1.0 INTRODUCTION

The Powder River Basin (PRB) of Wyoming and Montana is a major energy development area with diverse environmental values. The PRB is the largest coal-producing region in the United States (U.S.); PRB coal is used to generate electricity within the PRB and in 39 states. The PRB also has produced large quantities of oil and natural gas resources. Within the last decade, this region has experienced nationally significant development of natural gas from coal seams.

For the purpose of this study, the Wyoming PRB study area (**Figure 1-1**) comprises all of Campbell County, all of Sheridan and Johnson counties less the Bighorn National Forest lands to the west of the PRB, and the northern portion of Converse County. It includes all of the area administered by the Bureau of Land Management (BLM) Buffalo Field Office, a portion of the area administered by the BLM Casper Field Office, and a portion of the Thunder Basin National Grasslands (TBNG), which is administered by the U.S. Forest Service (USFS). The Montana portion of the PRB study area (Figure 1-1) comprises the area of relevant coal mines including portions of Rosebud, Custer, Powder River, Big Horn, and Treasure counties. It encompasses the area administered by the BLM Miles City Field Office. State and private lands also are included in the study area.

During the 1970s and early 1980s, the PRB emerged as a major coal production region. Federal coal leasing was a high profile activity as over 90 percent of the PRB's coal is federally owned. Between 1974 and 1982, the BLM issued three and started a fourth separate regional coal environmental impact statement (EIS), all addressing federal coal leasing and development, as well as other regional development.

In 1982, the BLM temporarily halted further coal leasing. However, mining continued on existing leases. When leasing resumed in 1990, the existing mines were mature operations, and there was no need for regional leasing to open new mines. However, many of the mines were depleting their original reserves, so there was a need for maintenance leasing to provide reserves to enable existing mines to meet the expanding demand. The Powder River Regional Coal Team (PRRCT) decertified the region, allowing BLM to use the lease by application (LBA) process to meet this need. Each LBA required an EIS or environmental assessment as part of the leasing process.

Starting with the first LBAs, the BLM met the need for cumulative analysis in each EIS or EA with a discrete chapter addressing cumulative impacts. This approach served to highlight and focus cumulative impacts as distinct from site-specific impacts. With each subsequent EIS, the cumulative analysis was updated and new information added. In the mid-1990s, the BLM conducted a study called the PRB Coal Development Status Check to evaluate how actual development levels compared to the development levels predicted in the earlier regional EISs. The results of this study were presented to the PRRCT in 1996. Then, in the late 1990s, annual coal production and associated air quality impacts drew closer to the maximum projections in the regional EISs. Furthermore, the large scale oil and gas development associated with coal bed natural gas (CBNG) development had not been foreseen in those EISs.

For the most recent LBAs, the BLM used the cumulative analysis from the Wyodak EIS (BLM 1999) and PRB Oil and Gas EIS (BLM 2003), particularly for air and water resources. Both EISs projected regional development including CBNG activity. They both used market demand projections to estimate future levels of coal development.

In early 2003, BLM completed a study of PRB coal demand through 2020 (Montgomery Watson Harza 2003). The study projected production to increase at a steady pace with current mines able to meet the demand as long as the existing mines continue to have access to additional coal reserves; therefore, the need for leasing using LBAs will continue into the foreseeable future. As part of processing these LBAs, BLM will need to maintain a current cumulative impact analysis. An initial step in that direction is this PRB Coal Review, which includes the identification of current conditions in the PRB.

1.1 Objectives

The objective of this study is to identify the current cumulative air quality impacts from air emission sources in the PRB study area in northeastern Wyoming and southeastern Montana. Impacts are assessed within the PRB as well as at applicable Class I areas, as identified in the Clean Air Act (CAA) Amendments of 1977. Other sensitive receptor areas, as appropriate, also are included in this analysis. The identification of current cumulative impacts was conducted by examining a base year (2002) of emissions data in the PRB and relevant air monitoring data. Impacts at these receptors involved cumulative modeling of base year air emissions using the CALPUFF (Scire et al. 1999a; Federal Land Manager's Air Quality Guidance [FLAG] 2000) air dispersion model.

