MINERALS APPENDIX

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Introduction

The *Minerals Appendix* contains a discussion of coal bed natural gas (CBNG) in the planning area, conventional oil and gas production trends, the Reasonably Foreseeable Development Scenario (RFD), and a description of the cumulative effects projects evaluated for this study.

Coal Bed Natural Gas

CBNG is a product of the transformation of plant material into coal; large volumes of methane are produced as coal matures due to heat of burial and the action of naturally occurring microbes. This methane-rich gas is adsorbed and stored on internal surfaces within the coal. The pressure of fluids (mostly formation water) in the coal reservoir keeps the methane adsorbed onto the coal. When meteoric waters encounter the methane-rich coals, bacteria act upon the coals and their entrained fluids to produce more methane (PTTC 2000). This biogenic methane-rich gas is also adsorbed onto the coal surfaces. Thermogenic methane can be differentiated from biogenic methane by the ratios of their stable carbon isotopes, that is, the ratio of C^{12} to C^{13} compared to a standard such as the PeeDee belemnite, a fossil marine mollusk (Coplen 1994). Methane with relative enrichment of C^{12} is indicative of low-temperature, biogenic gas; the heavier C^{13} isotope is enriched in the high-temperature gas. Both forms of methane have been reported in CBNG reservoirs (USGS 2000).

Coalbed gas reservoirs, because of their fine-grained nature, are able to hold six or seven times as much gas as conventional sand or carbonate reservoirs (USGS 2000), a factor that has made CBNG a desirable resource. Methane produced from coal beds is an unconventional hydrocarbon resource that has undergone rapid nationwide development in the past fifteen years (Nelson 2000). The Powder River Basin is estimated to contain approximately 39 trillion cubic feet [TCF] total gas in place (Hill et al. 2000)—approximately 10 percent of which is in Montana. The methane is contained in the Tertiary-age Fort Union Formation coal beds. Under initial reservoir conditions, the coal is under virgin hydrostatic pressure, which confines the coal and holds in the methane. Pumping water from the coal reduces hydrostatic pressure in the aquifer. The methane releases from the coal and moves through the natural cleat of the coal toward producing boreholes.

CBNG in Montana is currently produced only at the CX Ranch field in Big Horn County on the western edge of the Powder River Basin. During the first year of production, 1999, the field produced 204,433 MCF of natural gas. The subsequent year, 2000, the field produced 3.49 billion cubic feet (BCF) of natural gas (MBOGC 2001b). For 2004, the CX Ranch field produced 12.24 BCF of natural gas (MBOGC On-Line Data).

CBNG is prospective in the RMP areas that are the subject of this SEIS. In the Billings RMP area, the Bull Mountains Basin contains Fort Union Formation coals that may be similar to the Powder River Basin coals. CBNG resources are subject to the same drainage issues as conventional oil and gas resources. It is assumed that a single CBNG well will drain those resources in a single coal seam across 80 acres. Site-specific CBNG drainage may, however, be different and needs to be monitored to protect federal and Indian lands.

A study prepared at the request of Congress under a provision of the 2000 Energy Policy and Conservation Act (EPCA) was completed in 2002 by BLM, USGS, USFS, and the DOEs Office of Fossil Fuels and Energy Information Administration (EIA). The EPCA inventory, published in 2003 in both hardcopy and on CDs, provides estimates of undiscovered technically recoverable resources and proven reserves of oil and gas beneath five basins including the Powder River Basin (EPCA, 2003). The estimate of CBNG for the Powder River Basin (USGS Digital Data Series DDS-69-C, 2004) raised the technically recoverable amount of CBNG from 1.1 trillion cubic feet to 14.3 trillion cubic feet. The increase is accounted for by better data. Over the past 10 years, industry has drilled thousands of new wells, and information from these wells has provide a much better geologic definition of the unconventional oil and gas plays in the basin. In 1995 there were only two or three coal beds that were generating gas; but by 2004 it was found that other, deeper coal bed seams were generating more gas (ibid). The coal beds where CBNG is being produced in the Powder River Basin contain low-rank coal.

Of the 14.3 TCF estimated recoverable CBNG, the USGS estimates 5.0 TCF in Montana and 9.3 TCF in the Wyoming portion of the PRB.

In preparing this SEIS/Amendment, the updated EPCA estimate was considered for evaluation and alteration of the RFD. However, upon recognition of the original

method used to estimate the reasonable foreseeable development, it was noted that all possible CBNG wells over the next 20 years were accounted for, based on gas quantity per ton of coal present and potential drainage spacing. Therefore, considering the spacing (1 well/80-acre/coal seam), and the duration of the well life, it was felt that all known coal with the potential for CBNG production was accounted for and thus the gas present could be reached and extracted. No revision to the original number of CBNG wells predicted is necessary or was made.

Furthermore, the federal coal beneath the Custer National Forest was considered in the original RFD, and the EPCA estimate did not provide any new information with regards to the potential leasing or development of CBNG on the forest. Therefore, the original estimate for the Custer National Forest was not revised. Additionally the Ashland Ranger District has not completed an official RFD for the Custer National Forest nor has there been a leasing EIS proposed or scheduled for these minerals. Therefore, the existing estimate is adequate for the foreseeable future.

Conventional Oil and Gas Production Trends

Montana's oil production for 1999 was down by approximately 8 percent (from 16.61 million barrels of oil [mmbo] to 15.27 mmbo) from 1998. The oil production trend has been in place since 1984 when oil production began to decrease because of commodity prices. Due to increases in commodity prices, the rapid expansion of horizontal drilling, and improvements in secondary and tertiary recovery techniques, this downward trend started to reverse itself in 2000, and by the end of 2004 production had increased to 24.7 mmbo. Natural gas production increased by approximately 3 percent (59.7 BCF to 61.6 BCF) during 1998. Natural gas production has shown gradual increases in yearly production with an annual production for 2004 of 97.96 BCF (MBOGC On-Line Data). Drilling within the state for conventional oil and gas increased by approximately 55 percent from 1998 to 1999. Conventional oil and gas activity increased by approximately 27.2 percent from 2003 to 2004. Horizontal well completions continue to be popular in the state. In 1999, the Montana Board of Oil and Gas Conservation (MBOGC) gave approval for seven new horizontal wells and two horizontal re-completions of existing vertical wells. For 2004, the MBOGC approved 205 horizontal wells and 48 horizontal recompletions of existing vertical wells. In 1999, BLM approved four new horizontal wells and one horizontal recompletion. In 2000, BLM approved 13 new horizontal wells and 16 recompletions. In 2004, BLM approved 35 new horizontal wells and 36 recompletions as horizontal wells.

Figures MIN-1 and MIN-2 were constructed using the latest data available from the production files of the MBOGC.

Figure MIN-1

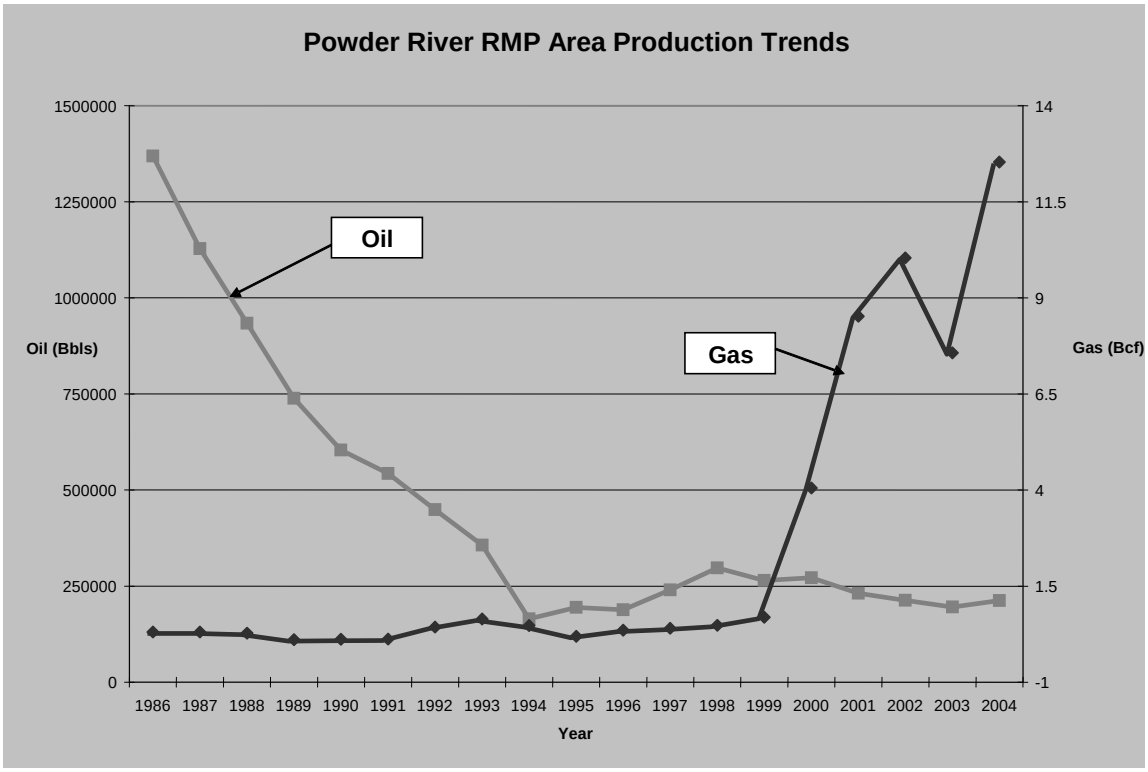
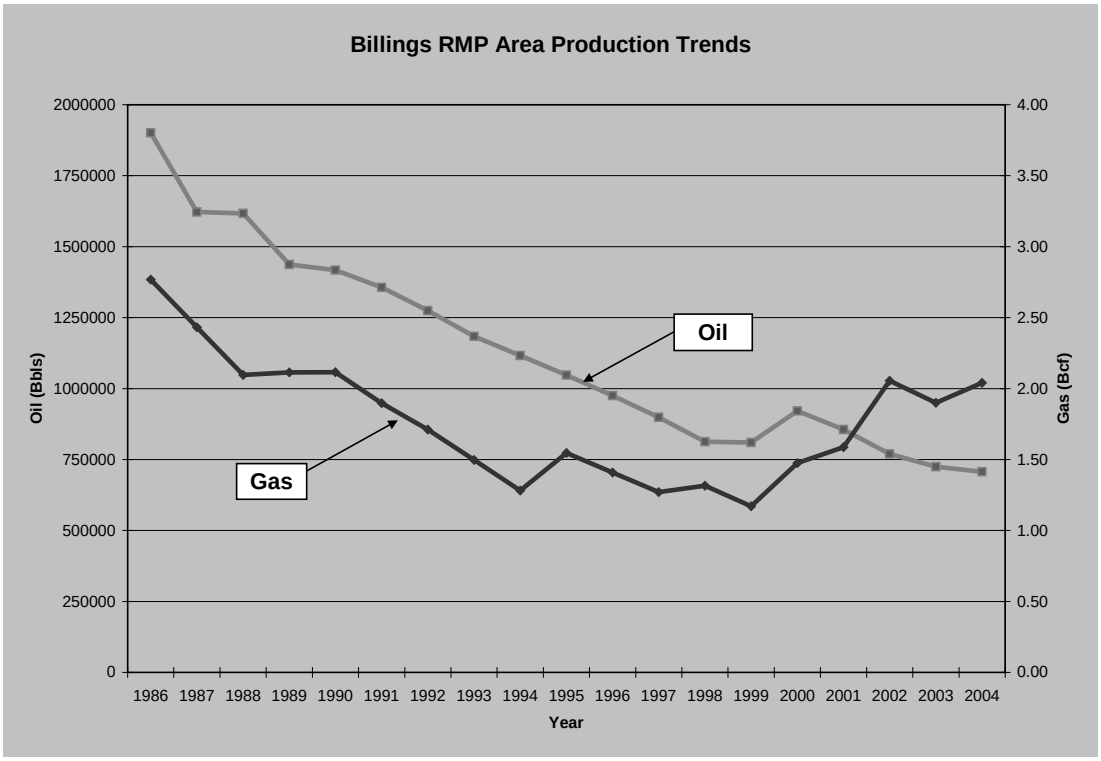


Figure MIN-2



REASONABLY FORESEEABLE DEVELOPMENT SCENARIO

Introduction

The Reasonably Foreseeable Development (RFD) scenario for the SEIS predicts oil and gas development for the Powder River Resource Management Plan (RMP) area and the Billings RMP area. The RFD projects drilling of both conventional and CBNG wells, numbers of pipelines, and compressors needed for production of CBNG wells.

For the purpose of the analysis, the RFD will address potential CBNG development of the Crow and Northern Cheyenne reservations and the Ashland Ranger District of the U.S. Forest Service. This does not imply or indicate the BLM is making decisions about the reservations or the Forest Service. The predictions are made so that all potential cumulative impacts are analyzed.

Predictions for exploration and development of coal bed natural gas (CBNG) and conventional oil and gas in the RFD are based on: the BLM RMPs for the areas; coal information from the U.S. Geological Survey (USGS); other referenced sources; expressions of interest; and projections from the oil and gas industry (Oct 18, 2000, CBNG Coordination meeting).

Coal Bed Natural Gas

To project CBNG exploration and development, the areal extent of certain coals and the rank of coals in the study areas were considered. Areas of sub-bituminous to bituminous were considered as the most likely to be explored and developed in Montana, although exploration and development has occurred mainly in sub-bituminous coal in the Wyoming portion of the Powder River Basin (Basin). The USGS produced a map showing the areas of coal, by rank, for the United States (see Map MIN-1). This information indicates sub-bituminous and bituminous coals in many parts of the study area. Powder River, Rosebud, Custer, and Big Horn counties contain the northern part of the Basin, which extends north from Wyoming. Musselshell County has mostly sub-bituminous coal. Carbon County has an extension of the Big Horn Basin coal, which is ranked as bituminous coal. The projection of methane gas estimated to be produced from coal beds in Montana range from a low of 1 TCF (Crockett 2001-PRB est -RMG, Casper) to a high of 17.7 TCF (estimated based on figures from Nelson 2000). This and other information for Montana is used to predict where CBNG exploration is most likely to occur in the planning area. The RFD predicts the number of CBNG wells that would be drilled and completed during the next 20 years.

Conventional Oil and Gas

Historical drilling activity and oil and gas price projections were used to project conventional oil and gas development for the RMPs. The RFD scenario describes a somewhat different level of activity than the scenario found in the BLM *Final Oil and Gas RMP/EIS Amendment* issued in 1992. This is primarily because of the use of a different span for historical drilling activity. The 1992 amendment used the span from 1973 to 1988 in forecasting future activity. This document uses a total period of 80 years for historical drilling activity to forecast future development. This led to a slight difference in the level of drilling activity forecast.

Approximately 200 to 800 wells would be drilled in the Powder River RMP area. Approximately 250 to 975 wells would be drilled in the Billings RMP area. A total of 450 to 1,775 wells could be drilled in 20 years.

