

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 (PM₁₀), 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 (SO₂), 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, PM₁₀ 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

SO₂ 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 PM₁₀, PM_{2.5}, NO_x, CO, VOC, SO₂, 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 PM₁₀ emissions based on guidance contained in AP-42 Chapter 13.2.5, Industrial Wind Erosion. Wind erosion emissions are 0.40 lb/hour PM₁₀, 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 PM₁₀ and SO₂ 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, SO₂ 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 (µg/m³)

Pinedale SO₂ measurements have been conducted since 1989; however, these data are weekly filter pack estimates of SO₂ 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). PM₁₀, PM_{2.5}, and SO₂ construction-specific and total concentrations are shown in Table 4.9.

Air quality impacts during production were quantified in 1998 for NO_x, 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 (NO₂) and CO are shown in Table 4.10.

Table 4.9

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

| Pollutant | Averaging Period | 1998 Modeled Impact ($\mu\text{g}/\text{m}^3$) | 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 PM₁₀ modeled concentrations in the absence of modeling results for this pollutant.

Table 4.10

Maximum NO₂ and CO Concentrations ($\mu\text{g}/\text{m}^3$)

| 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 ($\mu\text{g}/\text{m}^3$)

| 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 $0.07 \mu\text{g}/\text{m}^3$ (benzene) and $0.0003 \mu\text{g}/\text{m}^3$ (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 ($6\text{e-}08$), formaldehyde ($1.4\text{e-}8$) and the total MLE cancer risk ($7.4\text{e-}8$) are well below the acceptable range of $1\text{e-}04$ to $1\text{e-}06$. Under the MEI scenario, both the individual cancer risks for benzene and formaldehyde ($2\text{e-}7$ and $3.5\text{e-}8$) are less than $1\text{e-}6$, and the total cancer risk for the inhalation pathway is less than $1\text{e-}6$.

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 ($\mu\text{g}/\text{m}^3$)

| 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 ($235 \mu\text{g}/\text{m}^3$). 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 SO₂ 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 NO₂ and SO₂ 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 |
| TOTALS³ | 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 area 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 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 (*Charadrius 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.