The air modeling included assessment of contributions to concentrations of nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter with aerodynamic diameter of 10 microns or less (PM_{10}); visibility impacts; and acidic deposition from various source groups (differentiating coal development sources from other sources, such as CBNG, transportation, agriculture, etc.). This study identifies the current conditions as of 2002, including source characteristics, emissions, and impacts. An air dispersion model was employed to estimate cumulative impacts in the PRB and impacts on regional sensitive receptors, including designated Class I and Class II areas. The study also summarizes emissions and impacts of hazardous air pollutants (HAPs) on receptors near the major sources. Although neither U.S. Environmental Protection Agency (USEPA) nor the States of Wyoming or Montana has established ambient HAP standards, an evaluation of cumulative HAP impacts was conducted, using the USEPA's Reference Concentration approach.

The result of this study is an analysis tool that the BLM can use to examine future development scenarios and their potential air quality impacts.

1.2 Key Issues

Key air quality issues include the following:

- Characterizing emissions and controls
  - Air emissions data input to the model must be accurate and complete, and other model input parameters must be appropriate and should be consistent with approaches preferred by regulatory agencies.

  - Future emissions scenario(s) to be modeled must include acceptable, appropriate, and reasonable mitigation and/or control measures.

- Actual emissions from minor sources were used where available; and where not regularly reported, minor sources were estimated from permits and operational data.

- Using representative meteorological input data and representative air quality monitoring data
  - Air monitoring data must be representative, reliable, and quality-assured in order to be used to evaluate the efficacy of the model or to make conclusions about existing air quality.

- Assessing nearby impacts
  - Exceedances of the Ambient Air Quality Standards have been measured within the study area, suggesting that further development may exacerbate an existing problem.
  - Many minor sources in the vicinity have localized impacts.

- Assessing impacts from long-range transport at Class I and sensitive Class II areas
  - Class I areas have more stringent standards and are therefore more vulnerable to adverse impacts.
  - Major sources within the study area have the potential to impact far-field receptors.
  - The CALPUFF modeling system is very conservative, and results must be interpreted or modified on a case-by-case basis.

These key air quality issues are addressed below.

Characterizing Emissions and Controls. While an up-to-date inventory of actual emissions exists for major (i.e., Title V) sources in Wyoming and Montana, in Wyoming, minor sources do not report actual annual emissions; therefore, a tabulation of actual emissions for Wyoming minor sources does not exist. Available actual data for Montana sources was included in the emissions inventory. The Wyoming Department of Environmental Quality (WDEQ) has a list of minor sources and their facility-wide potential to emit (no list of individual units, locations, or emission parameters necessary for modeling). The WDEQ and Montana Department of Environmental Quality (MDEQ) do not track which minor sources have permits but have not been built, which minor sources have been built but are not operating, or whether minor operating sources operate at full capacity. Due to the number of minor sources (many of which are coal mines or CBNG facilities), it is important to approximate the actual emissions from these minor sources as accurately as possible. Therefore while every effort was made to obtain up-to-date actual emissions data for use in modeling, some overestimates and/or underestimates of minor source emissions were unavoidable.

Representative Meteorological and Air Quality Monitoring Data. Air quality currently is monitored by the State of Wyoming at a number of sites, as well as by the National Park Service (NPS), USFS, USEPA, and other groups using a variety of equipment and methods (e.g., ambient monitoring equipment, automated digital cameras, transmissometers, and nephelometers). Meteorological monitoring also is conducted at most visibility monitoring sites (e.g., Interagency

Monitoring Network of Protected Visual Environments [IMPROVE] and IMPROVE-protocol[1] sites), which provide for identification of situations when naturally occurring phenomena obscure or impair visibility. Air monitoring data accessible from the WDEQ's web site are from sites situated throughout the state that are located in rural and urban areas, near industrial and mining facilities, as well as in or near Class I areas. **Table 1-1** provides a list of air quality monitoring sites in the study area, as well as within the air modeling domain. Some sites did not begin operating until after 2002, so their data cannot be used in the evaluation of current conditions, but the data may be useful for the Task 3 report for the study.

IMPROVE (or IMPROVE protocol) monitoring sites in the modeling domain are presented in **Table 1-2**. The WDEQ database has observations from numerous monitoring sites (approximately 75). Plus, there also are monitoring sites from the BLM. The USEPA's Aerometric Information Retrieval System (AIRS) database lists 1 carbon monoxide (CO), 1 oxides of nitrogen (NO_x), 2 ozone (O_3), zero sulfur dioxide (SO_2), and 70 particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}) sites for the entire state; these numbers do not appear to include IMPROVE or IMPROVE protocol sites.