A total of 37,233 oil and gas wells have been drilled in Montana as of the 2003 FEIS (Petroleum Information Corp, 2001). This is an average of approximately 450 wells drilled per year statewide. From 1995 through 2004 the conventional wells drilled in the state ranged from 209 to 565 (MBOGC On-Line Data).

Coal Areas of Montana

The USGS produced a map showing the areas of coal in Montana. The RMPs also include maps that indicate areas of coal occurrence. The coal volume for each county was used to determine the number of potential CBNG wells that could be drilled. The values for volumes of coal in each county came from the BLM RMPs for the area, study papers, or estimates based on coal thickness, and acres of identified coal fields in the county. The coal volumes are based upon all coal beds, not just ones that are likely to be developed because of their thickness, depth, and extent. In all cases the volumes are estimates rather than exact figures. The coal volume in tons was multiplied by a range of estimates of recoverable methane per ton (USGS Professional Report 1625A, 1998 and Flores, et al. 2001) and then divided by an estimate of the gas production per well from CMS Energy's, October 18, 2000, presentation in Miles City (CMS 2000). The amount of gas to be produced per well (0.3 BCF per

well) would be used as the lowest economic limit. This resulted in a range of wells that may be drilled over the next 20 years. The coal volume data came mostly from the Powder River and the Billings RMPs, supplemented by information from USGS and Gas Technology Institute (GTI) papers (Nelson 2000).

Coal resources in the Powder River Basin are in the Paleocene Fort Union Formation. About half of the estimated 39 trillion cubic feet of in-place CBNG resource is recoverable. Less than half the coal resources occur in the Montana portion of the Basin. These sub-bituminous coals have low concentrations of gas per unit volume (Choate et al. 1984). However, because of the immense total coal thickness that reaches 170 feet in some areas in Montana (Campen 1990), vast quantities of CBNG may be present.

Gas Well Spacing

The MBOGC establishes the spacing of gas wells. Spacing for wildcat wells is 640 acres per well for each producing formation. MBOGC has the authority to change the well spacing to provide for maximum efficiency and recovery of gas reserves. Well spacing is usually changed after MBOGC has reviewed geologic, engineering and economic data provided by lease operators. The MBOGC then establishes the boundaries for a producing gas field. The planning area includes only one CBNG field and numerous conventional gas fields. When a field is discovered, the exploration company would appear before MBOGC to request permanent spacing for the production. Based upon current CBNG well spacing in Wyoming and Montana, spacing would probably range from one well per 80 acres to one well per 40 acres for CBNG production. The spacing in the CX field is four wells per coal bed per 160 acres. Because of the number of coals in the CX field, this could result in as many as 16 wells per 160 acres or potentially 64 wells per 640 acres. The well density has not reached this level at present and because of the faulting, splitting, and joining of the coals and absence of the coals in some sections this is not likely to happen. CBNG is produced from three coal seams in the CX field. Each well produces methane from a single coal seam; however, in the future, wells may be designed to produce from multiple coal seams. This would decrease the number of wells required for production in the CX field.

Oil Well Spacing

The MBOGC also sets the spacing of oil wells. The spacing for an oil well in the state of Montana is based on the depth of the well. For well depth of 0 to 6,000 feet, the statewide spacing is one well per 40 acres; for well depth of 6,001 feet to 11,000 feet, it would be one well per 160 acres; finally, for well depth of more than 11,001 feet, it would be one well per 320 acres. MBOGC has the authority to change the well spacing to provide for maximum efficiency and recovery of gas reserves. Well spacing is usually changed after MBOGC has reviewed geologic, engineering, and economic data provided by lease operators. The MBOGC then establishes the boundaries for the producing oil field. There are numerous fields within the planning area.

Areas of Disturbance

CBNG

Surface disturbance for a typical CBNG well includes 0.25 acres for the well pad and 0.75 acres for the access road for a total of 1 acre disturbed for drilling operations. Part of the well pad area is reclaimed for production operations, and the entire area of disturbance is reclaimed when the well is plugged and abandoned.

Conventional

Surface disturbance for a typical conventional shallow gas well (less than 2,000 feet deep) includes 0.5 acres for the well pad and a 2-mile bladed road for a total of 1 acre disturbed for drilling operations. Part of the well pad area is reclaimed for production operations, and the entire area of disturbance is reclaimed when the well is plugged and abandoned.

Surface disturbance for a typical shallow oil well (less than 5,000 feet deep) includes 2 acres for the well pad and 1.5 acres for a 1-mile bladed road for a total of 3.5 acres disturbed for drilling operations. Surface disturbance for a typical deep oil well (from 5,000 to 12,000 feet deep) includes 4 acres for the well pad and 1.5 acres for a 1-mile bladed road, for a total of 5.5 acres disturbed for drilling operations. Part of the well pad area is reclaimed for production operations, and the entire area of disturbance is reclaimed when the well is plugged and abandoned.

General Assumptions

- All numbers were rounded to the nearest significant number.
- The number of BLM-administered wells will be based on the BLM-administered oil and gas acreage in the county.

- 80 percent of Big Horn County is in the Billings RMP area.

Occurrence Potential

The text in this section discusses the oil and gas occurrence potential for each county.

Big Horn County

CBNG

The southeastern and eastern portion of the county contains approximately 28,700 million tons of sub-bituminous coal (Powder River RMP). The area includes one CBNG field (CX Ranch).

Conventional

The county has nine oil and gas fields, including four oil fields, one conventional gas field at Toluca, and an inactive gas field at Hardin. The oil and gas fields in Big Horn County produce from the Ft. Union, Shannon, Amsden, Madison, and Tensleep formations. Production has occurred from the Frontier formation (Hardin Gas field). A total of 844 wells have been drilled to date, of which 172 have been drilled on the Crow Reservation. One gas sales line runs through the north portion of Big Horn County, but none on the Crow Reservation.

Carbon County

CBNG

Carbon County includes the Silvertip, Bear Creek, Bridger and the Joliet-Fromberg coal fields. The coal ranges from Ft Union to Eagle coal and is of sub-bituminous to bituminous nature. The volume of coal is estimated at approximately 760 million tons. The estimate of the gas content of the coals for sub-bituminous will be the same as the coals in the Powder River basin. The estimate for the bituminous coals for the RFD will be from 200 to 450 standard cubic feet (SCF)/ton.

Conventional

Carbon County includes 18 identified gas and oil fields. The wells produce from the Frontier, Phosporia-Tensleep, Judith River, Claggett, Eagle, and Greybull formations. A total 735 wells have been drilled to date in this county (Dwights well data).

Carter County

CBNG

Bituminous or sub-bituminous coals have not been identified in Carter County. The only coal is of lignite rank, which is not considered to have a potential to produce methane in economic quantities.

Conventional

Carter County includes the Bell Creek, Southeast Bell Creek, and Repeat oil fields, as well as two gas fields near Hammond. They produce from the Muddy and Red River formations. There have been 434 wells drilled to date in this county.

Custer County

CBNG

The Powder River RMP estimated 1.3 billion tons of sub-bituminous coal is located within Custer County. The coal occurs in the southern and southwestern portion of the county.

Conventional

The Liscom Creek and Pumpkin Creek fields are located in Custer County. Gas in these fields is produced from the Shannon formation. These fields have a small sales line in place.

Golden Valley County

CBNG

Although there is some coal shown for Golden Valley County, there are no volumes estimated. The coal that is shown is of the sub-bituminous rank.

Conventional

Two oil and two gas fields have been identified in this county, and 124 wells have been drilled to date. The wells have produced from the Cat Creek, Lakota, Niobrara, Frontier, Heath, and Tyler formations.

Musselshell County

CBNG

The RMP estimated 646.6 million tons of sub-bituminous coal in the county. These Ft. Union coals are located in the Bull Mountain Basin.

Conventional

Thirty-five fields have been identified in Musselshell County, and 1,415 wells have been drilled to date. The wells have produced from the Amsden, Cat Creek, Morrison, Heath, and Tyler formations.

Powder River County

CBNG

Based on information from the RMP, there are 27 billion tons of sub-bituminous coal in the county. The coal is located mostly in the western half of the county.

Conventional

The county has seven oil and gas fields, including Bell Creek, which is the second-largest producing field in Montana (based on cumulative production). The Shannon and Muddy formations are productive in the county, and 1,249 wells have been drilled to date.

Rosebud County

CBNG

Rosebud County contains 11.3 billion tons of sub-bituminous coal. The coal is located in the southern and eastern portion of the county.

Conventional

Rosebud County has 18 identified oil and gas fields producing from the Tyler formation, and 1,147 wells have been drilled to date.

Stillwater County

CBNG

There is one identified bituminous coal field (Stillwater) in the county and it is estimated to have 475 million tons of Eagle formation coal. The coal is estimated to contain a much higher gas content per ton than the Powder River sub-bituminous coals. The county has three gas transmission lines running through the north half of the county.

Conventional

The county has 11 identified oil and gas fields. The producing formations are the Frontier, Eagle, Claggett, Cat Creek, Morrison, and Virgelle. There have been 367 conventional wells drilled to date in the county.

Sweet Grass County

CBNG

There are no known coal reserves in the county. However, there are gas transmission lines through the center and running southeast and northeast in the county.

Conventional

One identified field—a six-shooter dome—is in Sweet Grass County. This is the Sixshooter Dome. The productive formations in the county are the Eagle and Lakota. There have been 82 conventional wells drilled to date.

Treasure County

CBNG

The RMP's coal estimates for the county from the RMP are 100 million tons. A gas transmission line runs through the southeastern part of the county.

Conventional

There are no identified oil and gas fields in the county and no productive formations have been identified; however, 32 conventional wells have been drilled to date.

Wheatland County

CBNG

No coal has been identified in Wheatland County. A gas transmission line runs through the eastern part of the county.

Conventional

One oil and gas field—Mud Creek—has been identified in the county. The Amsden formation is productive, and 60 conventional wells have been drilled to date in the county.

Yellowstone County

CBNG

Some 590 million tons of coal have been identified in the county. There are four gas transmission lines in the southern part of the county.

Conventional

Six oil and gas fields are identified in the county, and 425 conventional wells have been drilled to date. The productive formations that have been identified are the Mosser Sand, Amsden, and Dakota.

Reasonably Foreseeable Future Actions

Reasonably Foreseeable Future Actions (RFFA) address the potential developments that may occur within other jurisdictions that fall within the Billings and Powder River resource management areas. The same general assumptions and source data used for developing the RFD are applicable.

Crow Reservation

CBNG

There has been 16.1 billion tons of coal identified on the Crow Reservation.

Conventional

The reservation includes the Soap Creek, Lodge Grass, Gray Blanket, and Ash Creek oil and gas fields. There have been 172 conventional wells drilled to date on the reservation. Production occurs from the Shannon, Tensleep, Amsden and Madison formations within the reservation.

Northern Cheyenne Reservation

CBNG

Based upon limited data, it is estimated that 16.3 billion tons of sub-bituminous coal lie within the reservation. The coal is believed to underlie most or all of the reservation.

Conventional

The reservation does not have any known oil or gas fields. Twenty conventional wells have been drilled to date.

Ashland District, U.S. Forest Service

CBNG

Tertiary Ft. Union coal is believed to underlie most or all of the Ashland Forest.

REASONABLY FORESEEABLE DEVELOPMENT—ALTERNATIVE A

CBNG

A general assumption used for this alternative for CBNG wells is that the number of townships of potential development in each county would be limited to areas where coal has been identified. Additionally, other assumptions were used for Alternative A for CBNG wells. These include:

- CBNG drilling would only be allowed where there was a need for additional data (townships where no CBNG wells had been drilled by any company).
- CBNG drilling would occur but there would be no production (from federal wells). That is, the permits would be for drilling and production testing but no commercial production (with associated infrastructure).
- No permanent pipelines, power-lines, or any production facilities would be installed at any of the federal CBNG wells.
- There would be no discharge of produced water allowed from any of the federal CBNG wells.
- For a high number, four wells per township were assumed; for the low number, one well per township was assumed.
- It was assumed that the number of townships in each county would be limited to areas where coal has been identified.

BLM-Administered

An estimated 400 acres based on 400 CBNG wells would be disturbed during exploratory drilling operations (0.25 acre per location and 0.75 acre per access road) which is the number of wells predicted to be drilled during the 20-year analysis period. The total number of acres could be reduced if more than one methane well is drilled on the well pad—as is the pattern in the CX Field.

State-Administered

Existing Management Assumptions

There will be 325 CBNG wells permitted for the Redstone project area in Big Horn County. Of these, only 250 will be allowed to produce and 75 will be for exploration only. Two hundred CBNG exploration wells will be permitted for the rest of the state.

Conventional Oil and Gas

The RFD scenario from the *Oil and Gas Amendment* contains projections for the number of wells and acres disturbed in each producing region. The disturbance for each well is based on the typical depth of wells for an area. Shallow wells generally disturb fewer acres. Tables 4.1 through 4.4 in the *Oil and Gas Amendment* show totals for the planning area and each resource area. The assumptions for conventional oil and gas in this alternative are as follows:

- The unconstrained number of wells comes from the Oil and Gas Amendment RFD scenario.
- The constrained number of wells is derived from the resource analysis for wells foregone in No Surface Occupancy areas.
- The average acreage figure (total acres/total wells) for the resource area was used to estimate federal acres disturbed.
- The RFD projections have a 20-year life.
- A more detailed description of information for the assumptions is contained in the *Oil and Gas Amendment* in *Chapter 4, Social Economic Conditions* (BLM 1992), and in *Appendix C.*

BLM-Administered

The number of acres disturbed during drilling operations would be 1,342 acres based on 400 wells, which is the number of wells predicted to be drilled during the 20-year analysis period.

State of Montana

The number of acres disturbed during drilling operations would be 4,551 acres based on 891 new wells predicted for the 20-year analysis period in the Powder River and Billings RMP areas. The RFD for the State of Montana for conventional wells under this alternative is the same as Alternatives B, C, D, E, F, G and H.

Development Potential

The development potential for federal oil and gas in each county is described in the text that follows.

Big Horn County

CBNG

Based on the review of unexplored coal areas in Big Horn County, there would be 20 to 64 exploration wells drilled on minerals under BLM jurisdiction. Approximately 16 to 44 of these wells would have production potential and 4 to 20 wells would be drilled and abandoned. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for five to 30 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Carbon County

CBNG

Based on the unexplored coal areas in the county, the BLM could permit the drilling of approximately 24 to 72 wells under this alternative. Sixteen to 48 of these wells would have the potential to be productive, and 8 to 24 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

Carbon County has potential for 10 to 45 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Carter County

CBNG

No CBNG wells are projected to be drilled under this alternative in the county.

Conventional

The county has potential for 1 to 6 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Custer County

CBNG

Based on the unexplored coal areas in the county, the BLM could permit the drilling of from 20 to 64 wells under this alternative. Sixteen to 44 of these wells would have the potential to be productive; and four to 20 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for one to three additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Golden Valley County

CBNG

No CBNG wells are projected to be drilled in this county on minerals under BLM jurisdiction with this alternative.

