts to wildlife within the MCRNGDPA.

4.10.3 Direct and Indirect Impacts

Please refer to Sections 4.9.3.1 and 4.9.3.2 of the CRNGDP EA (BLM 1998) for introductory remarks (Section 4.9.3.1) concerning the impacts upon wildlife populations within the overall project area including a definition of both short-term and long-term habitat loss, as well as a general discussion of habitat loss and displacement (Section 4.9.3.2) resulting from proposed project activities within the MCRNGDPA.

4.10.3.1 Introduction

Activities associated with additional development activity within the MCRNGDPA would temporarily eliminate approximately 158.79 acres of wildlife habitat, consisting mostly of shrubs, grasses and forbs. This would result in a proportionate reduction in the amount of herbaceous and browse forage available to herbivorous species such as antelope and mule deer, as well as a reduction in nesting, feeding and security habitat for both passerine (migratory) birds and game birds (e.g., sage grouse), as well as those smaller vertebrate species that may inhabit the affected areas.

4.10.3.2 Habitat Loss and Displacement

Disturbances resulting from well pad, access road, and pipeline construction associated with additional exploration and development activity within the MCRNGDPA would result in the loss of smaller, less mobile species of wildlife, such as small mammals and reptiles until such time as reclamation has been accomplished. However, considering the relatively small geographic area of disturbance, the actual magnitude of this loss and any potential displacement of these species would be considered as minimal. The displacement of more mobile species to adjacent undisturbed habitats, while difficult to predict, would be relatively short-term in nature given the overall duration of intensive activities associated with the proposed project. In many cases, alteration of the existing vegetative composition resulting from the reclamation of previously disturbed areas would increase species diversity, particularly for migratory (passerine) birds as climax stands of vegetation are removed and plant/shrub succession begins anew. Plant succession in the western United States has been short-circuited through decades of fire suppression - construction and reclamation activities associated with the MCRNGDP would revitalize plant succession on lands within the overall project area, replacing often decadent stands of climax vegetation with new growth thereby creating micro-habitats within the area for use by species not dependent upon the climax successional stage of vegetative development. This process would be most apparent once the wells within the MCRNGDPA have been plugged and abandoned and final reclamation occurs.

Please refer to Section 4.9.3.2 if the CRNGDP EA (BLM 1998) for an in-depth discussion of the effects of human intrusion upon big game animals within the MCRNGDPA.

4.10.3.3 Economically Important Species

As indicated in Section 4.9.3.3 of the CRNGDP EA (BLM 1998), the project area includes year-round habitat for several economically important game species including pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), and sage grouse (*Centrocercus urophasianus*). While the project area includes year-round habitat for the above species, crucial habitat(s) for these species are not known to occur within the overall project area. Consequently the short-term (initial) loss of 158.79 acres of habitat (3.89% of the MCRNGDPA) and the potential long-term loss of 56.91 unreclaimed acres of habitat (1.39% of the MCRNGDPA) is not viewed as a significant impact upon these species when one considers the relative availability and abundance of adjacent, undisturbed habitat. Moreover, considering that no crucial wildlife habitat(s) will be

affected by implementation of the Proposed Action, the potential for long-term displacement and/or significant individual losses attributable to human activities within the MCRNGDPA are considered to be insignificant. The above determination has been made despite the fact that population numbers for both antelope and mule deer in the Beaver Rim Herd Unit and mule deer in the Rattlesnake Herd Unit are currently below objective levels as indicated in Table 3.8.

Likewise, activities associated with oil/gas development activity in the overall project area would result in the loss of smaller, less mobile species of wildlife, such as small mammals and reptiles, from the area(s) of disturbance until such time as these activities ceased and site-specific reclamation had been achieved. Considering the relatively small percentage of total surface disturbance proposed within the 4,082 acre project area, the actual magnitude of this loss and subsequent displacement would be minimal. The displacement of more mobile species to adjacent, undisturbed habitats, while difficult to predict, would be relatively short-term in nature given the overall duration of additional development activities associated with the Proposed Action.

4.10.3.4 Raptor Species

As indicated in Section 3.10.4, 11 historic raptor nests are now known to exist within or directly adjacent to the MCRNGDPA. The intensive development activity that has occurred in the CRNGDPA since 1998 appears to have displaced the pair of ferruginous hawks (*Buteo regalis*) which had previously utilized nest numbers 64/65 and 169/170 within the core development area. It is likely that this pair of hawks has now taken up residence at the CRU #1 ANS, which appears to have been active for the past two years, and which is removed from the oil/gas development activity currently proposed within the Cooper Reservoir area. Based upon recent nesting inventories conducted in both the Cooper Reservoir and Cave Gulch areas, it is unlikely that nesting activity by ferruginous hawks will resume at any of these historic nests in the foreseeable future.

In this regard, the CRNGDP EA (BLM 1998) recommended the placement of two (2) ANS at specific locations within or adjacent to the CRNGDPA as mitigation for oil/gas exploration and development activities proposed therein. While Intoil ultimately installed three (3) ANS, none of these structures were placed in accordance with guidance contained within the subject EA document. Raptor nesting inventories conducted in 2003 would indicate that only one of these three structures is currently being utilized. As a consequence, mitigation will be recommended below to move the two ANS not being currently used to strategic locations adjacent to the MCRNGDPA, yet removed from the disturbances associated with project activities in the hopes of encouraging the use of these structures for future nesting activity in the general area.

4.10.3.5 Threatened, Endangered and Candidate Species

- **Bald eagle** *(Haliaeetus leucocephalus)* - Status: Threatened.

  The MCRNGDPA does not contain suitable roosting/perching habitat, concentrated feeding areas (perennial streams), or other special (nesting) habitats which might result in increased eagle

activity therein. While the general area may be opportunistically used by bald eagles in conjunction with wide-ranging foraging activities, the level of human activity expected to occur within the project area would likely discourage eagle use. Consequently, we would not expect any potentially significant impacts to occur to bald eagle populations as a result of activities associated with the MCRNGDP.

Determination: Likely to affect, but will not adversely affect.

- **Black-footed ferret** *(Mustela nigripes)* - Status: Endangered.

It is well documented that black-footed ferrets depend primarily upon prairie dogs *(Cynomys ssp.)* for food and upon prairie dog burrows for shelter (Hillman and Clark 1980, Fagerstone 1987). Repeated inventories within the MCRNGDPA (both prior and subsequent to the completion of the CRNGDP EA) have failed to identify any prairie dog colonies within the analysis area. Considering the lack of both an available food source and suitable habitat for black-footed ferrets within the MCRNGDPA, impacts to this species are not anticipated.

Determination: No effect.

- **Preble's meadow jumping mouse** *(Zapus hudsonius preblei)* - Status: Threatened.