A key issue is ascertaining which air monitoring sites are appropriate for use in defining existing air quality within the study area, which sites are reliable, and which sites are representative of the region, because it is expected that a great deal of local variability may exist. For example, in the case of PM_{10}, for which there are a large number of air monitoring sites within the modeling domain, the data may not necessarily be representative for all impacts to be addressed in this study. Some sites may only operate a limited amount of time. Some sites are co-located with industrial facilities and thus may be biased by a nearby source and not representative of regional air quality. Agency and stakeholder input has been incorporated into the modeling protocol, and specific conditions are noted where appropriate.

In the case of meteorological data, every attempt has been made to use only data that have been quality-assured using USEPA-approved procedures and (where necessary) gap-filling measures or assumptions.

Because the modeling was conducted with meteorological data from 1996, and an emissions inventory representative (to the extent possible) of 2002, differences between modeling results and actual observations are expected.

[1] IMPROVE operates using standard, approved IMPROVE Program methods. Four factors – operation, duration, location, and data availability – define IMPROVE and IMPROVE Protocol sites, with all sites following the same sampling, handling, analytical, and quality assurance procedures.

Table 1-2
IMPROVE Monitoring Sites within the Modeling Domain

Site ID	State	Elevation (meters)	Latitude	Longitude	Site Name
BADL1	SD	736.0	43.7435	-101.9412	Badlands National Park
BADL5	SD	736.0	43.7435	-101.9412	Badlands National Park
BRID1	WY	2607.0	42.9749	-109.7570	Bridger Wilderness Area
BRLA1	WY	3196.0	41.3662	-106.2418	Brooklyn Lake
CLPE1	WY	2469.0	44.3335	-106.9565	Cloud Peak
GAMO1	MT	2392.0	46.8263	-111.7108	Gates of the Mountains
GAMOX	MT	2392.0	46.8263	-111.7108	Gates of the Mountains
NOAB1	WY	2480.0	44.7448	-109.3817	North Absaroka
THBA1	WY	1193.0	44.6634	-105.2874	Thunder Basin
THRO1	ND	853.0	46.8948	-103.3777	Theodore Roosevelt
YELL2	WY	2425.0	44.5653	-110.4002	Yellowstone National Park 2

Assessing Nearby Impacts. Results from the previous PRB Oil and Gas EIS (BLM 2003) and the Montana Statewide Oil and Gas EIS (BLM and Montana Board of Oil and Gas Conservation 2003) air quality modeling indicated that if projects that (at the time) were considered to be reasonably foreseeable were to be built, and all of the emission rates and assumptions inherent in that modeling study were accurate, the following adverse effects might result.

- Annual nitrogen dioxide (NO_2) impacts may exceed the Class I Prevention of Significant Deterioration (PSD) increment in the Northern Cheyenne Indian Reservation.

- 24-hour PM_{10} impacts may exceed the Class II PSD increment near the maximum potential development.

- 24-Hour PM_{10} impacts may exceed the Class I PSD increment in the Northern Cheyenne Indian Reservation and the Washakie Wilderness Area.

Some of the potential development included in the analysis for the PRB Oil and Gas Final EIS is no longer planned; therefore, this study does not include such sources. The PRB Oil and Gas Final EIS suggested that impacts from coal development (including CBNG) could be substantial. Therefore, this study has modeled current (2002) emissions[2] from all sources[3] and compared those results against current monitoring data. This approach should provide a more accurate assessment of the sensitivity of the region to future development, as well as a qualitative measure of how well the CALPUFF model emulates near-field and far-field transport of emissions sources characteristic of those in the PRB.

[2] Accurate up-to-date (mid 2004) emissions inventories are not available; thus, for purposes of this study, “current” is defined as the most recent year for which accurate emissions data are available, which is 2002.

[3] The PRB Oil and Gas EIS (BLM 2003) modeling did not explicitly include emissions from existing sources. Anticipated changes in emissions expected to occur subsequent to a base year were modeled and then a “background value” (presumed to implicitly include emissions from those existing sources excluded from the model) was added to estimate total ambient air quality impacts for a future scenario.