Conventional

The county has potential for one to six additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Musselshell County

CBNG

Based on the unexplored coal areas in the county, the BLM could permit the drilling of 10 to 40 wells under this alternative. From eight to 30 of these wells would have the potential to be productive, and two to 10 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for 20 to 90 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Powder River County

CBNG

Based on the unexplored coal areas in the county, the BLM could permit the drilling of from 20 to 80 wells under this alternative. Sixteen to 60 of these wells would have the potential to be productive, and four to 20 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for one to three additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Rosebud County

CBNG

Based on the unexplored coal areas in the county, the BLM could permit the drilling of 12 to 48 wells under this alternative. Eight to 32 of these wells would have the potential to be productive, and four to 16 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for 10 to 40 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Stillwater County

CBNG

Based on the unexplored coal areas in the county, the BLM could permit the drilling of six to 24 wells under this alternative. Four to 18 of these wells would have the potential to be productive, and two to six wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for three to 12 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Sweet Grass County

CBNG

Based on the lack of known coal reserves in the county, no CBNG wells are expected under this alternative.

Conventional

The county has potential for one to six additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Treasure County

CBNG

Based on the unexplored coal areas in Treasure County, the BLM could permit the drilling of two to four wells under this alternative. Up to two of these wells would have the potential to be productive, and up to two wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for one to three additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Wheatland County

CBNG

There are no CBNG wells projected to be drilled on minerals under BLM jurisdiction in the county.

Conventional

The county has potential for one to three additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Yellowstone County

CBNG

Based on the unexplored coal areas in the county, the BLM could permit the drilling of two to six wells under this alternative. Up to three of these wells would have the potential to be productive, and up to three wells will be drilled and abandoned. There would be no pipelines

or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for five to 15 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

RFD Conclusion

CBNG

During the life of the plan, it is estimated that the number of CBNG exploration wells that may be drilled throughout the two RMP areas would range from a low of 110 wells to a high of 400 wells on BLM-administered minerals. CBNG drilling would be allowed but there would be no production (from federal wells). This means the permits would be for drilling and testing but no production. There would be no pipelines or power-lines or any production facilities installed at any of the federal CBNG wells. There would be no discharge of produced water allowed from any of the federal CBNG wells. This would result in approximately 400 acres of disturbance for the 400 wells (0.25 acre/location and 0.75 acre/access road).

State development under this scenario would include previously approved CBNG wells at the CX Ranch and additional exploration wells. The CX Ranch could drill up to 325 wells, of which 250 could be developed for production. An additional 200 exploration well permits would be issued to operators to investigate the likelihood of CBNG development throughout the state.

Powder River RMP Area

During the life of the plan, it is estimated that the number of CBNG wells that may be drilled in the Powder River RMP area would range from a low of 60 wells to a high of 240 wells on BLM-administered minerals. CBNG drilling would be allowed but there would be no production (from federal wells). This means the permits would be for drilling and testing but no production. There would be no pipelines or power-lines or any production facilities installed at any of the federal CBNG wells. There would be no discharge of produced water allowed from any of the federal CBNG wells. This would result in approximately 240 acres of disturbance for the 240 wells (0.25 acre/location and 0.75 acre/access road).

Billings RMP Area

During the life of the plan, it is estimated that the number of CBNG wells that may be drilled throughout the Billings RMP area would range from a low of 50 wells to a high of 160 wells on BLM-administered minerals. CBNG drilling would be allowed but there would be no production from Federal wells. This means the permits would be for drilling and testing but no production. There would be no pipelines, power-lines, or any production facilities installed at any of the federal CBNG wells. There would be no discharge of produced water allowed from any of the federal CBNG wells. This would result in approximately 160 acres of disturbance for the 160 wells (0.25 acre/location and 0.75 acre/access road).

Conventional Oil and Gas

Based on the Assumptions listed at the beginning of this section, the number of conventional oil and gas wells that could be drilled on BLM administered minerals would range from a low of 60 to a high of 260 wells. No estimates of disturbance were made for conventional wells.

Powder River RMP Area

The RFD estimates that 15 to 60 of these wells would be drilled on minerals under BLM jurisdiction. Most of these wells would be drilled in or near the existing fields.

Billings RMP Area

The RFD estimates that 45 to 200 conventional wells are to be drilled on minerals under BLM jurisdiction. Most of these wells would be drilled in or near the existing fields.

Reasonably Foreseeable Future Actions—Alternative A

The RFFA predictions for Alternative A were developed using the same general assumptions as the RFD.

Forest Service—Administered

Currently, the Custer National Forest, Ashland Ranger District, is not open for oil and gas leasing. Alternative

A assumes that similar management would continue, no leases would be issued, and no wells drilled.

Crow Reservation

CBNG

Although there is a considerable amount of known coal reserves on the reservation, it is assumed that the Crow Tribe of Indians would not develop any CBNG under this alternative.

Conventional

The Reservation has potential fourteen to twenty additional wells to be drilled on Tribal minerals in the next 20 years, based on historical drilling rates.

Northern Cheyenne Reservation

CBNG

Although there is a considerable amount of known coal reserves on the reservation, it is assumed that the Northern Cheyenne Tribe would not develop any CBNG under this alternative.

Conventional

Based on historical drilling rates it would appear that no conventional oil or gas wells would be developed on the reservation under this alternative.

REASONABLY FORESEEABLE DEVELOPMENT—Alternatives B, C, D, E, F, G and H

Assumptions

CBNG

The following assumptions were used to calculate the number of wells to be drilled, the number of in-field compressors, and the number of sales compressors required:

- The coal volume for each county was taken from published sources such as the RMPs. For the RMPs, all tonnages are based on in-place coal with development potential defined as beds 5 feet thick or greater, with a 15:l or less stripping ratio, and 500 feet of overburden or less. This gives a greater tonnage than actual limits currently used by the mining industry in the area, where stripping limits seldom exceed 200 feet of overburden or a ratio of 6:l. Tonnage calculations are based on 1,770 tons/acre-foot. For the Northern Cheyenne Reservation, the coal volumes from the USGS and U.S. Bureau of Mines reports are based on very limited data. The coal volumes for the Crow Reservation from the USGS and U.S. Bureau of Mines report were based on more extensive data. The coal tonnages in the RMPs include strippable coal, which may or may not contain producible methane in economic quantities
- The gas content per ton used to calculate the quantity of gas from sub-bituminous coal was 74 standard cubic feet per ton (SCF/ton) and came from studies by the USGS (Professional Paper 1625-A). The gas content for bituminous coal used to calculate the quantity was (450 SCF/ton) and came from a paper by Campen and Gruber (1991).
- The spacing for the CBNG wells would be one well per 80 acres per coal seam. The spacing was assumed after discussions with the MBOGC, as well as our understanding that Wyoming will be using this spacing (as a general rule) for CBNG wells.
- Three coal seams would be developed per 80 acres. Another way of saying this is there would be three wells per pad in each 80 acres.
- One field compressor would service 24 CBNG wells. The area of disturbance would be 0.5 acres.
- One sales compressor could handle 10 field compressors. The area of disturbance would be 0.5 acres.
- Each CBNG well would produce .3 BCF of gas.
- Where the wells would be located in the counties was based on either the Montana Coal Occurrences from the USGS open file report OF 96-92, the RMPs, or information from the U.S. Bureau of Indian Affairs (BIA).
- No predictions were made based on distances to coal outcrops, thickness of individual coal seams, or thickness of overburden to coals. This information will be used by companies to place individual wells.
- The coal in each county did not include the coal on the Indian reservation in that specific county. The coal (from USGS and U.S. Bureau of Mines reports) on each Indian reservation resulted in a number of wells being drilled on each reservation.
- The RFD assumed that areas of lignite would not have economic production of methane so no wells were forecasted in those areas. We are not aware of any companies or individuals that are currently pursuing the testing of lignite for gas. With the present technology, it is unlikely that industry will be able to produce commercial amounts of gas from lignite within Montana, for the reasonably foreseeable future.
- The number of CBNG producing wells in each county would be approximately 90 percent of the total CBNG wells projected for that county.
- The number of CBNG dry holes would be approximately 10 percent of the total CBNG wells projected for that county.
- A 0.5-mile gathering line would be buried from the CBNG well to the field compressor. The width of disturbance would be 15 feet. Multiple flowlines would be laid in the same trench from a well pad with more than one CBNG well. Whenever possible, these lines would be placed in the access road to the wells. This would result in 0.9 acres of disturbance per line.

- There would then be steel lines going from each gathering field compressor to the sales compressor. There would be 2 miles of these steel lines per field compressor. The width of disturbance would be 25 feet. This would result in 6 acres of disturbance per line.
- The lines would go from the sales compressor to the sales lines. These would be high-pressure steel lines. There would be no more than 60 miles of these high-pressure steel lines per county. The width of disturbance would be 25 feet. This would result in 3 acres of disturbance per mile of sales line.
- The estimates for CBNG wells did not take into account variations in topography, which could have a significant impact to actual placement and numbers of wells.
- The rate of development for 20 years was based on the industry projection of October 18, 2000. The projected rate is shown in Figure MIN-4. The rate of abandonment is presented in Figure MIN-5 for the expanded development alternatives and in Figure MIN-6 for the phased development alternatives.
- For purposes of planning, the State of Montana would consider other counties, such as Blaine, Gallatin, or Park, which may have coal resources.

Conventional Wells

- Wells drilled to date in each county were taken from Dwights well data.
- The number of wells drilled to date was divided by 80 years, which is an approximation of how long exploration has been ongoing.
  - This number was multiplied by one quarter (.25), then multiplied by 20 years for the low estimate of drilling for the next 20 years.
  - The number was multiplied by 20 years to calculate a high level of drilling for the next 20 years.
- The wells drilled on each reservation were counted in the total for each county.
- The percentage of dry holes for each county is based on the overall historical percentage of non-producing wells (71 percent), compared to the total wells drilled per county.
- The acres disturbed per well will be the same as shown in alternative A.

Development Potential

The development potential for CBNG and conventional wells for all owners is described in the text that follows.

Big Horn County

CBNG

Based on the volume of coal in these areas, Big Horn County could support from 2,500 to 7,000 CBNG wells. Approximately, half of these wells (1,250 to 3,500) would be drilled on minerals under BLM jurisdiction. Producing CBNG wells would range from 2,200 to 6,300 wells. Most of the wells in Big Horn County would be in the southeastern portion of the county. There would be from 100 to 250 field compressors. The number of sales compressors estimated for Big Horn County would be from 10 to 25. This level of production would require gathering and sales lines to be constructed. From 1,450 to 4,200 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. From 200 to 500 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 60 miles of sales lines would be laid to the main transmission lines. The sales lines would probably go north toward the main WBI pipeline or south to main lines in Wyoming.

Conventional

The county has potential for 50 to 200 additional wells to be drilled in the next 20 years, based on historical drilling rates. From 3 to 15 of these wells would be drilled on minerals under BLM jurisdiction.

Carbon County

CBNG

The coal in Carbon County varies from Tertiary Ft. Union (sub-bituminous) to the Cretaceous Eagle (bituminous). The Eagle coal can contain more gas per ton than the Ft. Union coals. Based on the coal volumes and gas content, 150 to 400 wells could be drilled. Thirty to 60 of these wells would be drilled on minerals under BLM jurisdiction. From 135 to 360 producing CBNG wells mostly would be located near the identified coal fields. The number of wells would

require from five to 15 field compressors and one to two sales compressors. Ninety to 240 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. Ten to 30 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. There would be no more than 60 miles of sales lines laid to the main transmission lines.

Conventional

Based on historical drilling, it is estimated that 50 to 200 wells would be drilled in the next 20 years. From 10 to 40 of these wells would be drilled on minerals under BLM jurisdiction. Some of these would be wildcat wells, but the majority would probably be associated with the existing fields.

Carter County

CBNG

CBNG wells are not predicted to be drilled in Carter County because of the nonexistence of bituminous or sub-bituminous coals.

Conventional

Based on historical drilling rates, we anticipate 25 to 100 wells to be drilled in the next 20 years. Ten to 40 of these wells would be drilled on minerals under BLM jurisdiction.

Custer County

CBNG

Based on the estimated quantity of coal, 100 to 300 wells will need to be drilled; of these, 90 to 270 would be producing wells. The CBNG development would occur in the southwestern corner of the county. Twenty to 70 of these wells would be drilled on minerals under BLM jurisdiction. This many wells would require from five to 10 field compressors and one to two sales compressors. Additional pipelines would have to be built. Sixty to 180 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Ten to 20 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 60 miles of sales lines would be laid to the main transmission lines.

Conventional

Based on historical drilling rates, we estimate from 15 to 60 wells will be drilled in the next 20 years. Five to 15 of these wells would need to be drilled on minerals under BLM jurisdiction.

Golden Valley County

CBNG

No CBNG wells are anticipated to be drilled in Golden Valley County.

Conventional

Based on historical drilling activity, it is anticipated that 10 to 30 wells would be drilled in the county over the next 20 years. Most of these will probably be near the existing fields. One or two of these wells would be drilled on minerals under BLM jurisdiction.

Musselshell County

CBNG

Based on the estimates of coal in the county, it is projected that 60 to 150 wells would be drilled, and of these, there would be from 50 to 140 producing wells. Five to 20 of these wells would be drilled on minerals under BLM jurisdiction. These wells would require from two to five in-field compressors and one sales compressor. No gas sales lines run through the county. Thirty to 100 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Five to 10 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 60 miles of sales lines would be laid to the main transmission lines.

Conventional

It is estimated that 100 to 350 wells will be drilled in the county in the next 20 years. Ten to 40 of these wells would be drilled on minerals under BLM jurisdiction.

Powder River County

CBNG

Based on the coals present in Powder River County, it is estimated that 2,300 to 6,700 CBNG wells could be drilled. From 1,150 to 3,350 of these wells would be

drilled on minerals under BLM jurisdiction. There would be 2,070 to 6,030 producing CBNG wells, which would require 100 to 250 field compressors, and 10 to 25 sales compressors. There is a transmission line in the southeastern part of the county but more pipelines would have to be built to gather and transport the potential gas that could be produced from this many wells. From 1,380 to 4,000 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Two hundred to 500 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. There would be no more than 60 miles of sales lines laid to the main transmission lines.

Conventional

Based on historical drilling rates, it is anticipated that 80 to 300 conventional wells would need to be drilled in the county over the next 20 years. Thirty to 100 of these wells would be drilled on minerals under BLM jurisdiction.