The MCRNGDPA is well outside of the limits of known habitat for the Preble's Meadow jumping mouse. Considering that there are there are no perennial or intermittent streams with associated riparian habitats within the MCRNGDPA and the project area is not within the area of expected occurrence thereof, we do not expect any impacts to this species.

Determination: No effect.

- **Ute ladies'-tresses** *(Spiranthes diluvialis)* - Status: Threatened.

As indicated in Section 3.10.3.1, the MCRNGDPA is outside of the expected area of occurrence for Ute ladies'-tresses. Considering the general lack of suitable habitat within the overall project area (seasonally moist soils and wet meadows associated with riparian habitats), we do not expect any impacts to this species.

Determination: No effect.

- **Colorado butterfly plant** *(Gaura neomexicana* spp. *coloradensis)* - Status: Threatened.

As indicated in Section 3.10.3.1, the MCRNGDPA is outside of the expected area of occurrence for the Colorado butterfly plant. Considering the general lack of suitable habitat within the overall project area (perennial or intermittent streams with associated sub-irrigated alluvial soils or floodplains), we do not expect any impacts to this species.

Determination: No effect.

- **Blowout penstemon** *(Penstemon haydenii)* - Status: Endangered.

  The only known populations of blowout penstemon in Wyoming are located at the eastern end of the Ferris sand dune system at the head of Schoolhouse Creek and the west side of Bradley Peak in Carbon County. Considering that there are no active sand dunes within the MCRNGDPA, impacts to blowout penstemon are not expected due to a lack of suitable habitat.

  Determination: No effect.

- **North Platte River Species**

  Threatened and endangered species which may occur in the downstream riverine habitats of the North Platte River include:

  1) Interior least tern *(Sterna antillarum)* - Status: Endangered;

  2) Piping plover *(Charadrium melodus)* - Status: Threatened;

  3) Pallid sturgeon *(Scaphirhynchus albus)* - Status: Endangered;

  4) Eskimo curlew *(Numenius borealis)* - Status: Endangered; and

  5) Western prairie fringed orchid *(Platanthera praeclara)* - Status: Threatened.

  As indicated in Section 2.2.5.1, water to be used in drilling operations would be obtained from commercial water wells directly adjacent to the project area which produce water from aquifers not connected to the North Platte River system. As there will be no depletions to the North Platte River, impacts to the above-named species will not occur.

  Determination: No effect.

- **Black-tailed prairie dog** *(Cynomys ludovicianus)* - Status: Proposed for Listing.

  As indicated in Section 4.10.3.5.1 (above), there are no known prairie dog towns within the MCRNGDPA. Consequently, we do not anticipate any impacts to black-tailed prairie dogs as a result of project-related activities.

  Determination: No effect.

4.10.3.6 Special Status Species

As indicated in Section 3.10.4, both swift fox *(Vulpes nigripes)* and mountain plover (*Charadrius montanus*) have been removed from further consideration as T/E/C species by the USFWS; however, BLM considers these species to be "sensitive" and management decisions should consider impacts

thereto. A review of the records maintained by the Wyoming Natural Diversity Database in May, 2003 failed to identify any recorded sightings of either swift fox or mountain plover within Townships 35 and 36 North, Range 87 West. Please refer to Section 3.10.4 for additional information in this regard.

4.10.3.7 Migratory and Non-Migratory Birds

Three of the species identified in Table 3.9 including ferruginous hawk, greater sage grouse, and mountain plover have been discussed elsewhere in Section 4.10 and will not be discussed further herein.

As indicated in Section 2.1, surface disturbing activities associated with the Proposed Action would result in the short-term disturbance of 158.79 acres of shrub-steppe and shortgrass prairie habitat which would provide a source of food, security cover and nesting habitat for many of the species listed in Table 3.9. Approximately 64% of this disturbance would be reclaimed within five years of initial disturbance resulting in a long-term (LOP) loss of 56.91 acres of habitat. Reclamation of those non-working areas disturbed in conjunction with additional development within the MCRNGDPA would introduce some degree of vegetative (e.g., habitat) diversity into the area as discussed in Section 4.10.3.2 which would benefit those species dependant upon the shortgrass prairie habitat type.

Considering the relatively small percentage of total surface disturbance proposed within the 4,082 acre project area, the actual magnitude of direct habitat loss and subsequent displacement would be minimal. The displacement of bird species to adjacent, undisturbed habitats, while difficult to predict, would be relatively short-term in nature given the overall duration of additional development activities associated with the Proposed Action.

4.10.4 The No Action Alternative

Under the No Action Alternative impacts to wildlife and raptor populations in the area would continue at existing levels, and would be affected primarily by weather, grazing, and natural tendency towards a climax stage.

4.10.5 Mitigation and Monitoring

Please refer to the CRNGDP EA (BLM 1998) for both Applicant-Committed Practices (Section 2.3.9) and Suggested Mitigation Measures (Section 4.9.5) designed to reduce impacts to wildlife populations within the overall analysis area. As indicated in Section 4.10.3.4, we recommend additional mitigation as follows regarding the relocation of Artificial Nesting Structures CRU #2 and CRU #3:

- Relocate the CR #2 ANS to federal surface estate at a mutually acceptable location in the S½NW¼ of Section 14 in Township 35 North, Range 87 West. The particular location ultimately selected would be east of the current MCRNGDPA boundary, while remaining on federal oil/gas lease #WYW-128769. As the proposed ANS site is outside of the modified project area boundary, we consider the likelihood of oil/gas exploration/development within approximately 0.25 miles of the ANS to be unlikely.

- Relocate the CR #3 ANS to federal surface estate in the SW¼NE¼ of Section 32, Township 36 North, Range 87 West. This particular location is approximately 0.25 miles west of the current MCRNGDPA boundary, yet remains on federal oil/gas lease #WYW-141678. As the proposed ANS site is outside of the modified project area boundary, we consider the likelihood of oil/gas exploration/development within approximately 0.25 miles of the ANS to be unlikely.

Implementation of the following Best Management Practices (BMP) developed by Wyoming PIF (Nicholoff 2003) would reduce the impacts of surface disturbing activities within the MCRNGDPA on migratory and non-migratory bird species.

- Relocate surface disturbing activities to avoid large sagebrush stands to the greatest extent possible in order to prevent habitat fragmentation within the shrub-steppe habitat type.

- Where possible, restore or rehabilitate degraded and disturbed sites to native plant communities.

- Maintain remaining biological soil crust communities by minimizing sources of soil disturbance such as off-road vehicle use.

- In large disturbed areas, sagebrush and perennial grasses may need to be reseeded to shorten the recovery time and prevent dominance by non-native grasses and forbs.