While differences arising from the fact that the meteorological data and the emissions data are not from the same year are to be expected (as noted above), wide differences between these values would suggest that either the emissions estimates or the model's treatment of them could be unrealistic. Impacts from ground-based sources (e.g., coal mines, roads, storage piles) tend to be greatest at areas near the facilities. Therefore, in areas where impacts have been predicted to approach or even exceed the standards, modeling does not prove that harm would occur or has occurred, only that it might occur if all assumptions are correct. Comparison between data observed at monitoring sites and modeled impacts will be used to evaluate the overall model results that are a part of the subsequent Task 3 report for this study.

Assessing Impacts from Long-range Transport at Class I and Sensitive Class II Areas. Federal land managers are charged with the protection of air quality and air quality-related values (AQRVs) in national parks and wilderness areas. Therefore, as future development is evaluated, it is necessary to ensure that such development does not result in exceedances of standards or significant degradation of visibility or AQRVs. The purpose of modeling in Task 1 of this study is to evaluate the impacts of current emissions from existing operations on Class I and sensitive Class II areas and to compare these modeled results with current observations. However, as the modeling was conducted with meteorological data from 1996, and an emissions inventory representative (to the extent possible) of 2002, differences between modeling results and actual observations are expected. Class I areas and the sensitive Class II areas for which long-range transport effects were evaluated are more vulnerable to adverse impacts. A careful evaluation of the current conditions allows the BLM (and other federal land managers) to identify areas that may require more careful scrutiny as development progresses in the future.

Another item addressed during Task I is the issue of HAPs. Neither the USEPA nor the States of Wyoming or Montana have established ambient HAP standards. However, in order to assess the overall air quality impacts from development activities in the PRB study area, an assessment of HAPS was conducted. The impact of short-term (1-hour) HAP concentrations from development-related sources was compared to acute Reference Exposure Levels (RELs). The modeled annual impacts were compared to Reference Concentrations for Chronic Inhalation (RfCs). Accepted methods for risk assessment were used to evaluate the incremental cancer risk for these pollutants. Annual modeled concentrations were multiplied by the USEPA's unit risk factors (based on 70 year exposure) for those pollutants, and then the product multiplied by an adjustment factor that represents the ratio of projected exposure time to 70 years, with appropriate adjustments for exposure.

1.3 Agency Outreach, Coordination, and Review

The BLM directed the preparation of this PRB Coal Review. In order to ensure the technical credibility of the data, projections, interpretations, and conclusions of the study and ensure the study's usefulness for other agencies' needs, the BLM initiated contact with other federal and state agencies early in the study. This contact included meetings, periodic briefings, and written communications.

The BLM conducted an agency outreach program to solicit input from other agencies relative to their:

- Interested role and level of involvement in the study;
- Available data for use in the study;
- Input to the technical approach for resource evaluations; and
- Review of project deliverables.

As part of this agency outreach and technical oversight, the BLM organized technical advisory groups. These groups were composed of agency representatives with technical expertise in the applicable resources. Participating agencies and their regulatory rolls relative to air quality are identified below.

BLM. The National Environmental Policy Act (NEPA) requires that federal agencies (including the BLM) consider mitigation of direct and cumulative impacts during their preparation of an EIS (BLM Land Use Planning Manual 1601). Under the CAA, federal agencies (including the BLM) are to comply with State Implementation Plans (SIPs) regarding the control and abatement of air pollution. Prior to approval of Resource Management Plans (RMPs) or Amendments to RMPs, the BLM State Director must submit any known inconsistencies with SIPs to the Governor of that state. If the Governor of the state recommends changes in the proposed RMP or Amendments to meet SIP requirements, the State Director shall provide the public an opportunity to comment on those recommendations (BLM Land Use Planning Manual at Section 1610.3-2).