Rosebud County

CBNG

Based on the coal estimates for Rosebud County, the RFD projects 1,000 to 2,800 CBNG wells will be drilled. From 500 to 1,400 of these wells would be drilled on minerals under BLM jurisdiction. There would be from 900 to 2,500 producing CBNG wells, which would require approximately 40 to 100 field compressors and from five to 10 sales compressors. From 600 to 1650 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Eighty to 200 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors, and there would be no more than 60 miles of sales lines laid to the main transmission lines. There is one gas sales line that runs through the county south of Forsyth. The CBNG development would occur in the southern and eastern half of the county.

Conventional

Based on historical drilling rates in the county, the RFD projects 50 to 300 wells to be drilled over the next 20 years. Five to 50 of these wells would be drilled on minerals under BLM jurisdiction.

Stillwater County

CBNG

The RFD projects 300 to 700 CBNG wells to be drilled in the county. Fifteen to 35 of these wells would be drilled on minerals under BLM jurisdiction. These would most likely be drilled in the vicinity of the existing coal field. From 270 to 630 would be producing CBNG wells. This would require 10 to 25 field compressors and one to three sales compressors. One hundred and eighty to 420 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Twenty to 50 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 30 miles of sales lines would be laid to the main transmission lines.

Conventional

Based on historical drilling rates, the RFD projects 25 to 100 conventional wells will be drilled in the next 20 years. Two to 5 of these wells would be drilled on minerals under BLM jurisdiction.

Sweet Grass County

CBNG

There are no known coal reserves in the county and therefore, no CBNG wells are anticipated for Sweet Grass County.

Conventional

Based on historical drilling rates, the RFD projects that five to 20 conventional wells will be drilled in the next 20 years. Up to 1 of these wells would be drilled on minerals under BLM jurisdiction.

Treasure County

CBNG

Based on the estimated coal volume in this county, the RFD projects that 10 to 25 CBNG wells could be drilled. One to 2 of these wells would be drilled on minerals under BLM jurisdiction. There would be eight to 22 producing CBNG wells, which would require 1 to 2 in-field compressors and 1 sales compressor. Five to 15 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel

routes to the wells and would follow the roads to the field compressors. One to 2 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 10 miles of sales lines would be laid to the main transmission lines.

Conventional

Based on historical drilling rates, the RFD projects one to 10 conventional wells will be drilled in the next 20 years. None of these wells would be drilled on minerals under BLM jurisdiction.

Wheatland County

CBNG

No CBNG wells are projected to be drilled in Wheatland County.

Conventional

Based on historical drilling rates, the RFD projects five to 15 conventional wells will be drilled in the next 20 years. None of these wells would be drilled on minerals under BLM jurisdiction.

Yellowstone County

CBNG

Based on the identified coal, there could be from 50 to 150 CBNG wells drilled in the next 20 years. One to 10 of these wells would be drilled on minerals under BLM jurisdiction. There would be 40 to 140 producing CBNG wells in the county, which would require from two to five field compressors and one sales compressor. Twenty five to 90 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. Five to 10 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 10 miles of sales lines would be laid to the main transmission lines.

Conventional

Based on historical drilling in the county, there could be from 25 to 100 wells drilled in the county in the next 20 years. None of these wells would be drilled on minerals under BLM jurisdiction.

RFD Conclusion

CBNG

During the life of the plan, it is estimated that the number of CBNG wells that may be drilled throughout the Powder River and Billings RMP Planning Areas would range from a low of 6,470 to a high of 18,225—of which 2,975 to 8,450 would be drilled on BLM-administered minerals. There would be from 5,800 to 16,400 producing CBNG wells, of which 2,500 to 7,500 would be BLM administered. For a graphical presentation of these predictions, refer to Map 4-1 in Chapter 4 of this EIS. Table MIN-1 at the end of this section presents the RFD Expanded Development Scenario in numerical form.

These wells would require 250 to 700 field compressors, and 25 to 70 sales compressors. From 3,900 to 11,200 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. Five hundred to 1,400 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors, and approximately 480 miles of sales lines would be laid to the main transmission lines. This would result in 22,500 to 74,000 acres of disturbance.

Powder River RMP Area

During the next 20 years, it is estimated that the number of CBNG wells that may be drilled throughout the Powder River RMP area, would range from a low of 5,400 to a high of 15,600. The number of wells drilled each year would range from 200 to 1,100. There also would be 4,800 to 13,400 producing CBNG wells, which would require 200 to 550 field compressors and 20 to 55 sales compressors. From 3,200 to 8,900 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. From 400 to 1,100 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. Approximately 290 miles of sales lines would be laid to the main transmission lines. This would result in 24,400 to 73,600 acres of disturbance.

Billings RMP Area

During the next 20 years, it is estimated that the number of CBNG wells that may be drilled throughout the Billings RMP area, would range from 1,100 to

2,600. There would be 100 to 2,350 producing CBNG wells, which would require 5 to 100 field compressors and 1 to 10 sales compressors. One hundred to 1,600 miles of plastic, low-pressure gathering lines needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. From 10 to 200 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. Approximately 170 miles of sales lines would be laid to the main transmission lines. This would result in 350 to 18,400 acres of disturbance.

Conventional Oil and Gas

Based on the assumptions listed at the beginning of this section, the number of conventional oil and gas wells that could be drilled would range from 450 to 1,775. The number of wells drilled each year would range from two to seven in each of the 13 counties if the wells were distributed equally among the counties. No estimates of disturbance were made for conventional wells.

Powder River RMP Area

The RFD estimates that 200 to 800 conventional wells would be drilled in the next 20 years in the Powder River RMP area. Seventy to 300 of these wells would be drilled on minerals under BLM jurisdiction. Most of these wells would be drilled in or near the existing fields.

Billings RMP Area

The RFD estimates that 250 to 975 conventional wells would be drilled in the next 20 years in the Billings RMP area. Twenty-five to 100 of these wells would be drilled on minerals under BLM jurisdiction. Most of these wells would be drilled in or near the existing fields.

Reasonably Foreseeable Future Actions—Alternatives B, C, D, E, F, G, and H

The RFFA predictions for Alternative B, C, D, E, F, G and H were developed using the same general assumptions as the RFD. However, the coal tonnages for the Indian reservations are based on the thickest coals (coals over 20 feet thick).

Development Potential

The development potential for CBNG and conventional wells for all owners on the Crow Reservation, Northern Cheyenne Reservation and the Custer National Forest is described in the text that follows.

Ashland District, U.S. Forest Service

CBNG

Coal resources are primarily concentrated in the southern portion of the district. Otter Creek and the Tongue River drainages have eroded or exposed many of the coal zones. Based on the coal resources, the RFFA predicts that approximately 200 wells may be drilled over 20 years. This would result in approximately 400 acres of long-term disturbance.

Crow Reservation

CBNG

Based on the identified coal resources within the reservation, 1,400 to 4,000 CBNG wells could be drilled; of these, 1,300 to 3,600 would be producing wells. The wells would probably be located in the eastern portion of the Crow Reservation. This would require from 50 to 150 field compressors and from five to 15 sales compressors. Eight hundred to 2,400 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. One hundred to 300 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 60 miles of sales lines would be laid to the main transmission lines. This would result in 7,000 to 12,000 acres of disturbance.

Conventional

Based on historical drilling rates, 10 to 50 conventional wells could be drilled in the next 20 years.

Northern Cheyenne Reservation

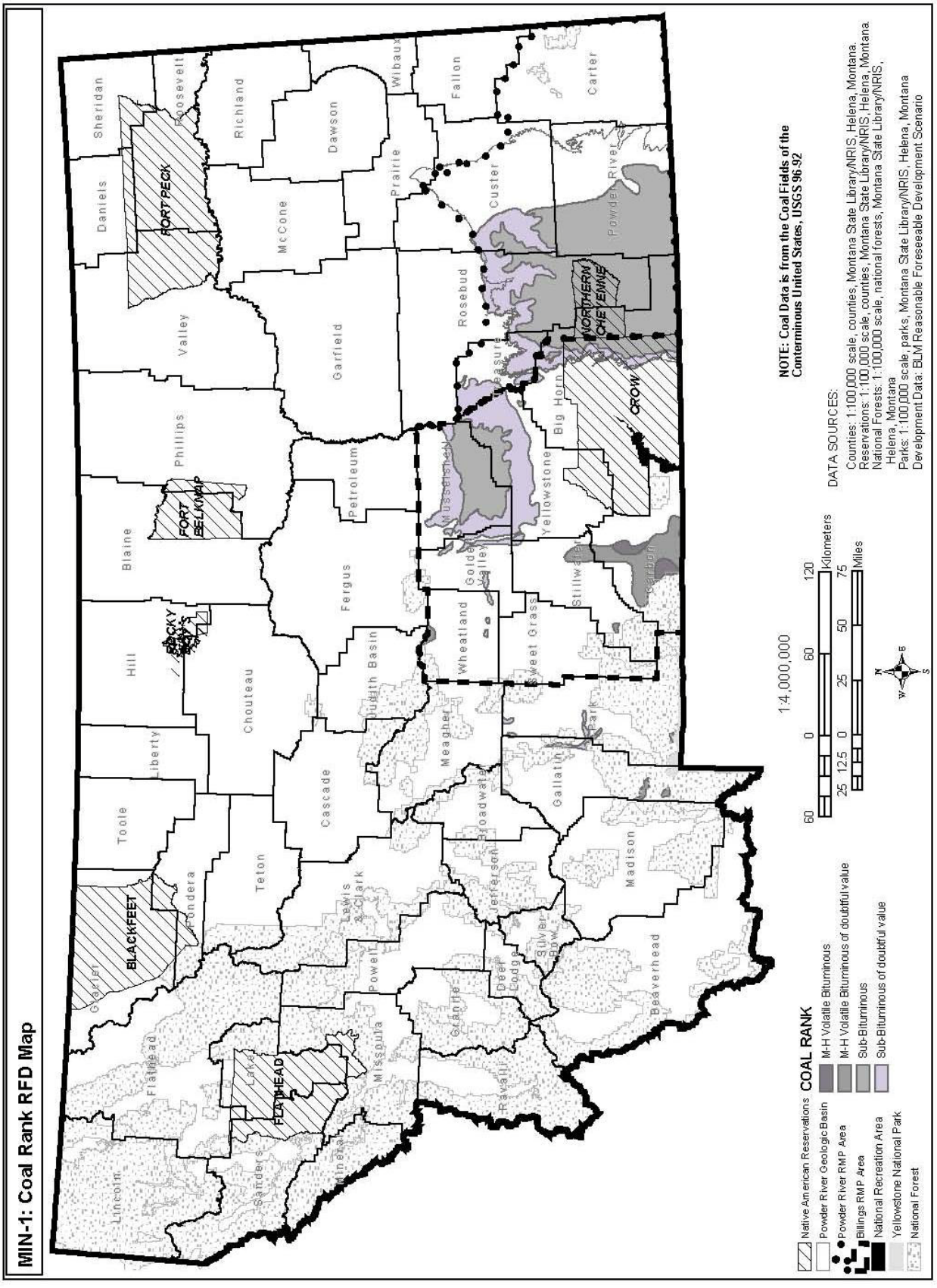
CBNG

Based on coal resources, 1,400 to 4,000 CBNG wells could be drilled on the reservation; of these, there would be 1,300 to 3,600 producing wells. The wells would most likely be located along the southern boarder of the reservation and extend from the western to the eastern boundaries. This would require 50 to 150

field compressors, and from five to 15 sales compressors. Eight hundred to 2,400 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. From 100 to 300 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. There would be no more than 60 miles of sales lines laid to the main transmission lines. This would result in 7,000 to 12,000 acres of disturbance.

Conventional

Based on historical drilling rates, one to five conventional wells could be drilled on the reservation in the next 20 years.


MIN-1: Coal Rank RFD Map
Native American Reservations
Powder River Geologic Basin
Powder River RMP Area
Billings RMP Area
National Recreation Area
Yellowstone National Park
National Forest
COAL RANK
M-H Volatile Bituminous
M-H Volatile Bituminous of doubtful value
Sub-Bituminous
Sub-Bituminous of doubtful value
1:4,000,000
60 0 60 120 Kilometers
25 12.5 0 25 50 75 Miles
NOTE: Coal Data is from the Coal Fields of the Conterminous United States, USGS 96-92
DATA SOURCES:
Counties: 1:100,000 scale, counties, Montana State Library/NRIS, Helena, Montana.
Reservations: 1:100,000 scale, counties, Montana State Library/NRIS, Helena, Montana.
National Forests: 1:100,000 scale, national forests, Montana State Library/NRIS, Helena, Montana
Parks: 1:100,000 scale, parks, Montana State Library/NRIS, Helena, Montana
Development Data: BLM Reasonable Foreseeable Development Scenario
BLACKFEET
FORT PECK
FORT BELKNAP
ROCKY BOY'S
FLATHEAD
NORTHERN CHEYENNE
CROW
Sheridan
Roosevelt
Richland
Dawson
Wibaux
Fallon
Carter
Daniels
McCone
Prairie
Custer
Powder River
Valley
Garfield
Rosebud
Phillips
Petroleum
Big Horn
Blaine
Fergus
Yellowstone
Hill
Wheatland
Sweet Grass
Stillwater
Carbon
Liberty
Toole
Chouteau
Judith Basin
Meagher
Park
Cascade
Gallatin
Glacier
Pondera
Teton
Broadwater
Madison
Lewis & Clark
Jefferson
Powell
Silver Bow
Beaverhead
Flathead
Granite
Deer Lodge
Missoula
Ravalli
Lake
Sanders
Lincoln
Mineral