4.10.6 Unavoidable Adverse Impacts

Unavoidable adverse impacts would include both the short-term and long-term (LOP) loss of habitat associated with surface disturbing activities resulting from implementation of the Proposed Action. In addition, there may be an indeterminate loss of smaller, less mobile species and the displacement of larger, more mobile species as a result of project related activities.

4.10.7 Cumulative Impacts

Surface disturbing activities within the MCRNGDPA resulting from both pre-existing activities within the overall MCRNGDPA have already accounted for approximately 265.96 acres of short-term habitat loss (see Table 4.1). Implementation of the current MCRNGDP proposal and subsequent drilling of the 35 wells remaining under the original CRNGDP EA (BLM 1998) would add an additional 329.32 acres (158.79 and 171.43 acres, respectively) of short-term habitat loss (see

Section 2.2 and Table 4.3), resulting in a cumulative loss of 596.18 acres of habitat. As indicated in Section 4.7.7, we would expect the bulk of this direct habitat loss to occur within the 2,528 acre core area depicted in Figure 2.1, resulting in a direct loss of 23.6% of available habitat within the core area. Considering the effects of habitat fragmentation and resultant displacement of both big game and sensitive wildlife species from this area, implementation of the Proposed Action will undoubtedly render the overall core area ineffective as habitat for these particular species - particularly during the initial phase of operations when human activity would be greatest (e.g., construction, drilling, and completion operations). As the field matures and levels of human intrusion subside, these effects may be lessened somewhat; however, it is unlikely that effects of habitat fragmentation and displacement will subside to the point where pre-disturbance levels of wildlife use are attained.

4.10.7.1 Economically Important Species

Section 4.13.9.1 of the CRNGDP EA (BLM 1998) contains a fairly comprehensive discussion of the cumulative effects of activities associated with the CRNGDP upon economically important big game species including both antelope and mule deer. As indicated in this particular analysis, the Rattlesnake and Beaver Rim Antelope Herd Units encompass approximately 3,538,560 acres in Natrona and Fremont Counties (656,000 and 2,882,560 acres respectively). Likewise, the combined Rattlesnake and Beaver Rim Mule Deer Herd Units encompass approximately 1,693,440 acres in Natrona and Fremont Counties (788,480 and 904,960 acres respectively) (BLM 1997). The cumulative, long-term (LOP) loss of 313.56 post-reclamation acres (see Table 4.4) in the combined herd units for antelope and mule deer would represent less than 0.01% of the total antelope habitat and less than 0.02% of the total mule deer habitat. It should be noted that the cumulative, long-term (LOP) disturbance has decreased approximately 20% (81 acres) from the CRNGDP analysis in 1998.

Direct habitat loss on an individual herd unit basis (assuming that all disturbance occurred in a single herd unit) would represent less than 0.05% and 0.01% of antelope and mule deer habitat in the respective Rattlesnake Herd Unit and approximately 0.04% for both antelope and mule deer habitat in the respective Beaver Rim Herd Unit. Considering that no crucial habitat(s) would be impacted by additional development in the MCRNGDPA, this direct habitat loss is insignificant.

Indirect habitat loss as a result of fragmentation and human intrusion within the MCRNGDPA would result in the probable loss of habitat effectiveness within the entire 2,528 acre core area and would also probably result in diminished habitat effectiveness within the remaining portions of the MCRNGDPA as well when one considers that the vast majority of the "non-core" area is less than one-half mile from the core area boundary (see Figure 2.1). If we consider the entire 4,082 acre MCRNGDPA as unsuitable habitat for big game species as a result of project related activities, the resultant indirect habitat loss would still only equal 0.12% and 0.24% of available habitat for antelope and mule deer within the combined Rattlesnake and Beaver Rim Herd Units. Indirect habitat loss on an individual herd unit basis (assuming that all disturbance occurred in a single herd unit) would represent less than 1% of antelope and mule deer in either herd unit (0.6% and 0.5% respectively in the Rattlesnake Herd Unit, 0.1% and 0.5% respectively in the Beaver Rim Herd Unit).

Again, considering that no crucial habitat(s) would be impacted by additional development in the MCRNGDPA, this indirect habitat loss is also considered as insignificant.

Likewise, as there is no evidence that sage grouse nest or strut within or directly adjacent to (within a two mile radius of) the overall project area, cumulative impacts to this economically important game species are not anticipated.

4.10.7.2 Raptor Species

Please refer to Section 4.13.9.2 of the CRNGDP EA (BLM 1998) for a thorough discussion of impacts to raptors and raptor nesting activity within the overall analysis area.

4.10.7.3 Migratory and Non-Migratory Birds

Direct impacts to migratory and non-migratory birds within the MCRNGDPA would include short-term loss of approximately 596.18 acres of habitat and long-term (LOP) habitat loss of approximately 313.56 acres of habitat. Indirect losses would primarily involve the fragmentation of existing habitat within the 4,082 acre MCRNGDPA. As there are no reliable population data for migratory and/or non-migratory birds within the area, and considering that both direct and indirect impacts upon these bird populations are poorly understood, it would be difficult to accurately predict the cumulative impact of the project thereon. Considering that the additional surface disturbance resulting from project implementation would only account for 15% and 8% respectively of the short-term and long-term (LOP) cumulative surface disturbance (respectively) within the MCRNGDPA, the potential for adverse impacts to the migratory and non-migratory bird species identified in Table 3.9 is diminished proportionately and is not considered to be a significant impact to these particular bird species.

4.11 SHORT-TERM USE OF THE ENVIRONMENT VERSUS LONG-TERM PRODUCTIVITY

Short-term use of the environment during the life of the project would not detract from long-term productivity of the area. Even during the life of the project, only the small areas from which vegetation is removed would be unavailable for grazing and wildlife habitat. Once the project is completed and disturbed areas are reclaimed the same resources that were available prior to the project would be available once again, with the exception of the hydrocarbons that were extracted from the subsurface. While it may ultimately take up to 25 years to regenerate a mature, climax stand of shrubs (e.g., sagebrush) comparable to shrub populations present prior to project initiation, successful and ongoing reclamation of surface disturbance within the overall project area would introduce vegetative communities which would support wildlife and livestock grazing.

4.12 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Please refer to Section 4.11 of the CRNGDP EA (BLM 1998) for a thorough discussion of Irreversible and Irretrievable Commitment of Resources.