WDEQ. Wyoming regulates air pollutants through the Wyoming Environmental Quality Act (W.S. 35-11-101 et seq.). Wyoming also is authorized by an approved SIP to administer all requirements of the PSD permit program under the CAA. Additionally, the approved Wyoming SIP contains a number of programs that provide for the implementation, maintenance, and enforcement of the National Ambient Air Quality Standards (NAAQS), including a New Source Review program for minor source permitting which requires, among other things, application of Best Available Control Technology (BACT) for all new or modified sources regardless of size or source category. Included as well are authorities for the control of particulate emissions, including fugitive particulate emissions from haul roads, access roads, or general facility boundaries. Wyoming also is delegated responsibility to operate an approved ambient air quality monitoring network for the purpose of demonstrating compliance with the NAAQS and Wyoming Ambient Air Quality Standards (AAQS).

MDEQ. Montana regulates air pollution compliance through its CAA of Montana, under the Montana Code Annotated, Title 75 Chapter 2, Parts 1 through 4 and under the Administrative Rules of Montana Title 17 Chapter 8. Montana also is authorized by an approved SIP to administer all requirements of the PSD permit program under the CAA. Additionally, the approved SIP contains a number of programs which provide for the implementation, maintenance, and enforcement of the NAAQS, including a New Source Review program for minor source permitting which requires, among other things, application of BACT for all new or modified sources regardless of size or source category. Included as well are authorities for the control of particulate emissions, including fugitive particulate emissions from haul roads, access roads, or general facility boundaries. Montana also operates an approved ambient air quality monitoring network for the purpose of demonstrating compliance with the NAAQS and Montana AAQS.

USEPA. The USEPA administers the Federal CAA (42 U.S.C. 7401 et seq.) to maintain the NAAQS that protect human health and to preserve the rural air quality in the region by assuring the PSD Class I and Class II Increments for SO_2, NO_2, and PM_{10}, are not exceeded. USEPA has delegated this CAA authority to the States of Wyoming and Montana.

Until the Tribes have a USEPA-approved Tribal program, the USEPA will administer air quality requirements within Indian reservations. The USEPA is responsible for assuring that NAAQS are attained and that the Tribally-designated Northern Cheyenne Class I sensitive airshed is protected, as well as the Class II increment limits that apply on the Crow Reservation. The USEPA will implement an air permitting program for major sources within Indian reservations, where appropriate. At this time, there is no federal minor source permitting program. Therefore, the USEPA does not regulate minor sources on Indian reservations directly unless the USEPA, based on the results of a PSD increment consumption modeling analysis, decides to implement a Federal Implementation Plan. Based on future regulatory modeling in cooperation with MDEQ, the USEPA and Bureau of Indian Affairs may require either Tribe to apply Best Available Control Measures to unimproved roads on Indian reservations or other control measures sufficient to avoid exceeding the Class I and Class II increment limits for PM_{10}.

NPS. Class I areas (administered by the NPS under the CAA) could be affected by existing emissions. As noted in Section 1.2, the previous PRB Oil and Gas Final EIS indicated that if the previously identified reasonably foreseeable development projects were built, adverse effects, including exceeding the PSD increments for NO_x or for PM_{10} may occur in some areas. As federal land managers, the NPS could act in a consultative role to find that any modeling submitted to WDEQ or MDEQ under a permit application demonstrates adverse impacts. Ultimately, the federal land manager may object to the issuance of such a permit. In addition, NEPA requires that federal agencies (including the NPS) consider mitigation of direct and cumulative impacts during their preparation of an EIS.

USFS. Class I areas (administered by the USFS under the CAA) could be affected by existing emissions. As noted above in Section 1.2, the previous PRB Oil and Gas Final EIS indicated that if the reasonably foreseeable development projects were built, adverse effects, including exceeding the PSD increments for NO_x or for PM_{10} may occur in some areas. As federal land managers for designated wilderness areas, the USFS could act in a consultative role to find that any modeling submitted to WDEQ or MDEQ under a permit application demonstrates adverse impacts. Ultimately, the federal land manager may object to the issuance of such a permit. In addition, NEPA requires that federal agencies (including the USFS) consider mitigation of direct and cumulative impacts during their preparation of an EIS.

Coordination with Stakeholder Agencies. A draft air quality modeling protocol was prepared in March 2004 and distributed to stakeholders for comments. The BLM reviewed the stakeholders' comments on the draft protocol and prepared responses, which were distributed and discussed at a stakeholders' meeting in Cheyenne on May 12, 2004. The draft modeling protocol was revised and distributed to stakeholders prior to modeling for the Task 1 report.