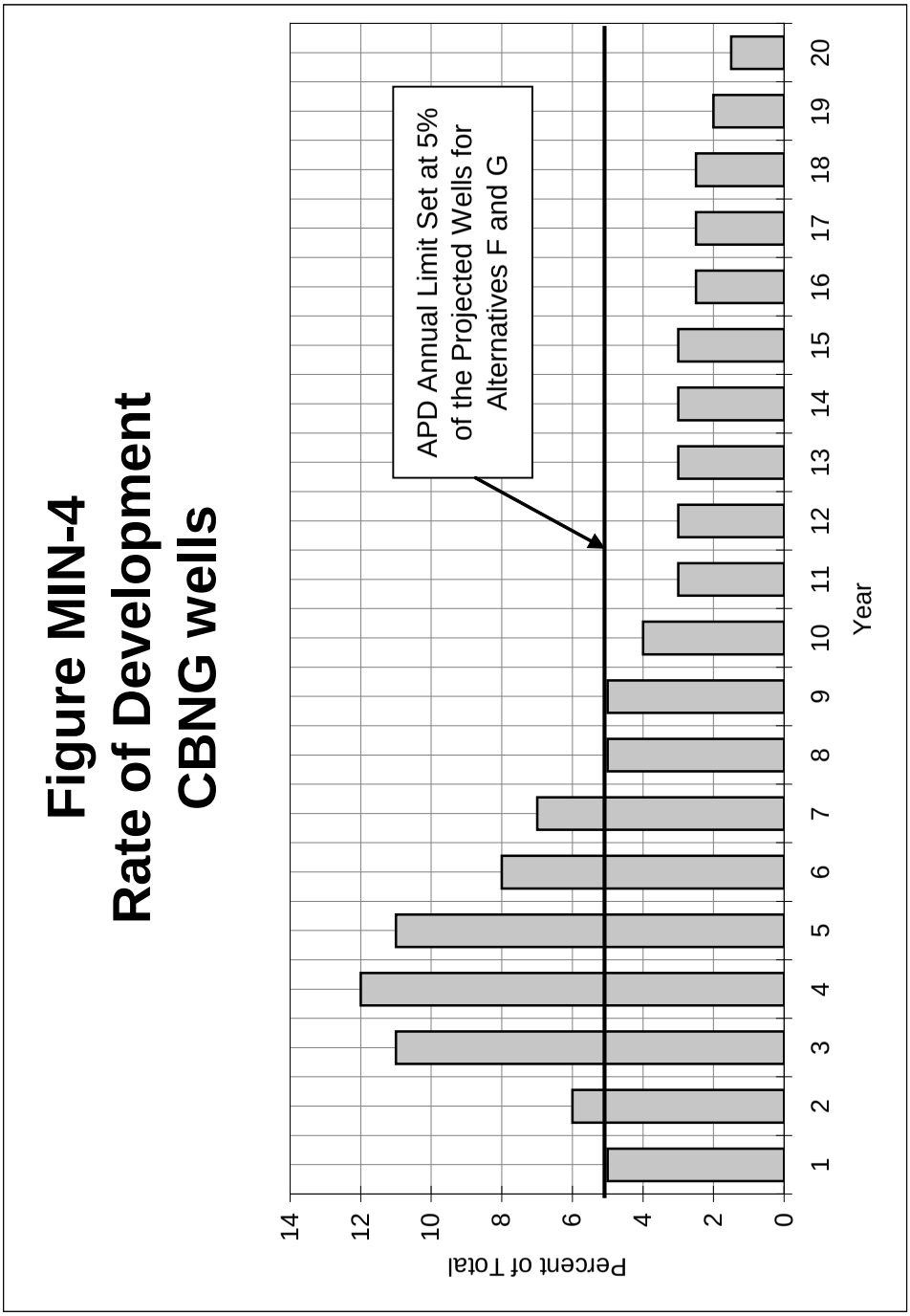
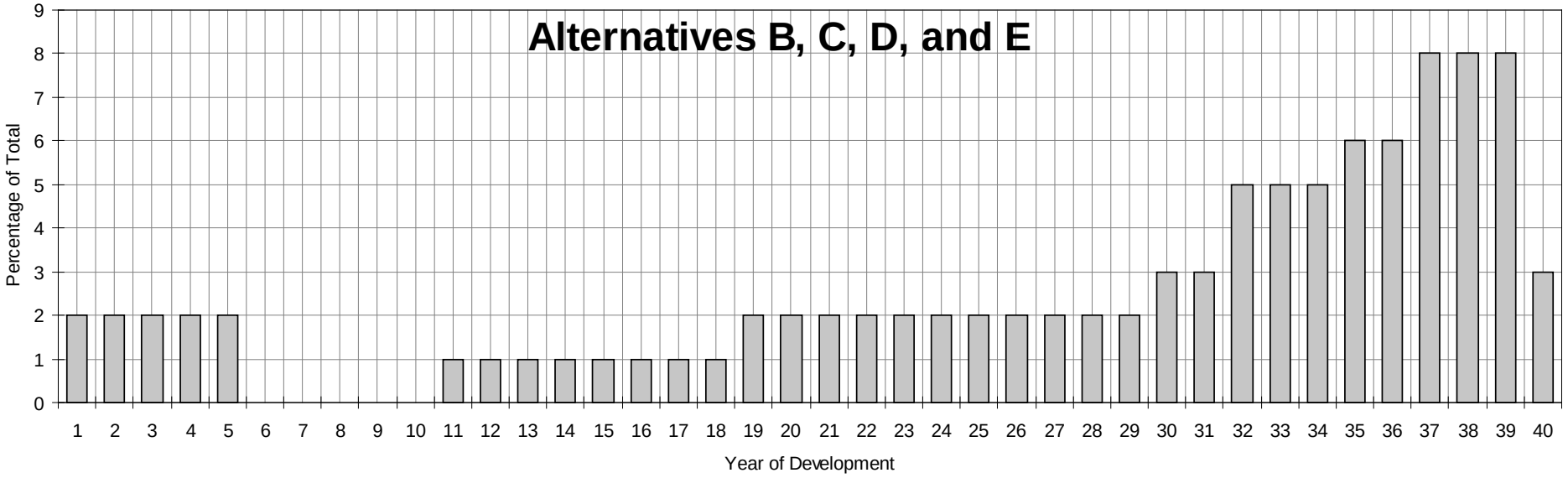


Figure MIN-4
Rate of Development
CBNG wells
APD Annual Limit Set at 5% of the Projected Wells for Alternatives F and G
Percent of Total
0
2
4
6
8
10
12
14
Year
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure MIN-5
Rate of Abandonment of CBNG Wells
Alternatives B, C, D, and E



1) Wells will be drilled over a 20 year period.
2) Wells may have a productive life of 20 years.
3) A well drilled in the 20th year with a productive life of 20 years would be plugged in the 40th year.
4) Initially (years 1-5) some wells will be P&A (1%-2%) while defining the productive areas this accounts for increased dry holes.
5) During years 6-10 most of the wells drilled will be productive.
6) After 10 years some wells will start to be P&A due to declining production.
7) The majority of the abandonment will occur in the last few years, as field production declines to uneconomic.
8) After 40 years all wells will be P&A.

Figure MIN-6
Rate of Abandonment of CBNG Wells
Alternatives F & G

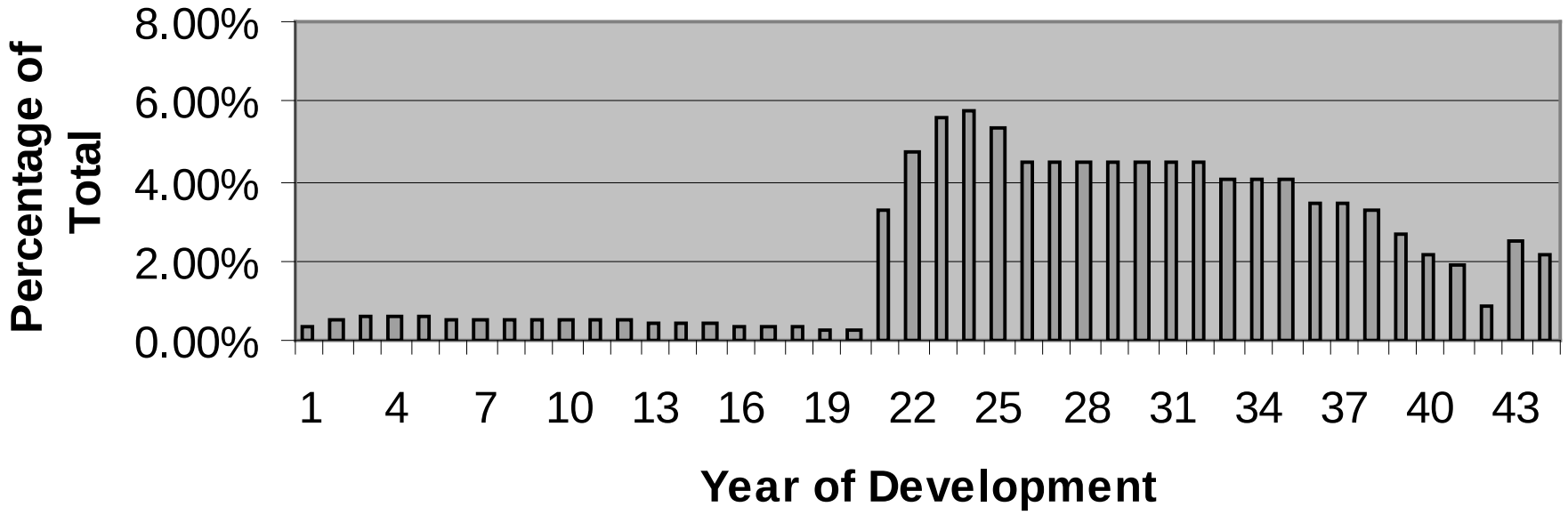


TABLE MIN-1
RFD/RFFA NUMERICAL PREDICTIONS FOR EXPANDED CBNG DEVELOPMENT SCENARIO

County	Total Drilled			Production			Dry Holes/Exploration			Acreage Overlying Coal Occurrences
	Expanded	State	BLM	Expanded	State	BLM	Expanded	State	BLM	Acres
	Reasonably Foreseeable Development (RFD)									
Big Horn	7,000	3,500	3,500	6,300	3,150	3,150	700	350	350	524,738
Carbon	400	320	80	360	288	72	40	32	8	448,000
Carter	0	0	0	0	0	0	0	0	0	0
Custer	300	230	70	270	207	63	30	23	7	418,000
Golden Valley	0	0	0	0	0	0	0	0	0	0
Musselshell	150	130	20	135	117	18	15	13	2	764,000
Powder River	6,700	3,350	3,350	6,030	3,015	3,015	670	335	335	713,500
Rosebud	2,800	1,400	1,400	2,520	1,260	1,260	280	140	140	1,005,500
Stillwater	700	665	35	630	599	32	70	67	4	65,500
Sweetgrass	0	0	0	0	0	0	0	0	0	0
Treasure	25	24	1	23	22	1	3	2	0	153,500
Wheatland	0	0	0	0	0	0	0	0	0	0
Yellowstone	150	140	10	135	126	9	15	14	1	678,000
Total RFD	**18,225**	**9,759**	**8,466**	**16,401**	**8,782**	**7,619**	**1,821**	**975**	**847**	**4,770,738**

TABLE MIN-1
RFD/RFFA NUMERICAL PREDICTIONS FOR EXPANDED CBNG DEVELOPMENT SCENARIO

County	Total Drilled			Production			Dry Holes/Exploration			Acreage Overlying Coal Occurrences
	Expanded	State	BLM	Expanded	State	BLM	Expanded	State	BLM	Acres
Reasonably Foreseeable Future Actions (RFFA)										
Northern Cheyenne	4,000	0	0	3,600	0	0	400	0	0	445,000
Crow	4,000	0	0	3,600	0	0	400	0	0	332,000
Forest Service	200	0	0	180	0	0	20	0	0	501,500
Total RFFA	**8,200**	**0**	**0**	**7,380**	**0**	**0**	**820**	**0**	**0**	**1,278,500**
Total RFD and RFFA	**26,425**	**9,759**	**8,466**	**23,781**	**8,782**	**7,619**	**2,641**	**975**	**847**	**6,049,238**
Powder River RMP	15,635	7,899	7,716	14,071	7,109	6,944	1,563	790	772	2,726,033
Billings RMP	2,590	1,860	750	2,330	1,673	675	258	185	75	2,044,705
RFD Totals	**18,225**	**9,759**	**8,466**	**16,401**	**8,782**	**7,619**	**1,821**	**975**	**847**	**4,770,738**

Big Horn County		Drilled	Production	Dry Holes
Powder River RMP	83.00%	5810	5229	581
Billings RMP	17.00%	1190	1071	119

Note: Percentages indicate portion of Big Horn county overlying known coal occurrence within each RMP excluding the Crow Reservation lands.

Note: The adjustment of numbers in Table MIN-1 is due to the SEIS Planning Area consisting of the Billings and Powder River RMP Areas which do not include Park, Gallatin, and Blaine Counties which were included in the 2003 Statewide FEIS.

CUMULATIVE PROJECTS EVALUATED

Compliance with the National Environmental Protection Act (NEPA) requires analysis of cumulative effects for each alternative. Cumulative effects on the environment are those that result from the incremental impacts of an alternative when added to the other past, present and reasonably anticipated future actions, regardless of who undertakes those actions. In analyzing cumulative effects from this project, it will be important to understand the incremental impacts from other past, present, and future actions planned for the RMP areas. However, not every project can be included in the analysis or the result could become cumbersome; thus, providing decision makers with extraneous information. Therefore, the importance of scoping cannot be overstressed because it provides the initial opportunity to identify boundaries for a meaningful analysis. The cumulative effects study approach is defined by discussing the Study Area Delineation (spatial boundary); past, present, and future projects that meet a minimum criteria of magnitude as to add to the cumulative effect and time frame for the analysis and is discussed in the conclusions section of each alternative.

Study Area Delineation

The planning area for BLM is the Billings RMP area (10,791,964 acres) and the Powder River RMP area (8,567,125 acres). Acre estimates are for all land within the RMP's regardless of ownership, federal, state or private.