4.13 RESIDUAL IMPACTS

The term "residual impacts" refers to those impacts remaining after all reasonable mitigation has been applied. The disturbance of approximately 158.79 acres of soil and related wildlife habitat resulting from construction associated with additional oil/gas exploration and development activity within the MCRNGDPA would constitute a short-term impact, considering that 64% of this initial disturbance (101.88 acres) would be reclaimed within two years following initial disturbance. The remaining 56.91 acres of initial surface disturbance would not be reclaimed until termination of the project and would, therefore, represent a long-term (or residual) impact to the affected resources. This long-term impact to both the soil and related resources would also represent a residual loss of both domestic livestock and wildlife forage, as well as associated wildlife habitat for a comparable period of time.

Construction of roads and drill pads, in conjunction with the installation of permanent production facilities (as applicable) on selected well locations would result in a long-term (or residual) impact to the visual resource of the area. Final abandonment of the project, plugging of each individual well, reclamation and revegetation of the remaining 56.91 acres of disturbed surface area and cessation of project related human intrusions into the area would effectively eliminate all of the above-referenced residual impacts associated with this project.

5.0 MITIGATION SUMMARY

5.1 INTRODUCTION

Applicable mitigation measures identified in this chapter summarize specific measures discussed in Chapters 2.0 and 4.0 of the CRNGDP EA (BLM 1998) and Chapter 4.0 of this document. These measures were developed in response to impacts identified during the course of both analyses and describe how project activities would be implemented to assure compliance with resource management goals identified in the Platte River Resource Area *Resource Management Plan* and the *Oil and Gas Programmatic Environmental Assessment*, applicable lease stipulations, and any additional resource limitations which may have been identified during interdisciplinary team analyses. Mitigation and monitoring measures identified herein may be modified or selectively applied by the Authorized Officer (AO) on the basis of new information or the need to further minimize impacts. In this regard, the Field Manager for the Casper Field Office, Bureau of Land Management would be the AO for this project and would be responsible for all activities associated with the additional oil/gas exploration and development activity within the MCRNGDPA. Final mitigation and monitoring requirements would be determined by the AO after recommendations are received from the appropriate Resource Specialists.

5.2 ADMINISTRATIVE REQUIREMENTS

1. The Operator, as well as their contractors and subcontractors, would conduct operations in full compliance with all applicable Federal and State laws and regulations, and within the guidelines specified in the approved APD's, Sundry Notices, and/or Right-of-Way Grants.

2. All applicable lease stipulations would also be adhered to during the course of additional oil/gas exploration and development activity in the MCRNGDPA, unless the AO approves a specific exception in writing. Exceptions would only be granted in those cases where adherence to lease stipulations is either not possible or not necessary, and the action is deemed acceptable with proper mitigation.

5.3 APPLICANT-COMMITTED ENVIRONMENTAL PROTECTION MEASURES

Following is a summary of those mitigation measures which were incorporated directly into the project design by the Operator and enumerated in Chapter 2.0 of the CRNGDP EA (BLM 1998).

5.3.1 Preconstruction Planning and Design Measures

1. The Operator and BLM would conduct on-site inspections of each proposed disturbance site (e.g., well sites, roads, pipelines, etc.) to develop site-specific recommendations and mitigation measures.

2. Roads required for the proposed project would be constructed in accordance with BLM Manual 9113 standards (BLM 1985b, 1991).

3. The Operator would prepare and submit individual drill site design plans to the BLM for approval prior to initiation of construction. These plans would show the layout of the well location over the existing topography, dimensions of the well pad, volumes and cross-sections of proposed cuts and/or fills, location and dimensions of reserve and flare pits, and access road design.

4. Prior to construction, the Operator would submit a Surface Use Plan or a Plan of Development for each well site, pipeline segment, and access road project. These plans would enumerate the measures and techniques to be used for erosion control, revegetation, and restoration, and would provide specific detail on project administration, time frames, responsible parties, objectives, characteristics of site pre-disturbance conditions, topsoil removal, storage and handling, runoff and erosion control, seed bed preparation, recommended seed mixtures, seed application, fertilization, mulching, site protection, weed and livestock or other herbivore control, and monitoring and maintenance.

5. The Operator would slope stake construction activities on steep and/or unstable slopes when required by the BLM, and would receive approval by the BLM prior to initiating construction.

6. The Operator would identify aggregate and other road material sources for use in drill site and road construction. The appropriate surface management agency would approve these sources, including timing for extraction, prior to use.

5.3.2 Air Quality

1. The Operator would adhere to all applicable Wyoming Ambient Air Quality Standards (WAAQS) and Regulations including those for fugitive dust suppression presented in Wyoming Air Quality Regulations on Fugitive Dust Suppression Section 14(F) (WDEQ 1995). If a fugitive dust problem is identified by the BLM as a result of this project, immediate abatement measures (e.g., applications of water or chemical dust suppressants to disturbed surfaces) would be initiated in consultation with the BLM and WDEQ to avoid exceeding ambient air quality standards.

2. The Operator would not allow open burning of garbage or refuse at well locations or other facilities in the MCRNGDPA. Any other open burning would be conducted under the permitting provisions of Section 13 of the Wyoming Air Quality Standards and Regulations (WDEQ 1995).

5.3.3 Cultural Resources

1. The Operator would follow the Section 106 compliance process prior to any surface disturbing activity.

2. The Operator would halt construction activities if previously undetected cultural resource materials are discovered during construction. The BLM would be immediately notified, and consultation with the SHPO and Advisory Council would be initiated, as appropriate, to determine proper mitigation measures pursuant to 36 CFR 800.11. Construction would not resume until a Notice to Proceed is issued by the BLM.

5.3.4 Geology and Minerals

1. BLM/WOGCC casing and cementing criteria would be followed to protect all subsurface mineral and water-bearing zones.

5.3.5 Hydrology

1. Construction at drainage crossings would be limited to periods of low-or no-flow.

2. The Operator would follow all practical alternatives and designs to limit disturbance within drainage channels, including ephemeral and intermittent draws.

3. A 100-foot wide buffer area of undisturbed land would be left between construction sites and ephemeral and intermittent channels.

4. Channel crossings by pipelines would be constructed so that the pipe is buried at least 4 feet below the channel bottom.

5. Channel crossings by roads and pipelines would be constructed perpendicular to flow.

6. Disturbed channel beds would be reshaped to their approximate original configuration.

7. All reserve pits would be constructed with a minimum of one-half (1/2) the total depth of the pit below the original ground surface on the lowest point within the pit.

8. All reserve pits would be designed with a minimum of 1 foot of freeboard.

9. The discharge of all water (stormwater, produced water, etc.) would be done in conformance with WDEQ-WQD, BLM, and WOGCC rules and regulations (WDEQ 1990; BLM Onshore Oil and Gas Order No. 7).

10. The Operator would prepare SWPPPs for all disturbances as required by WDEQ NPDES permit requirements. In some instances, SWPPPs for groups of wells would be developed.