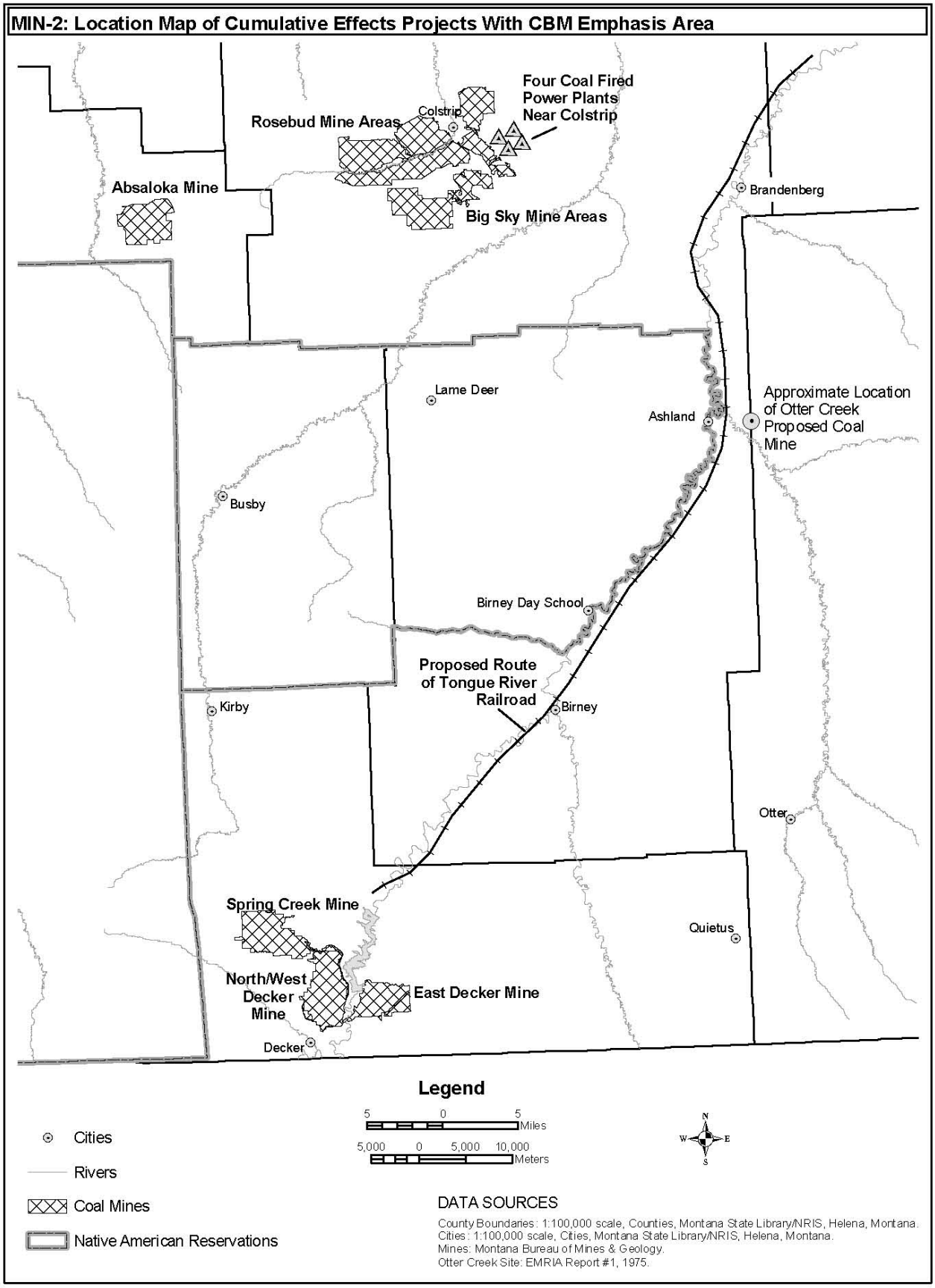
The planning area proposed for the supplemental environmental impact statement (SEIS) RMP is exceptionally large and limits the type of analyses that can be included in the subject analysis. It is important to note that the objective of the cumulative analysis is not to perform the perfect analysis, but to select projects that would be appropriate to the subject analysis and aid in the selection of a preferred alternative. With this in mind, the objective is not to make an attempt to choose all projects throughout the entire state of Montana that might add to the cumulative effect of the BLM's action. This extreme is simply not practical; however, if the thought is more focused, cumulative impact analysis could be chosen on a practical level. Cumulative impacts that might affect other resources are not considered as regionally extensive, the projects/activities to consider may be different. For example, groundwater impacts would be limited to the general area of CBNG production. This would also be the case with soils, agriculture and grazing, cultural and paleontological resources, geology and minerals, Indian trust assets, socioeconomics, and others. Other than air quality related impacts (including visual) and surface and ground water influences from Wyoming CBNG development, BLM believes the proposed study area is appropriate for this plan and is consistent with other BLM plans. Using this approach, combined with the general knowledge of the area, consideration of a study area that is essentially the Powder River Basin is appropriate. We are, however, limited to some extent in what can be considered and must strive to choose those areas and projects and activities that are truly applicable to the process.

As such, the cumulative analysis for this SEIS will emphasize impacts from oil and gas industry-related projects within the project study area and appropriate adjacent areas, depending on the resource being analyzed. The cumulative analysis also considered impacts from the largest foreseeable non-oil and gas industry developments. Activities and projects of sufficient magnitude that may result in cumulative impacts to the environment include natural gas and oil production; surface coal mining; railroads; highways; water storage reservoirs; power plants; potential wildfires; and effects from CBNG development in Wyoming, the Ashland Ranger District and on the Crow and Northern Cheyenne reservations. Map MIN-2 indicates the locations of projects included in the cumulative effects analysis.

A discussion of each project or type included in the cumulative effects analysis follows.

Natural Gas and Oil Production

Impacts from conventional natural gas and oil production are addressed in the *Impacts from Management Common to All Alternatives* discussion under the individual resource topic section of the *Impacts From Management Specific to Each Resource and Alternative*. The impacts from conventional oil and gas development are consistent with the BLM's 1994 *Final Oil and Gas EIS RMP Plan Amendment* to the Billings, Powder River, and South Dakota RMPs, and the state's 1989 *Oil and Gas Drilling and Production in Montana Final EIS*.


MIN-2: Location Map of Cumulative Effects Projects With CBM Emphasis Area
Four Coal Fired Power Plants Near Colstrip
Colstrip
Rosebud Mine Areas
Absaloka Mine
Big Sky Mine Areas
Brandenberg
Lame Deer
Ashland
Approximate Location of Otter Creek Proposed Coal Mine
Busby
Birney Day School
Proposed Route of Tongue River Railroad
Kirby
Birney
Otter
Spring Creek Mine
Quietus
North/West Decker Mine
East Decker Mine
Decker
Legend
Cities
Rivers
Coal Mines
Native American Reservations
5 0 5 Miles
5,000 0 5,000 10,000 Meters
N
W
E
S
DATA SOURCES
County Boundaries: 1:100,000 scale, Counties, Montana State Library/NRIS, Helena, Montana.
Cities: 1:100,000 scale, Cities, Montana State Library/NRIS, Helena, Montana.
Mines: Montana Bureau of Mines & Geology.
Otter Creek Site: EMRIA Report #1, 1975.

Surface Coal Mining

Several mines are present in and around the CBNG planning area. They include operating mines, mines undergoing expansion, reclamation of older mines, and future planned mines. Mines that are generally located within the Powder River Basin and have a potential to add to the cumulative impact include the Spring Creek, Decker, Big Sky, Rosebud, and Absaloka. These mines are located in three general areas: the Spring Creek and Decker mines are in southeast portion of Big Horn County just east of the Crow Reservation; the Absaloka mine is located just outside the northeastern corner of the Crow Reservation in Big Horn County; and the Rosebud and Big Sky mines are located near Colstrip, Montana, just north of the Northern Cheyenne Reservation. Table MIN-2 shows the annual production (2004) of each mine in the planning area along with environmental data for permitted acres, disturbed acres, and backfilled and re-topsoiled acres.

In addition to the quantities identified in the Table MIN-2, the BLM has been conducting a coal screening to identify additional lands that may be suitable for leasing over the next 20 years. Currently, the study has identified lands immediately adjacent to the existing mines. These newly-identified potential lease areas amount to approximately 16,000 acres. Approximately 41,810 acres remain to be disturbed by mining operations during the next 20 years. This estimate is based on current activities and foreseen future developments.

Based on the analysis conducted for this study, it is estimated that the current (2003) production of 36.1 mmtpy of coal in the Montana PRB study area would increase to 56.0 mmtpy under the lower production scenario and to 83.0 mmtpy under the upper production scenario by 2020. Production at currently operating mines is projected to continue throughout the study period. In addition, three potential new developments (i.e., P&M Ash Creek Mine, Otter Creek Mine, and Kinsey Mine) have been identified in the Montana PRB study area. Under the lower production scenario, it is projected that production at the P&M Ash Creek Mine would be initiated by 2010; the Otter Creek and Kinsey mines would not be developed. Under the upper production scenario, it is projected that production would be initiated by 2010 at both the Otter Creek and P&M Ash Creek mines and by 2015 at the Kinsey Mine. Development of these mines would be dependent on markets for the coal and may be tied to development of infrastructure including the Tongue River Railroad and/or power plants. It is assumed that development of the Otter Creek Mine would require construction of Tongue River Rail Company's (TRRC's) proposed Tongue River Railroad and a power plant near Miles City, Montana. However, at this time, no application has been filed for a new power plant at this location. It is assumed that the Kinsey Mine would be developed in response to construction of a mine-mouth power plant; however, an application for a new power plant at this location has not been filed at this time.

Surface water quality within the vicinity of the coal mines is impacted by increased sediment load resulting from increased erosion during mining. This is mitigated by the use of sediment settling ponds and the vegetating of overburden and topsoil storage areas. The discharge of groundwater pumped from mine pits may also affect surface water depending on the quality of groundwater within the mine vicinity and the quantity of groundwater discharged. Much of the groundwater pumped from the mine pits is stored and used to control dust on roads, truck and train car loading areas, and the mine face. In some instances, mining activities require the diversion of streams or drainage areas that are within the area to be mined. Approximate original topography, including stream channels and drainage areas, are restored during mine reclamation activities. All mines are required to monitor their discharges and obtain Montana Pollution Discharge Elimination System permits. The majority of discharges are related to storm responses with the exception of the Decker mines, which has a permit for a regular discharge of 4.5 cubic feet per second into the Tongue River. Impacts to groundwater resources resulting from surface coal mine activities are usually related to drawdown and quality issues from backfilled spoils. Coal beds are among the most dependable and utilized aquifers in

TABLE MIN-2
SURFACE MINES WITHIN THE CBNG PLANNING AREA

Mine	Annual Production 2004 (Short Tons)[1]	Permitted Surface Acres	Disturbed Acres	Backfilled and Re-topsoiled Acres
Spring Creek	12,068,328	6,700	3,000	550
Decker (North/West and East)	8,241,467	11,400	6,921	1,966
Big Sky (Area A&B)	2,850,000	8,100	3,600	2,600
Rosebud (Areas A, B, C, D, and E)	12,664,823	26,400	15,255	6,969
Absaloka	6,474,339	5,400	3,714	2,563
Total	42,298,957	58,300	32,490	14,648

Note: This table shows the cumulative disturbances and reclamation efforts associated with each of the surface mining operations within the CBNG planning area.
[1]Energy Information Administration, Annual Coal Report, 2004, DOE/EIA-0584(2004) (Washington, DC, September 2005). http://www.eia.doe.gov/cneaf/coal/page/acr/table9.html

eastern Montana, because of their fracture-related transmissivity and lateral continuity. Adjacent portions of these aquifers discharge water into the mining pit, which requires that it be pumped-off resulting in the lowering of the water levels within aquifers adjacent to the mine. The area affected and the distance from the mine affected depends on the particular aquifer characteristics of the area, presence of faults, rates of surface water and precipitation recharge, and other factors, and will vary depending on the location of the mine. Groundwater wells, springs, and surface streams within the area can be impacted by the lowered water levels. Those located nearest the mine experience the greatest impact. In the mining areas near Colstrip and Decker, coal aquifers have shown drawdown as much as 75 feet and a radius of impact up to 4 miles (Wheaton and Metesh 2001). The resulting total area of groundwater impact from coal mines is calculated to be 366,000 acres. The rate at which water levels recover varies between mining regions, but normally requires more than 20 years (Wheaton and Van Voast 1998).

Overburden replaced in the mine pits during reclamation is approximately inverted from its original orientation. The mineral content of these near-surface unsaturated and weathered rock layers used in typical overburden affect the groundwater quality within the area of the reclaimed mines. The resulting poor water quality is present for many years after mining is completed. Elevated levels of sodium, magnesium, calcium, bicarbonate, chlorides, and sulfates are possible, as well as increased total dissolved solids (TDS). Dissolution of these salts causes increases in TDS concentrations in the spoils aquifers that have been observed at levels 50 percent to 200 percent greater than the adjacent bedrock aquifers (Wheaton and Van Voast 1998). With time, some sites return to pre-mining quality; however, the impacts to water quality may be everlasting at other sites where soluble salts are continuously generated by weathering and oxidation.

Coal Mine Impacts on Air Quality

Coal mines have an effect on air quality within the region surrounding the surface operations. Air pollutant emissions data are available for five surface coal mines within the planning area; three are in Big Horn County (Absaloka, Spring Creek, and Decker mines), and two are in Rosebud County (Big Sky and Rosebud mines). Table MIN-3 shows the average air pollutant emissions from the mines within the planning area. Volatile organic compounds (VOCs) shown in the table would also include any fugitive methane vented from the mines. Future impacts also would be realized from opening new mines, expanding existing mines, and installing power generation plants at existing coal mines. Wyoming mines would also have an effect on Montana's air quality. Emission sources for these mines as considered in the air quality model have been included in the Air Model Appendix.

TABLE MIN-3
AVERAGE AIR POLLUTANT EMISSIONS FROM SURFACE MINES WITHIN THE PLANNING AREA (TONS/YEAR)

Source	PM_{10}[1]	CO[2]	NO_2[3]	SO_2[4]	VOCs[5]
Existing Coal Mines (5)—Avg/Mine	412.1	323.4	290.2	56.5	18.8

Notes: This table summarizes the impacts to air quality from surface mining sources within the planning area (MDEQ—1999 Air Quality Monitoring Data). Values were obtained from 1999 Toxic Release Inventory for the State of Montana.

[1]PM_{10}—Particulate matter that is less than or equal to 10 microns in size.

[2]CO—Carbon monoxide

[3]NO_2—Nitrous oxides

[4]SO_2—Sulfur dioxide

[5]VOCs—Volatile organic compounds

Highways

There are no current proposals for new highways within the CBNG planning area. It is assumed that several secondary highways, state routes, and county roads will undergo some form of repair, resurfacing, widening, or extension during the course of CBNG development. Currently, a list of proposed road improvements within the CBNG planning area is not available for analysis and quantification. These activities, however, would subject the adjacent lands to impacts associated with linear construction and surface disturbances. For the purposes of this analysis, we are assuming that 250 miles of existing road would be improved over the next 20 years.

Water Storage Reservoirs

The Tongue River flows about 100 miles from its headwaters in Wyoming's Bighorn Mountains to the Tongue River Reservoir. The reservoir is approximately 8 miles long and 1 mile wide, with an average depth of 20 feet, and was completed in 1940. Water leaving the north end of the reservoir flows about 190 miles, northeasterly, until it reaches its confluence with the Yellowstone River at Miles City.

The reservoir was enlarged in 1999, at the request of the Department of Natural Resources and Conservation (DNRC), Northern Cheyenne Tribe, and the U.S. Bureau of Reclamation. The enlargement included the reconstruction of the dam and disturbance of 157 acres. The disturbance included aggregate mining, roads, staging areas, and railroad layout areas, some of which have been reclaimed. As a result of the enlargement, the reservoir capacity was increased by 13,000 acre-feet, the surface water level raised by 4 feet, and the surface area expanded by some 400 acres to nearly 3,615 acres.

Power Generation Plants

Five existing power generation plants are located within the CBNG planning area, and all are coal-fired. Four are located in Rosebud County near the coal mine area and one is located in Billings. The resource area most affected by the burning of coal to produce electrical power is air quality. Air quality data from all five power generation plants are available. Table MIN-4 summarizes the impacts to air quality from these plants within the planning area, according to the MDEQ 1999 Air Quality Monitoring Data.

Hardin Generating Station

The Hardin Generating Station has been permitted, constructed, and is operating as a direct combustion facility. The 116-megawatt coal-fired plant was retrofitted into an existing manufacturing facility, resulting in reduced surface disturbances and no new power lines were needed to move the power. The air quality permit was issued to Rocky Mountain Power for the Hardin Generating Station, however, the project ownership has changed hands, and is now backed by MDU Resources Group, an affiliate of the Montana-Dakota Utilities. The permit was issued by the Montana Department of Environmental Quality in December 2004.

Coal to fuel the plants comes from the nearby Absaloka coal mine operated by Westmoreland. The power plant will burn an estimated 650,000 tons annually. The electricity was contracted by a subsidiary of BC Hydro of Vancouver, British Columbia, the third-largest electrical utility in Canada.

A good source of water comes from the Bighorn River which flows nearby but there is zero discharge of water back into the river as the plant was designed with a closed internal system. The Hardin project is the first plant in the state to install technology to control mercury emissions and will be "state of the art" in pollution control. The technology the plant employs will be a test site for mercury controls during its first three years of operation. Before the three-year period expires, the company must install a technology known as activated carbon injection or a similar technology approved by the Montana Department of Environmental Quality.

Additional information regarding the Hardin Generating Station, such as estimated emission levels, is available in the Air Quality appendix.

Roundup Power Plant

Another power plant project considered in the air quality analysis is the Roundup project proposed by the Bull Mountain Development Company, No. 1, LLC (Bull Mountain). They propose to build a coal-fired electricity generation plant, called the Roundup Power Project, and related facilities on a 208-acre site about 13 miles south-southeast of Roundup, Montana, in Musselshell County. The plant would consist of two steam turbine generating units each burning pulverized coal. The nominal generation capacity would be 780 megawatts.

The boilers would be fueled with coal from the nearby Bull Mountain Mine. Coal would be transported from the mine to the power plant via a 4,000- foot-long conveyor. Power generated by the plant would be transmitted via a 28.2- mile 161kV transmission system, consisting of three circuits, to the Broadview Substation. Boiler water would be supplied by wells drilled into the Madison Formation.

In January, 2003, the DEQ issued a Clean Air Act permit to Bull Mountain Development Corp. for this new plant. However, on July 13, 2005, the DEQ informed Bull Mountain Development Corp. that their air quality permit had expired and a new one must be obtained before construction of the power plants can proceed. The DEQ has offered to extend the permit, if the corporation agrees to additional stipulations for toxic air emissions.

A coal-fired power plant proposed for east of Great Falls by Southern Montana Electric Generation and Transmission Cooperative received a draft air-quality permit from the DEQ. The city of Great Falls joined five rural electric cooperatives in proposing the Highwood Generating Station. The technology planned at the Highwood plant is called circulating fluidized bed combustion. The new technology produces less mercury, sulfur dioxide and other toxic emissions. The plant would generate 250 megawatts and is scheduled to be built by 2008 on a site 8 miles east on the south side of the Missouri River. The plant will burn approximately 1,100,000 tons of coal yearly.

Other power plants maybe envisioned due to the electrical industry's deregulation and the increased demand nation wide. Some of these plants may find it advantageous to locate in Montana near a source of coal or natural gas; however, no new plants were presented to the DEQ for permitting at the time of the 2003 Statewide FEIS.

Wildfires

The BLM Fire Management Program suppresses wildfires and uses prescribed fires to achieve land management objectives. Nationally, 63 percent of wildfires are caused by lighting and the remaining 37 percent by human activities. The average wildfire consumes approximately 370 acres, but the acreage can more than double in severe years that have drought, high winds, or above normal lightning.

Prescribed fires are carefully planned to remove old, woody vegetation, prepare areas for reseeding, or reduce the natural accumulation of dead vegetation. They make room for growth of more nourishing forage for livestock and wildlife, and are often designed to burn a mosaic pattern, leaving patches to serve as cover for some wildlife species. The average prescribed fire covers 150 acres of land. Based on previous RMPs, it is estimated that 25 wildfires would occur per year in the planning area. The fires would range in size from 1/4 acre to 1,000 acres. Surface disturbances caused from fire lines would average 3 acres per fire or a total of 75 acres per year.

TABLE MIN-4
AVERAGE AIR POLLUTANT EMISSIONS FROM FIVE MAJOR SOURCES WITHIN THE PLANNING AREA
(TONS/YEAR)

Source	PM_{10}[1]	CO[2]	NO_2[3]	SO_2[4]	VOCs[5]
Existing Power Plants (5)—Avg/Plant	1534.1	578.9	7977.1	5339.4	69.8

Note: Values were obtained from the EPA Critical Air Pollutants 2001 for the State of Montana.
http://www.epa.gov/air/data/emcatbar.html?st~MT~Montana

1PM10—Particulate matter that is less than or equal to 10 microns in size

2CO—Carbon monoxide

3NO2—Nitrous oxides

4SO2—Sulfur dioxide

5VOCs—Volatile organic compounds

Wyoming CBNG Production

CBNG production in Wyoming is concentrated in the Powder River Basin. CBNG resources of the Powder River Basin are more extensively developed in Wyoming than in Montana. Most of the surface area of the basin is located in Wyoming, with 92 percent of the coal volume located in the Powder River basin lying within Wyoming (Ellis et al., 1999a). The CBNG development in Wyoming has the potential to impact water resources in Montana through the drawdown of groundwater within coal seam aquifers that extend from Wyoming north into Montana and by the discharge of CBNG-produced waters in Wyoming to surface waters that flow north into Montana. The potential magnitude of the impact to Montana water resources from Wyoming CBNG production is tied to the RFD of CBNG in Wyoming. Projections for the RFD of CBNG in the Wyoming portion of the Powder River basin adjacent to Montana have been the subject of recent BLM reports.

CBNG development in Wyoming has the potential to cause substantial impacts in Montana to surface water quality and groundwater resources. The Wyoming DEQ and the Montana DEQ have adopted an interim memorandum of cooperation on limiting discharge to watersheds that extend into Montana, the probability of future agreements is tentative.

The *Coalbed Methane Project Final EIS (Wyodak EIS)* (BLM 1999b) projected 6,000 CBNG wells in the Buffalo Field Office Area. The water model, done as part of the EIS, estimated an average production rate of 12 gpm per CBNG well. This level of development was estimated to result in an increase of approximately 1.1 percent (452 cfs to 457 cfs) in the average flow volume of the Powder River at Moorhead, Montana (BLM 1999b), and an increase of approximately 50 percent (22 cfs to 33 cfs) in the average flow volume in the Little Powder River at the Weston station, which is located approximately 20 miles south of the Wyoming/Montana border. These increases are based on yearly averages. However, during low-flow periods, the Powder River flow volume could be increased by more than 800 percent as a result of the discharge of CBNG-produced waters. Flow volumes in the Little Powder River would consist entirely of discharged CBNG-produced waters (BLM 2001b).

The quality of CBNG produced water from individual wells in the Wyoming portion of the PRB shows considerable variability (Rice et al, 2000); water quality parameters such as SAR vary from approximately 5 to over 30 and TDS varies from approximately 250 million gallons per liter (mg/L) to more than 2000 mg/L. Watershed averages in Wyoming also show variation (BLM, 1999b.); water quality parameters such as SAR vary from an average of 17 in the Powder River Watershed to 9 in the Little Powder River watershed. As CBNG development continues in Wyoming, these average water quality parameter values may change. Surface water quality would be affected by CBNG water discharge, with yearly average SAR values increasing from 4.0 to 4.1 in the Powder River and from 6.0 to 7.5 in the Little Powder River. Impact to the quality of water within the Powder River during low-flow periods is expected to increase water quality concentrations for compounds common to CBNG produced water, including increases in the SAR from values that could be as low as 1 up to approximately 17. During low-flow periods in the Little Powder River, SAR is expected to increase from approximately 6.5 to an estimated value of approximately 9. The Wyoming

EIS (BLM, 1999b.) did not address potential impacts to the Tongue River from discharge of CBNG-produced waters within Wyoming. However, it is expected that impacts of similar magnitude to those predicted for the Powder and Little Powder could occur.

Following the release of the Wyodak EIS (BLM 1999b), the BLM has reassessed the RFD for the Wyoming portion of the Powder River Basin and has issued a new RFD (BLM 2001a). This more recent reasonably foreseeable development study by the BLM indicates that the total number of CBNG wells in the Wyoming portion of the Powder River Basin may approach 50,000 wells (BLM 2001a). This level of development represents an increase of more than 8 times the number of CBNG wells included in the 1999 Wyodak EIS, and if realized, could have a corresponding increase in impact on the quantity and quality of surface water in Montana's Powder River Basin watersheds in terms of annual average measures and especially during periods of low-flow or base-flow. However, actual impacts will be dependant upon the manner in which discharges are managed with respect to CBNG development in Wyoming.

Rivers within the Wyoming portion of the PRB show considerable seasonal variation in terms of flow volume and water quality. The flow volume in the Powder River ranges from a maximum of 1,400 cubic feet per second (cfs) to a minimum of 0.5 cfs. Water quality also varies because flow volume contains varying amounts of meteoric water added to the base-flow contributed by groundwater. If CBNG water discharge rates are essentially constant throughout the year, resultant flows in the river would vary depending upon the ratio of CBNG discharge to natural river flow. Impacts to the Powder River would include a 9 percent increase in the annual average flow volume (450 cfs to 500 cfs), as well as an increase in the annual average SAR value to 5.2. Impacts during natural low-flow periods, however, would cause the river to flow at rates 70 times normal with SAR values in excess of 17.

Annual average flow within the Little Powder River with the impact of CBNG discharge water is extrapolated to increase from 22 cfs to 92 cfs and a resultant SAR of 9. Depending on how CBNG-discharges are managed in Wyoming, these flow rates and water qualities could be maintained during traditionally low-flow periods when the river is normally often dry.

Impacts to the Tongue River drainage are not included in the Wyodak EIS, however, impacts to surface water quantity and quality resulting from the increase in the number of CBNG wells and the resultant increase in the volume of CBNG water discharged in Wyoming are possible. The Upper Tongue River watershed is currently the site of CBNG production and it is expected that more development would occur. Impacts to the Tongue River in Montana are expected to be commensurate with impacts to the Powder and Little Powder Rivers by Wyoming CBNG production. These impacts would result in increases in surface water quantity and decreases in quality. This could result in 3 to 5 times more water entering Montana and an increase in SAR from 0.7 to 5. This is important because Tongue River water quality is the highest in the PRB and the river feeds the Tongue River Reservoir.

Groundwater resources in Montana could also be impacted from CBNG production in Wyoming. CBNG-producing wells in northern Wyoming would cause a drawdown of coal aquifers on adjacent land, with groundwater drawdown possibly extending northward into Montana. Groundwater computer modeling for the Wyodak EIS indicates that the 5-foot drawdown level could extend up to 18 miles from the edge of production, given a 12-gpm per well rate of water withdrawal (BLM 1999b). The modeling values are based on assumptions made regarding the known geology of the Wyoming portion of the basin, which field data has shown to differ from the Montana portion of the basin. The Wyoming coal seams that have been developed are deeper and thicker than the seams in Montana. In addition, the 12-gpm water production value for the state was a “snap-shot” derived from current production data at a single point (1997) early in the life of the PRB CBNG play. The 20-year average rate of 2.5 gpm for Montana was derived from carefully organized data from a single CBNG field considering production trends with time. Nonetheless, both the 12 gpm and the 2.5 gpm rates are projections that may need to be monitored and refined over time as CBNG development proceeds. Given these groundwater modeling results and related assumptions, if CBNG fields were located in Wyoming adjacent to the border with Montana, this could affect groundwater levels for a distance of up to 18 miles into Montana, assuming the parameters used in the Wyoming computer model are applicable to this area of Montana. Drawdown impacts of this magnitude would result in impacts to private lands, the Crow Indian Reservation, state-owned lands, and federal lands controlled by BLM.

CBNG Development on Indian Reservations and the Ashland Ranger District

The development of CBNG resources on the Crow and Northern Cheyenne reservations and on the Ashland Ranger District is assumed to take place during the next 20 years and is therefore included in the cumulative effects analysis. The RFD estimated that 1,400 to 4,000 wells could be developed on each reservation and 50 to 200 wells on the Ashland Ranger District. The impacts associated with this development would be similar to the impacts described within each of the resource topics per alternative and adjusted for magnitude. Of course, the land disturbances, wildlife, cultural and paleontological, visual, social economic, recreational, air quality, soils, and special status species impacts described for those resources would be experienced on the reservations and on the Ranger District. The surface and groundwater quality impacts would be felt on the reservations and on the District but they would also contribute to changes in the watersheds into which the flow.

Tongue River Railroad

The Surface Transportation Board has published a Draft Supplemental Environmental Impact Statement for the Tongue River Railroad Company's (TRRC) proposed rail line construction in Custer, Rosebud and Big Horn Counties, Montana. The document specifically analyzes the proposed 17.3 mile "Western Alignment" route, which had been preceded by two related applications that were considered and approved by the Board in 1986 and 1996, respectively. The proposed Western Alignment is an alternative route for the southernmost portion of the 41-mile Ashland to Decker alignment; known as the Four Mile Creek Alternative. The proposed Western Alignment bypasses the Four Mile Creek alignment, which is generally located from the Birney Road (Hwy 566) and the Tongue River Canyon junction, running west to Hwy 314, then south to the Decker Mine. The Western Alignment would continue south along the Tongue River on the ridge, but paralleling the river and ending around the Spring Creek Mine area.

The Tongue River Railroad is a proposal to build a new rail system to support trains hauling coal along the Tongue River from Miles City to Decker, Montana. The TRRC was authorized to begin construction of the 117-mile railroad in 1996 by the Surface Transportation Board. Operations were scheduled to begin in 2001 but construction has not commenced and no projected start date is available. The rail system, if built, would consist of several spur lines connected to individual coal mines throughout the CBNG emphasis area. The total system would measure approximately 150 miles. Assuming an average 200-foot wide right-of-way, an estimated 3,600 acres would be disturbed by construction and operation activities within the planning areas.

The construction of this rail system would create numerous potential impacts, including socioeconomic issues for local towns along the route, alteration to ranch and grazing lands, reductions in air quality, impediments to Native American cultural sites, increased erosion along the Tongue River riparian areas, increased sedimentation loading in the Tongue River, introduction of noxious weeds, and increased obstructions to wildlife habitat. Specific impacts would be similar to impacts from other surface disturbing activities and emission sources. Details of potential impacts can be found in the EIS and SEIS prepared by the Surface Transportation Board. Mitigation measures would be included with agency permits.

Land Management Agency-Approved Natural Resource Mitigation Measures

Mitigation measures are restrictions on lease operations, which are intended to minimize or avoid impacts to resources or land uses from oil and gas activities. The mitigation measures listed in Table MIN-5 would be applied to permits, leases or approvals granted by the land management agency. The list is not all inclusive, but presents the mitigation measures most often used in the planning area. The wording of the mitigation measure may be modified or additional measures may be developed to address specific conditions. Mitigation measures would be included as appropriate to address site-specific concerns during all phases of CBNG development.