11. The Operator would implement SPCC Plans if liquid petroleum products or other hazardous materials are stored on-site in sufficient quantities, in accordance with 40 CFR 112.

5.3.6 Range Management

1. Removal or disturbance of vegetation would be kept to a minimum through construction site management (e.g., by utilizing previously disturbed areas, using existing ROW's, designating limited equipment/material storage yards and staging areas, scalping, etc.) where and as feasible.

2. The Operator would seed and stabilize disturbed areas in accordance with management direction from the appropriate surface management agency or private surface owner, as appropriate.

3. The Operator would monitor for noxious weeds and apply BLM-approved weed control techniques (e.g., soil sterilants, biological controls, etc.), as necessary with the prior written approval of the Authorized Officer, BLM.

5.3.7 Soils

1. Prior to commencement of construction activities, all available topsoil (up to a maximum of 12 inches) would be stripped from areas of cut, fill, and subsoil storage, and stockpiled for future reclamation operations.

2. The Operator would keep the area of disturbance to the minimum necessary for drilling and subsequent production activities, while providing for worker safety on site.

3. The Operator would restrict off-road vehicle activity by employees and contract workers.

4. The Operator would restrict project-related travel and reclamation activities during periods when soils are saturated and excessive rutting could occur.

5. Where feasible, the Operator would locate pipelines immediately adjacent to roads or other pipelines to avoid creating separate areas of disturbance.

6. The Operator would minimize construction activities in areas of steep slopes and apply special slope stabilizing structures and techniques (e.g., mulch, matting, etc.) if construction cannot be avoided in these areas.

7. The Operator would not conduct construction and/or reclamation activities using frozen or saturated soils, unless an adequate plan is submitted and approved by the BLM that demonstrates potential impacts would be mitigated.

8. Runoff and erosion control measures such as water bars, berms, and interceptor ditches would be installed as necessary or required by the Authorized Officer.

9. All drainage crossing structures would be designed to carry at least a 10-year storm event, pursuant to guidelines contained in BLM Manual, Section 9113 (BLM 1985, 1991a).

10. Upon completion of drilling operations and/or production facility installation, the Operators would restore those areas disturbed in conjunction therewith to the approximate original contours.

11. The Operator would replace topsoil or suitable growth materials over all disturbed surfaces prior to reseeding.

12. The Operator would reseed all disturbed sites as soon as practical following disturbance.

5.3.8 Transportation

1. Existing roads and trails would be utilized to the greatest extent possible for access top proposed well locations and these trails would be upgraded as necessary to comply with BLM road construction specifications.

2. All roads not required for routine operation and maintenance of producing wells or ancillary facilities would be reclaimed as directed by the BLM, State Land Board, or private landowner. These reclaimed roads would be permanently blocked, recontoured, reclaimed, and revegetated by the Operator, as would disturbed areas associated with permanently plugged and abandoned wells.

3. The Operator would comply with existing federal, state, and county requirements and restrictions to protect road networks and the traveling public.

4. Special arrangements would be made with the WDOT to transport oversize loads to the project area. Otherwise, load limits would be observed at all times to prevent damage to existing road surfaces.

5. All development activities along approved ROW's would be restricted to areas authorized in the approved ROW Grant.

6. The Operator would be responsible for maintenance of roads in the project area and for closure of roads following production activities.

7. Where proposed roads would follow existing roads, those portions of existing roads not included in the new ROW would be reclaimed and revegetated by the Operator.

5.3.9 Wildlife

1. Reserve, workover, and evaporation/production pits potentially hazardous to wildlife would be adequately protected (e.g., fencing, netting) to prohibit wildlife access as directed by the BLM, to ensure protection of migratory birds and other wildlife.

2. USFWS and WGFD consultation and coordination would be conducted for all mitigation activities relating to raptors, and T&E species and their habitats and all permits required for movement, removal, and/or establishment of raptor nests would be obtained.

3. The Operator would implement policies designed to control poaching and littering and would notify all employees (contract and company) that conviction of a major game violation could result in disciplinary action. Contractors would be informed that any intentional poaching or littering within the MCRNGDPA could result in dismissal.

4. Firearms and dogs would not be allowed on-site during working hours. The Operator has existing drug, alcohol, and firearms policies that would be internally enforced.

5.4 MITIGATION AND MONITORING

Mitigation measures identified as a result of impact analyses in Chapter 4.0 of the CRNGDP EA (BLM 1998) and Chapter 4.0 of this document have been summarized below by specific resource component.

5.4.1 Air Quality

The CRNGDP air quality impact assessment assumes that water and/or chemical dust suppressants would be applied during construction in order to achieve a 50% control efficiency (at an assumed application rate of 0.02 gallons per square yard every 4 hours) in order to minimize TSP and PM_{10} fugitive dust emissions. In addition, roads constructed on soils susceptible to wind erosion could be graveled, or dust inhibitors could be periodically used on unpaved local, collector or arterial roads which present a fugitive dust problem. The operator could also establish and enforce speed limits for all non-surfaced roads within the CRNGDPA.

BBC would apply Best Achievable Control Technology (BACT) for reciprocating internal combustion engines, condensate storage, and other applicable emission sources to reduce air emissions in accordance with Wyoming Air Quality Standards and Regulations (WAQSR) Section 2(c)(v) and WDEQ/AQD guidance for oil and gas sources.

5.4.2 Cultural Resources

1. Any cultural or paleontological resource (historic or prehistoric site or object or fossil) discovered by the Operator, or any person working on his behalf, on public or federal land should be immediately reported to the Authorized Officer (AO). The operator should suspend all operations in the immediate area of the discovery until written authorization to proceed is issued by the AO. An evaluation of the discovery will be made by the AO to determine the appropriate action(s) to prevent the loss of significant cultural or scientific values. The Operator

would be responsible for the cost of evaluation and any decision as to proper mitigation measures would be made by the AO after consulting with the Operator.

5.4.3 Geology and Minerals

No mitigation measures were identified for this particular resource component.

5.4.4 Hydrology

In order to minimize the potential impact(s) of additional oil/gas exploration and development activity within the CRNGDPA to both surface and subsurface waters, the following mitigation measures are recommended.

1. All drilling operations should be conducted with a lined reserve pit in order to prevent drilling water loss and potential contamination of sub-surface water aquifers in the Wind River Formation through seepage. The reserve pit should be lined with a vinyl/plastic liner or a comparable alternative that has and can maintain a permeability less than or equal to 1×10^{-7} cm/sec. The liner should be chemically compatible with all substances which may be put into the pit and should be installed so that it will not leak.

   Liners made of any man-made synthetic material should be of sufficient strength and thickness to withstand normal installation and pit use and should be installed with sufficient bedding (either straw or dirt) to cover any rocks, should overlap the pit walls, extend under the mud tanks, and be covered with dirt and/or rocks to hold it in place. No trash, scrap pipe, etc. that could puncture the liner should be disposed of in the reserve pit.

2. Emergency and/or production pits associated with oil/gas production operations should consist of either metal or fiberglass tanks rather than earthen pits. Where these tanks are installed in the ground, a leak detection system should be installed to prevent the potential migration of leaking liquid leaking hydrocarbons into the subsurface. Earthen emergency/production pits should not be allowed within the MCRNGDPA.

5.4.5 Range Management

In order to minimize the overall impact to range resources and existing range improvements within the CRNGDPA which could result from additional oil/gas exploration and development activity therein, the following mitigation measures are recommended.

1. To ensure that infestations of noxious weeds are suitably controlled, the proponent should cooperate with the appropriate weed and pest control authority as necessary to implement an integrated pest management program which would be in compliance with all federal and state rules and regulations concerning the application of herbicides or pesticides.

2. In order to maintain the structural integrity of existing fences, wooden "H" braces should be installed on either side of the proposed fence cut and the fence properly tied off, prior to cutting the fence and installation of the required cattleguard.

3. All cattleguards should be routinely maintained for the duration of the project in order to eliminate the potential for any livestock migration to occur.

5.4.6 Soils

In order to minimize impacts to soil resources within the MCRNGDPA which could result from surface disturbing activities associated with additional oil/gas exploration and development activity therein, the following mitigation measures are recommended.

1. In order to protect sensitive soils, no occupancy or other surface disturbing activity should be allowed on slopes in excess of 25%.

2. The sensitive soils identified in Table 3.7 should be avoided to the greatest extent possible. In those instances where disturbance of these soils is unavoidable, the proponent should prepare a site specific Erosion Control, Reclamation and Revegetation Plan which sets forth the construction, reclamation, and revegetation techniques to be implemented in conjunction with the proposed surface disturbing activity.

3. All available topsoil (e.g., 6 to 12 inches) should be removed (stripped) from the areas of new construction and stockpiled for future reclamation of these disturbed areas. This stored topsoil, as well as cut and fill slopes on the well pad, should be secured from erosion through mulching and temporary revegetation (hydroseeding) if reclamation is not anticipated within one (1) year following initial construction.

4. Unused areas (borrow ditch) along the proposed access road route(s) which would be denuded of existing vegetation during initial construction should be reseeded in order to re-establish vegetative cover and reduce the overall potential for erosion and off-site sedimentation.

5.4.7 Visual Resources

In order to minimize the potential impact(s) of additional oil/gas exploration and development activity within the CRNGDPA to the visual resource (viewshed), the following mitigation measures are recommended.

1. All permanent (on-site for six months or longer) above-ground structures constructed or installed on the individual well locations (including pumping units, tank batteries, etc.) should be painted a flat, non-reflective, earthtone color to match one of the standard environmental colors as determined by the Five (5) State Rocky Mountain Interagency Committee.

Those facilities required to comply with Occupational Safety and Health Act (OSHA) rules and regulations would be excluded from this painting recommendation.

5.4.8 Wildlife

As a result of this analysis process, the following mitigation measures are recommended to minimize impacts to wildlife resulting from additional oil/gas exploration and development activity within the MCRNGDPA.

1. All project workers should be instructed about the nature of raptor species that occur on the project area, potential impacts to these species, and measures that can be taken to avoid or minimize impacts. They should also be advised of federal and state regulations and laws concerning harassment and illegal kill of raptor species.

2. If above-ground power lines are installed, power pole cross arms should be configured by the owner of the power line according to specifications described in Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996 (Avian Power Line Interaction Committee) so as to eliminate the potential for raptor electrocution.

3. Seasonal restrictions of construction activities within 1/4 mile of occupied raptor nests should be applied. An occupied nest is defined as one where eggs or young are being incubated or tended. Occupied nests should be protected during the nesting period until the young have safely fledged. Normally the exclusionary time window for nesting activities extends from February 1 through July 31 for golden eagles and from March 15 through July 31 for other species. The AO may modify these dates depending on the specific circumstances surrounding individual nests. Seasonal restrictions should be applied as follows:

    - Any activity initiated prior to February 1 may be completely finished. This means a well may be permitted (casual uses), drilled, completed, and hooked up without restrictions unless activities on the drill site cease for 3 weeks or longer between February 1 and June 1. In the event of such prolonged inactivity, a nest survey must be performed in the 1/4-mile radius surrounding the drill site to determine whether or not an occupied nest has been established during the period of inactivity. If an occupied nest is found, the operation must temporarily cease until the young have fledged.

    - Any activity initiated between February 1 and June 1 should require a nest check either by the BLM or an Operator representative approved by the BLM within 1/4 mile; if an occupied nest is present, activity would be restricted during the critical period.

4. Casual use activities away from existing roads and facilities that are scheduled to occur between March 1 and mid-June should be coordinated with the BLM in order to minimize or avoid potential impacts to nesting raptors in the area.

Casual uses include, but are not limited to, ground activities such as: (1) preliminary scouting of routes or sites, (2) land surveying and staking, and (3) cultural and wildlife surveys. Because casual use is generally not treated as a managed or permitted activity, there is a potential for causing impacts to nesting raptors.

5. Raptor nests that are discovered by the Operator or Operator's representatives should not be approached and should be immediately reported to the BLM. Employees should be directed not to enter buffer zones, established by the BLM to reduce stress to raptor adults or young and to prevent nest abandonment.

6. The Operator should relocate ANS number CRU #2 to federal surface estate at a mutually acceptable location in the S½NW¼ of Section 14 in Township 35 North, Range 87 West. The particular location ultimately selected would be east of the current MCRNGDPA boundary, while remaining on federal oil/gas lease #WYW-128769. As the proposed ANS site is outside of the modified project area boundary, we consider the likelihood of oil/gas exploration/development within approximately 0.25 miles of the ANS to be unlikely.

7. The Operator should relocate ANS number CRU #3 to federal surface estate in the SW¼NE¼ of Section 32, Township 36 North, Range 87 West. This particular location is approximately 0.25 miles west of the current MCRNGDPA boundary, yet remains on federal oil/gas lease #WYW-141678. As the proposed ANS site is outside of the modified project area boundary, we consider the likelihood of oil/gas exploration/development within approximately 0.25 miles of the ANS to be unlikely.

8. Relocate surface disturbing activities to avoid large sagebrush stands to the greatest extent possible in order to prevent habitat fragmentation within the shrub-steppe habitat type.

9. Where possible, restore or rehabilitate degraded and disturbed sites to native plant communities.

10. Maintain remaining biological soil crust communities within the MCRNGDPA by minimizing sources of soil disturbance such as off-road vehicle use.