TABLE MIN-5
MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS

Mitigation Measure	BLM	TLMD
Disturbed areas resulting from any construction will be seeded following the BLM seeding policy, state guidance or surface owner's requirements. Depending on surface ownership seeding is usually required during the fall or late spring.	X	
To the extent practicable, vegetation will be preserved and protected from construction operations and equipment except where clearing operations are required to conduct oil and gas operations, such as for roads, well pads, pipelines, power lines, utility lines, and structures. Clearing of vegetation will be restricted to the minimum area needed for construction and equipment.	X	
Temporary and permanent access roads will be avoided on south-facing slopes within big game winter range, where practicable.	X	
To the maximum extent practicable, all maintenance yards, field offices, and staging areas will be arranged to minimize disturbance to trees, shrubs, and other native vegetation.	X	
Topsoil removed by construction activities will be stockpiled for reclamation. Sensitive habitat areas will not be used for topsoil storage.	X	
The planting of grasses, forbs, trees, or shrubs beneficial to wildlife will follow the BLM seeding policy. When needed, BLM will require installation of erosion and sedimentation control measures, such as riprap, erosion mats, mulch, bales, dikes or water bars. Riprap material and placement must be approved by the appropriate agency.	X	
Erosion control and site restoration measures will be initiated as soon as a particular area is no longer needed for exploration, production, staging, or access. Disturbed areas will be recontoured to provide proper drainage.	X	
Topsoil piles may be required to be seeded following the BLM seeding policy.	X	
All above-ground electrical poles and lines will be raptor-proofed to avoid electrocution following the criteria and outlined in the Avian Power Line Interaction Committee (APLIC) (1994) and APLIC (1996). (APLIC 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute, Washington D.C. 78 pp.; APLIC 1996. Suggested Practices for Raptor Protection on Power Lines. Edison Electric Institute. Washington, D.C. 128 pp.).	X	

TABLE MIN-5
MITIGATION MEASURES THAT WOULD BE APPLIED
AS APPROPRIATE TO MINIMIZE IMPACTS

Mitigation Measure	BLM	TLMD
Conduct three nesting habitat surveys for mountain plover in suitable habitat between May 1 and June 15. Surface use may be deleted in accordance with 43 CFR 3101.1-2.	X	
The Surface Management Agency is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. Guidance for application of this requirement can be found in NTL-MSO-85-1.	X	
Cuts and fills for new roads will be sloped to prevent erosion and to facilitate revegetation.	X	
It is the responsibility of the operator to control noxious weeds on lands disturbed in association with oil and gas lease operations. Lease-associated weed control strategies, when required by BLM, are to be coordinated with any involved surface owners and local weed control boards. A pesticide-use proposal must be prepared, and reviewed and approved by BLM prior to any herbicide application on lands disturbed by federal oil and gas lease operations. A pesticide application record must be within 24 hours after completion of application of herbicides. Additional measures may be required to prevent the spread of noxious weeds.	X	
Activities such as stream crossings that could directly impact sensitive or protected fish species will be undertaken during non-spawning periods for these species. In the unlikely event that multiple, sensitive, or protected fish species with back-to-back spawning periods are present in the same stream reach, one of the following options will be exercised. These options include selecting a nearby, alternative stream crossing site that does not provide suitable spawning habitat for the fish species of concern; using a nearby, existing stream crossing over the channel to avoid instream disturbances; or using shore-based equipment to position and extend the pipeline or other item (e.g., temporary bridge) across the stream, thereby avoiding in-channel activities.	X	
Operators must develop a Spill Prevention Control and Countermeasures plan to deal with accidental spills, the plan would include the strategic placement of berms and dikes.	X	
The road ditches would be flat bottomed and “V” ditches would not be allowed. Place water turn outs where appropriate to lessen the water impacts upon the ditches.	X	

TABLE MIN-5
MITIGATION MEASURES THAT WOULD BE APPLIED
AS APPROPRIATE TO MINIMIZE IMPACTS

Mitigation Measure	BLM	TLMD
Prior to surface disturbance on slopes over 30 percent, an engineering/reclamation plan must be approved by the authorized officer. Such plan must demonstrate how the following will be accomplished: • Site productivity will be restored. • Surface runoff will be adequately controlled. • Off-site areas will be protected from accelerated erosion, such as rilling, gullying, piping, and mass wasting. • Water quality and quantity will be in conformance with state and Federal water quality laws. • Surface-disturbing activities will not be conducted during extended wet periods. • Construction will not be allowed when soils are frozen.	X	
Surface occupancy and use is prohibited within existing coal leases with approved mining plans.	X	
Surface occupancy and use is prohibited within riparian areas, 100-year flood plains of major rivers, and on water bodies and streams.	X	
Surface use is prohibited from December 1 to March 31 within crucial winter range for wildlife. This stipulation does not apply to the operation and maintenance of production facilities.	X	
Surface use is prohibited from April 1 to June 15 within established spring calving range for elk. This stipulation does not apply to the operation and maintenance of production facilities.	X	
Surface occupancy is prohibited in the designated Bighorn Sheep Range.	X	
Surface occupancy and use is prohibited within ¼ mile of grouse leks.	X	
Surface use is prohibited from March 1 to June 15 in grouse nesting habitat within 2 miles of a lek. This stipulation does not apply to the operation and maintenance of production facilities.	X	
Surface use is prohibited from March 1 – August 1, within ½ mile of raptor nest sites which have been active within the past 2 years. This stipulation does not apply to the operation and maintenance of production facilities.	X	
Surface occupancy and use is prohibited within ¼ mile of designated reservoirs and fisheries.	X	
The "Draft Guidelines for Oil and Gas Activities in Prairie Dog Ecosystems Managed for Black-footed ferret Recovery" (FWS, 1990) will be used as appropriate to develop site-specific conditions of approval to protect black-footed ferret reintroduction and recovery. Specific conditions of approval will depend on type and duration of proposed activity, proximity to occupied ferret habitat, and other site-specific conditions.	X	

TABLE MIN-5
MITIGATION MEASURES THAT WOULD BE APPLIED
AS APPROPRIATE TO MINIMIZE IMPACTS

Mitigation Measure	BLM	TLMD
Prior to surface disturbance, prairie dog colonies and complexes 80 acres or more in size will be examined to determine the absence or presence of black-footed ferrets. The findings of this examination may result in some restrictions to the operator's plans or may even preclude use and occupancy that would be in violation of the Endangered Species Act (ESA) of 1973. The lessee or operator may, at their own option, conduct an examination on the leased lands to determine if black-footed ferrets are present, or if the proposed activity would have an adverse effect, or if the area can be cleared. This examination must be done by or under the supervision of a qualified resource specialist approved by the Surface Management Agency (SMA). An acceptable report must be provided to the SMA documenting the presence or absence of black-footed ferrets and identifying the anticipated effects of the proposed action on the black-footed ferret and its habitat. This stipulation does not apply to the operation and maintenance of production facilities.	X	
Surface occupancy and use is prohibited within ½ mile of known bald eagle nest sites which have been active within the past 7 years and within bald eagle nesting habitat in riparian areas.	X	
Surface occupancy and use is prohibited within 1 mile of identified peregrine falcon nesting sites.	X	
Surface occupancy and use is prohibited within ½ mile of known ferruginous hawk nest sites which have been active within the past 2 years.	X	
Surface occupancy and use is prohibited within ¼ mile of wetlands identified as piping plover habitat.	X	
Surface occupancy and use is prohibited within ¼ mile of wetlands identified as interior least tern habitat.	X	
Surface occupancy and use is prohibited within sites or areas designated for conservation use, public use, or sociocultural use.	X	
Surface occupancy and use is prohibited within designated paleontological sites.	X	
Surface occupancy and use is prohibited within developed recreation areas and undeveloped recreation areas receiving concentrated public use.	X	
All surface-disturbing activities, semipermanent and permanent facilities in VRM Class II, areas may require special design, including location, painting, and camouflage, to blend with the natural surroundings and meet the visual quality objectives for the area.	X	
Geophysical exploration for oil and gas will not be allowed in the East Pryor Mountains, and Petroglyph Canyon areas of the Billings RMP area.	X	
Geophysical exploration for oil and gas will be allowed on designated roads and trails with restrictions in the Battle Butte, Finger Buttes, and Reynolds Battlefield areas of the Powder River RMP area.	X	

TABLE MIN-5
MITIGATION MEASURES THAT WOULD BE APPLIED
AS APPROPRIATE TO MINIMIZE IMPACTS

Mitigation Measure	BLM	TLMD
Underground explosives for geophysical exploration for oil and gas exploration will not be allowed in the Bridger Fossil area of the Billings RMP area. Other geophysical exploration methods for oil and gas will be allowed at Bridger Fossil if the method will not damage the paleontology resource. If monitoring indicates fossil damage as a result of geophysical activity, it will no longer be allowed.	X	
Geophysical exploration for oil and gas will not be allowed on the significant cultural resource sites of the Castle Butte and Stark Site areas of the Billings RMP area. Geophysical exploration will be allowed (surface methods and vibroseis) in the remainder of the ACEC.	X	
In the sensitive plant areas of the Meeteetse Spires of the Billings RMP area, geophysical exploration for oil and gas will not be allowed by any method. On the remaining area of the Meeteetse Spires, geophysical exploration will be accessed by air only. Exploration will be shot holes and above-ground shots. Vibroseis will not be allowed.	X	
Lessee shall notify and obtain approval from the Department's Trust Land Management Division (TLMD) prior to constructing well pads, roads, power lines, and related facilities that may require surface disturbance on the tract. Lessee shall comply with any mitigation measures stipulated in TLMD's approval.		X
Prior to the drilling of any well, lessee shall send one copy of the well prognosis, including Form 22 "Application for Permit" to the Department's Trust Land Management Division (TLMD). After a well is drilled and completed, lessee shall send one copy of all logs run, Form 4A "Completion Report", and geologic report to TLMD. A copy of Form 2 "Sundry Notice and Report of Wells" or other appropriate Board of Oil and Gas Conservation form shall be sent to TLMD whenever any subsequent change in well status or operator, is intended or has occurred. Lessee shall also notify and obtain approval from the TLMD prior to plugging a well on the lease premises.		X
Issuance of this lease in no way commits the Land Board to approval of coal bed natural gas production on this lease. Any coal bed natural gas extraction wells would require subsequent review and approval by the board.		X
The TLMD will complete an initial review for cultural resources and, where applicable, paleontological resources of the area intended for disturbance and may require a resources inventory. Based on the results of the inventory, the TLMD may restrict surface activity for the purpose of protecting significant resources located on the lease premises.		X
The lessee shall be responsible for controlling any noxious weeds introduced by Lessee`s activity on State-owned land and shall prevent or eradicate the spread of those noxious weeds onto land adjoining the lease premises.		X
The lessee is responsible to pay for all damages, including penalties and charges assessed by the USDA-CFSA on CRP lands, as a result of drilling and production on the tract. All damages will be assessed by and paid directly to the TLMD.		X

TABLE MIN-5
MITIGATION MEASURES THAT WOULD BE APPLIED
AS APPROPRIATE TO MINIMIZE IMPACTS

Mitigation Measure	BLM	TLMD
This lease includes areas that may be environmentally sensitive. Therefore, if the lessee intends to conduct any activities on the lease premises, the lessee shall submit to TLMD one copy of an Operating Plan or Amendment to an existing Operating Plan, describing in detail the proposed activities. No activities shall occur on the tract until the Operating Plan or Amendments have been approved in writing by the Director of the Department. TLMD shall review the Operating Plan or Amendment and notify the lessee if the Plan or Amendment is approved or disapproved.		X
After an opportunity for an informal hearing with the lessee, surface activity may be denied or restricted on all or portions of any tract if the Director determines in writing that the proposed surface activity will be detrimental to trust resources and therefore not in the best interests of the trust.		X
This tract contains navigable river beds. No surface occupancy is allowed within the bed of the navigable river, abandoned channels, or on islands and accretions. In addition, upon completion of a successful well, where river title is disputed, the lessee will file an interpleader action under Rule 22, M.R.Civ.P. in the Montana District Court in which the leased lands are located for all acreage within the lease in which the title is disputed. The lessee shall name all potential royalty claimants as defendants.		X
Lessee must contact the owner of the surface in writing at least 30 days prior to any surface activity. A copy of the correspondence shall be sent to TLMD.		X
No surface occupancy shall be allowed on this tract unless otherwise approved in writing by the Director of DNRC.		X
No surface occupancy shall be allowed on any portion of this tract which is indicated as right-of-way on the official highway plans on file at the Department of Transportation in Helena, Montana without prior written approval from TLMD.		X
It is the opinion of the TLMD that drainage is occurring on the land described in this lease and that if a well is not drilled within two years after this lease is issued the department will consider cancellation of the lease for failure to drill an offset well.		X
Prior to the cutting or removal of timber on these tracts for exploration or development related activities, the lessee shall acquire the approval of the appropriate TLMD area office.		X
To protect wildlife during periods important to their survival, surface occupancy or other activity shall be restricted from (date) through (date) of each year unless otherwise authorized in writing by the TLMD. Dates are determined on a case-by-case basis depending on the applicable species.		X
Potential wildlife conflicts have been identified for this tract. The TLMD will contact the Montana Department of Fish, Wildlife, and Parks office in the area for advice on alleviating any possible conflicts caused by lessee's proposed activities. Additional mitigation measures may be required.		X

TABLE MIN-5
MITIGATION MEASURES THAT WOULD BE APPLIED
AS APPROPRIATE TO MINIMIZE IMPACTS

Mitigation Measure	BLM	TLMD
Potential wildlife conflicts have been identified for this tract. The TLMD will contact the U.S. Fish and Wildlife Service office in the area for advice on alleviating any possible conflicts caused by lessee's proposed activities. Additional mitigation measures may be required.		X
Wildlife species of concern have been identified on or near this tract. A survey in areas of proposed activity may be required prior to disturbance. Identified species will be avoided, unless otherwise authorized by the TLMD. Additional mitigation measures may also be required.		X
Any activity within 1/8 mile of the river, flood plain, or lake/reservoir on or adjacent to this tract must be approved in writing by the TLMD prior to commencement. No surface occupancy is allowed within the bed of the river, abandoned channels, the bed of the lake/reservoir, or on islands and accretions associated with the river or lake/reservoir.		X
No activity shall be allowed within 100 feet of any perennial or seasonal stream, pond, lake, prairie pothole, wetland, spring, reservoir, well, aqueduct, irrigation ditch, canal, or related facilities without prior approval of the TLMD.		X
Due to unstable soil conditions on this tract and/or steep topography, surface use may be restricted or denied. Seismic activity may be restricted to poltershots.		X
Due to existing surface uses (such as center pivots, wheel lines, etc.) development on this tract may be restricted.		X
Plant species of concern have been identified on or near this tract. A vegetation survey in areas of proposed activity will be required prior to disturbance. Identified rare plant species will be avoided, unless otherwise authorized by the TLMD.		X
A critical weed problem exists on this tract. Additional mitigation measures will be required to prevent further spread of noxious weeds. The department may require such measures as power washing of vehicles, car pooling, timing restrictions for seismic, etc. to facilitate this prevention.		X
This tract contains biological weed-control sites which must be avoided unless otherwise authorized by TLMD.		X
No surface occupancy of the cemetery site is permitted without written approval of TLMD.		X
Wooded areas on this tract will be avoided unless otherwise authorized by the TLMD.		X