11. In large disturbed areas, sagebrush and perennial grasses may need to be reseeded to shorten the recovery time and prevent dominance by non-native grasses and forbs.

6.0 CONSULTATION AND COORDINATION

6.1 BACKGROUND

A field development environmental assessment (EA) was submitted to the CFO, BLM in May 1998 by Intoil, Inc. analyzing additional oil and gas exploration and development activities within a 6,282.38 acre area surrounding the Cooper Reservoir Unit. The Decision Record and Finding of No Significant Impact for the Cooper Reservoir Natural Gas Development Project (CRNGDP) (BLM 1998) approved the drilling, completion, testing, production, and reclamation of up to 73 additional natural gas wells in and adjacent to the Cooper Reservoir Unit at a maximum density of 16 well locations per section (i.e., a 40-acre well location density pattern).

Bill Barrett Corporation has since acquired the mineral rights within the CRNGDP area and subsequently notified the CFO, BLM in early 2003 of their intent to propose a modification to the CRNGDP as approved by the BLM. The foregoing document details the modifications proposed by BBC and analyzes the effects of the proposed project modification upon the human environment within the Modified Cooper Reservoir Natural Gas Development Project Area (MCRNGDPA).

The Modified Cooper Reservoir Natural Gas Development Project Environmental Assessment was prepared by an independent environmental consulting firm, with the guidance, participation, and independent evaluation of the Bureau of Land Management. A list of the personnel responsible for document preparation, and their individual responsibilities are provided in Section 6.4.

6.2 PUBLIC PARTICIPATION

Public participation, consultation, and coordination for the proposed Modified Cooper Reservoir Natural Gas Development Project occurred through press releases, public meetings, scoping notices, and individual contacts. The contact dates and actions taken are summarized below. All of the information is available for review at BLM's CFO in Casper, Wyoming.

1. September 22, 2003. BLM issued a statewide press release informing the public that the Casper Field Office was conducting scoping regarding BBC's proposal to modify the Cooper Reservoir Natural Gas Development Project Environmental Assessment (BLM 1998).

2. September 23, 2003. A scoping notice was mailed to agencies, organizations, entities, and individuals in order to gather public input concerning the identification of issues and concerns relative to the proposal by Bill Barrett Corporation (BBC) to modify the Cooper Reservoir Natural Gas Development Project Environmental Assessment (BLM 1998).

3. September 25, 2003. An article appeared in the Thursday, September 25, 2003 edition of the Casper Star Tribune advising that BLM's CFO is seeking public input on BBC's proposal to modify the Cooper Reservoir Natural gas Development Project (Environmental Assessment).

As a result of the public participation process, one electronic (email) comment and nine faxed and/or written comments were received during the scoping period between September 23 and October 22, 2003.

6.3 AGENCIES, INDIVIDUALS AND ORGANIZATIONS CONTACTED

As indicated above, numerous contacts have been made during the course of this environmental analysis. The following agencies, organizations, entities, and individuals (or their representatives) who responded to scoping notice were notified during the preparation of this analysis document. Separate consultations were conducted with some of the state and federal agencies identified below in order to obtain specific information concerning potential impacts to individual resources within their jurisdictional purview.

6.3.1 Federal Government/Federal Agencies Contacted

1. Congressional Delegation for the State of Wyoming
    a. Representative Barbara Cubin, Field Office, Casper Wyoming
    b. Senator Mike Enzi, Field Office, Casper, Wyoming
    c. Senator Craig Thomas, Field Office, Casper, Wyoming
2. Department of Agriculture
    a. U.S. Forest Service, Buffalo Ranger District; Buffalo, Wyoming
    b. U.S. Forest Service, Douglas Ranger District; Douglas, Wyoming
    c. U.S. Forest Service, Rocky Mountain Region; Lakewood, Colorado
3. Department of Defense
    a. U.S. Army Corps of Engineers; Omaha, Nebraska
    b. U.S. Army Corps of Engineers; Cheyenne, Wyoming
4. Department of the Interior
    a. U.S. Fish and Wildlife Service; Cheyenne, Wyoming
5. Environmental Protection Agency
    a. Region VIII; Denver, Colorado

6.3.2 State of Wyoming Contacts

1. Honorable Dave Freudenthal, Governor; Cheyenne, Wyoming
2. Department of Environmental Quality; Cheyenne, Wyoming
3. Department of Transportation; Casper, Wyoming
4. Federal Land Policy Office; Cheyenne, Wyoming
5. Game and Fish Department; Casper, Cheyenne and Lander, Wyoming
6. Oil and Gas Conservation Commission; Casper, Wyoming
7 State Engineer; Cheyenne, Wyoming
8. State Historical Preservation Office; Cheyenne, Wyoming
9. State Land and Investments Office; Cheyenne, Wyoming

6.3.3 Local Governments/Organizations Contacted

1. Natrona County Assessor; Casper, Wyoming
2. Natrona County Commissioners; Casper, Wyoming
3. Natrona County Development Department; Casper, Wyoming

6.3.4 Individuals, Citizens Groups, and Regional Societies Contacted

1. Jim Barlow; Jackson, Wyoming
2. Richard Bassham; Casper, Wyoming
3. Deer Creek Ranch; Shoshoni, Wyoming
4 Bruce Hinchey; Casper, Wyoming
5. John Ellbogen; Casper, Wyoming
6. Mike Hirsch; Casper, Wyoming
7. Greg Mohl; Casper, Wyoming
8. J.W. MacGuire; Casper, Wyoming

9. Kit Jennings; Casper, Wyoming
10. Mike Kozimko; Midland, Texas
11. Pauline Hitt; Casper, Wyoming
12. Murie Audubon Society; Casper, Wyoming
13. Ty Perkins; Casper, Wyoming
14. A.V. Tharp, Jr.; Denver, Colorado
15. Wyoming Outdoor Council; Lander, Wyoming

6.3.5 Industry/Business Contacts

1. Alpha Development; Casper, Wyoming
2. Double Eagle Petroleum & Mining Company; Casper, Wyoming
3. EOG Resources, Inc.; Denver, Colorado
4. Frontier Well Service Inc.; Casper, Wyoming
5. Halliburton Energy Services, Inc.; Evansville, Wyoming
6. Hose & Rubber Supply; Casper, Wyoming
7. Inter-Mountain Pipe Company; Casper, Wyoming
8. Kinder Morgan, Inc.; Casper, Wyoming
9. Petroleum Association of Wyoming; Casper, Wyoming
10. Prima Oil & Gas Company; Denver, Colorado
11. Pronghorn Archaeological Services; Mills, Wyoming
12. SST Energy Corporation; Casper, Wyoming
13. SWACO; Casper, Wyoming
14. Thunder Basin Environmental Consulting, Inc.; Casper, Wyoming
15. Weatherford Enterra U.S., Inc.; Casper, Wyoming

6.3.6 Native American Interests Contacted

1. Crow Tribal Council; Crow Agency, Montana
2. Eastern Shoshone Tribal Council; Fort Washakie, Wyoming
3. Northern Arapaho Business Council; Fort Washakie, Wyoming
4. Northern Cheyenne Tribal Council; Lame Deer, Montana
5. Oglala Sioux Tribal Administration; Pine Ridge, South Dakota
6. Southern Cheyenne/Southern Arapaho Tribal Offices; Concho, Oklahoma

6.4 LIST OF PREPARERS

The following tables identify those BLM and consulting individuals that played a key role in the preparation of this Environmental Assessment.

Table 6.1

Interdisciplinary Reviewers from the Bureau of Land Management

Name	Title
Casper Field Office	
Linda Slone	Project Lead, Planning and Environmental Coordinator
Patrick Moore	Assistant Field Manager, Minerals and Lands
Don Whyde	Assistant Field Manager, Resources
Chris Arthur	Archaeologist
Eve Bennett	Recreation Planner
Mike Brogan	Hydrologist, Water Quality
Leslie Collins	Public Affairs Specialist
Willie Fitzgerald	Wildlife Biologist
Michael J. Phillips	Rangeland Management Specialist
Ken McMurrough	Physical Scientist
Joe Meyer	Physical Scientist, Soils
Patrick Moore	Assistant Field Manager, Minerals and Lands
Celia Skillman	Realty Specialist
Lloyd Wright	Petroleum Engineer
Wyoming Reservoir Management Group; Casper, Wyoming	
Lee W. Almasy	Petroleum Engineer
W. Roger Miller	Professional Geologist

Table 6.1 - Continued

Interdisciplinary Reviewers from the Bureau of Land Management

Wyoming State Office; Cheyenne, Wyoming	
Susan Caplan	Physical Scientist: Air Quality
National Science and Technology Center; Denver, Colorado	
Craig Nicholls	National Air Quality Modeler

Table 6.2

Principal Interdisciplinary Team

Name	Affiliation	Responsibility
Robert M. Anderson	Anderson Environmental Consulting	Project Manager, Principal Author
James A. Brunette	Frontier Archaeology	Cultural Resources
Susan J. Connell	TRC Environmental Corporation	Air Quality
Chris Gardiner	Uintah Engineering & Land Surveying, Inc.	Cartography
Jeff Garrard	Uintah Engineering & Land Surveying, Inc.	Cartography
Tamara T. Linse	TRC Mariah Associates Inc.	Cover Design

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8.0 ABBREVIATIONS AND ACRONYMS

ACEC	Area of Critical Environmental Concern
AEC	Anderson Environmental Consulting
ANC	Acid Neutralizing Capacity
ANS	Artificial Nest Structures
APD	Application for Permit to Drill
AO	Authorized Officer
AQRV	Air Quality Related Value
AUM	Animal Unit Month
BACT	Best Achievable Control Technology
BBC	Bill Barrett Corporation
BBS	Breeding Bird Survey
BCF	Billion Cubic Feet
BLM	Bureau of Land Management
BMP	Best Management Practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CFO	Casper Field Office
CIAA	Cumulative Impacts Analysis Area
CO	Carbon monoxide
COA	Condition of Approval
CPWA	Cloud Peak Wilderness Area
CRNGDP	Cooper Reservoir Natural Gas Development Project
CRNGDPA	Cooper Reservoir Natural Gas Development Project Area
CRU	Cooper Reservoir Unit
DCF	Discounted Cash Flow
DR	Decision Record
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
EUR	Estimated Ultimate Recovery
FLAG	Federal Land Manager Air Quality Related Values Workgroup
FLM	Federal Land Manager
FLPMA	Federal Land Policy Management Act
FONSI	Finding of No Significant Impact
FOOGLRA	Federal Onshore Oil and Gas Leasing Reform Act
FOOGRMA	Federal Onshore Oil and Gas Royalty Management Act
GRAA	Greater Raptor Analysis Area
HAP	Hazardous Air Pollutants
IDLH	Immediately Dangerous to Life or Health
INJ	Injection well

KGS	Known Geologic Structure
KNE	KN Energy, Inc.
LFU/L	Lower Fort Union/Lance undifferentiated Formation
LOP	Life of Project
MEI	Maximally Exposed Individual
MLA	Mineral Leasing Act of 1920
MLE	Most Likely Exposure
MCRNGDP	Modified Cooper Reservoir Natural Gas Development Project
MCRNGDPA	Modified Cooper Reservoir Natural Gas Development Project Area
MSLE	Modified Soil Loss Equation
NAAQS	National Ambient Air Quality Standards
NCR	Natrona County Road
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides (oxides of nitrogen)
NRHP	National Register of Historic Places
O_3	Ozone
PGW	Producing gas well
PL	Public Law
PM_{10}	Particulate matter with an effective diameter less than 10 microns
$PM_{2.5}$	Particulate matter with an effective diameter less than 2.5 microns
PRAOL	Powder River Agri-Ogranics, LLC
PRRA	Platte River Resource Area
PSD	Prevention of Significant Deterioration
REL	Reference Exposure Level
RfC	Reference Concentration for Chronic Inhalation
ROD	Record of Decision
ROW	Right-of-Way
SARA	Superfund Amendments and Reauthorization Act
SGP	Shortgrass Prairie
SHPO	State Historic Preservation Officer
SI	Shut-in
SMU	Soil Mapping Unit
SO_2	Sulfur dioxide
SO_x	Sulfur oxides (oxides of sulfur)
SS	Shrub Steppe
T/A	Temporarily abandoned
TCLP	Toxicity Constituent Leaching Process
T/E	Threatened and Endangered Species
T/E/C	Threatened, Endangered and Candidate Species
TPH	Total Petroleum Hydrocarbons
TPY	Tons per Year

TRC	TRC Environmental Corporation/TRC Mariah Associates Inc.
USC	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compound
VRM	Visual Resource Management
WAAQS	Wyoming Ambient Air Quality Standards
WAQSR	Wyoming Air Quality Standards and Regulations
WDEQ	Wyoming Department of Environmental Quality
- AQD	Air Quality Division
WGFD	Wyoming Game and Fish Department
WNDDB	Wyoming Natural Diversity Database
WOC	Waiting on Completion
WOGCC	Wyoming Oil and Gas Conservation Commission
WRMG	Wyoming Reservoir Management Group
WSA	Wilderness Study Area