APPENDIX G

AIR QUALITY TECHNICAL SUPPORT DOCUMENT

APPENDIX G: AIR QUALITY TECHNICAL SUPPORT DOCUMENT

Introduction

As part of the leasing and permitting process for the Hay Creek II lease by application (LBA) tract, the Buckskin Mine contracted with IML Air Science, a division of Inter-Mountain Laboratories, Inc., to assess potential air quality impacts from mining the proposed tract or an alternative tract configuration within the general analysis area. A portion of the information in this air quality appendix is taken from the Air Quality Technical Support Document (McVehil-Monnett Associates, Inc. 2007) prepared for the West Antelope II Coal Lease Application Environmental Impact Statement (EIS). This information has been updated to current conditions by Inter-Mountain Labs, Inc.

The purpose of this appendix is to provide background information on air quality issues, including the regulatory framework, regional air quality conditions, dispersion model methodologies, and the best available control technology (BACT) process. The actual analyses of known and potential impacts under various alternatives considered in the Hay Creek II LBA EIS appear in section 3.4 of that document. The information presented in the EIS and this technical support document is focused primarily on impacts from emission sources at the Buckskin Mine, the applicant in the EIS. Emissions from neighboring mines are accounted for in the regional monitoring and near-field dispersion modeling discussions. Analysis methods used in preparing this Air Quality Technical Support Document meet or exceed the BLM's "Data Adequacy Standards for the Powder River Coal Region" (BLM 1987) and include use of recent and extensive air quality modeling analyses conducted at the Buckskin Mine by IML Air Science for recent permitting actions.

Regulatory Background

Ambient air quality and air pollution emissions are regulated under federal and state laws and regulations. The Wyoming Department of Environmental Quality/Air Quality Division (WDEQ/AQD) is responsible for managing air quality through the Wyoming Air Quality Standards and Regulations and the Wyoming State Implementation Plan. The WDEQ/AQD has also been delegated authority by the U.S. Environmental Protection Agency (EPA) to implement federal programs of the Clean Air Act Amendments of 1990.

The WDEQ/AQD implements the Wyoming Air Quality Standards and Regulations and Clean Air Act Amendments through various air permitting programs. A proponent initiating a project must undergo new source review and obtain a pre-construction permit or a permit waiver authorizing construction of the project. This process ensures that the project will comply with the air quality requirements at the time of construction. To ensure ongoing compliance, the WDEQ/AQD also implements an operating permit program that can require ongoing monitoring of emissions sources and/or source control systems.

National Ambient Air Quality Standards

The Clean Air Act (CAA) requires the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. These standards define the maximum level of air pollution allowed in the ambient air. The CAA established NAAQS for six pollutants, known as “criteria” pollutants, which “… cause or contribute to air pollution which may be reasonably anticipated to endanger public health or welfare and the presence of which in the ambient air results from numerous or diverse mobile or stationary sources.” The six, present-day criteria pollutants are lead, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3) and particulate matter (PM_{10} and $PM_{2.5}$), where PM_{10} is coarse particulate with mean aerodynamic diameters less than 10 microns and $PM_{2.5}$ is fine particulate with a diameter of 2.5 microns or less.

The CAA and Clean Air Act Amendments allow states to promulgate additional ambient air standards that are at least as stringent, or more stringent, than the NAAQS. The NAAQS and Wyoming Ambient Air Quality Standards (WAAQS), set by the WDEQ/AQD, are listed in table G-1. In some instances, the Wyoming standards are more stringent than the national standards.

During the new source review process, applicants must demonstrate that the facility will not cause or significantly contribute to exceedance of these standards. These demonstrations are made via atmospheric dispersion modeling or other means, including monitoring data approved by the WDEQ/AQD administrator.

The federal standard for particulate matter pollutant was specified as total suspended particles (TSP) until 1987. This measurement included all particulates generally less than 100 microns in diameter. In 1987, the form of the federal standard was changed from TSP to PM_{10} to better reflect human health effects. Wyoming added the PM_{10} standard in 1989, but also retained the TSP standard until March 2000. In 1997, the EPA set separate standards for fine particles ($PM_{2.5}$), based on their link to serious health problems. The EPA adopted an interim $PM_{2.5}$ standard in April 2005, and that standard was later modified in September 2006. That year, the EPA again revised the air quality standards for particulate matter by tightening the 24-hour $PM_{2.5}$ standard from the previous level of 65 micrograms per cubic meter ($\mu g/m^3$) to 35 $\mu g/m^3$ and revoking the annual PM_{10} standard of 50 $\mu g/m^3$. The EPA retained the existing annual $PM_{2.5}$ standard of 15 $\mu g/m^3$ and the 24-hour PM_{10} standard of 150 $\mu g/m^3$. These revisions took effect on December 18, 2006. In view of the December 2006 revisions to the NAAQS for particulate matter, the State of Wyoming entered into rulemaking to revise the WAAQS for particulate matter so that they remain as stringent as or more stringent than the NAAQS. The current Wyoming and federal ambient air standards for PM_{10} and $PM_{2.5}$ are shown in table G-1. The old TSP standard has not been part of Wyoming’s monitoring requirements for more than 10 years. The $PM_{2.5}$ standard is not currently applied to modeling of surface mine emissions. Therefore, any discussion of particulate modeling in Wyoming is confined to PM_{10} emissions. Even with the evolution of state or federal small size particulate standards, TSP is still monitored in some PRB locations.

Table G-1. Six Criteria Air Pollutant Concentrations and Applicable Standards in the Powder River Basin (µg/m³)

Criteria Pollutant	Averaging Time[1]	Background Concentration	Primary NAAQS[2]	Secondary NAAQS[2]	WAAQS	PSD Class I Increments	PSD Class II Increments
CO	1-hour	3,336[4]	40,000	40,000	40,000	—	—
	8-hour	1,381	10,000	10,000	10,000	—	—
NO_2	Annual	5[5]	100	100	100	2.5	25
O_3	8-hour	70[6]	147	147	147	—	—
SO_2	3-hour	181[7]	—	1,300	1,300	25	512
	24-hour	62[7]	365	—	260	5	91
	Annual	13[7]	80	—	60	2	20
PM_{10}[8]	24-hour	54[9]	150	150	150	8	30
	Annual	13[9]	—	—	50	4	17
$PM_{2.5}$[8]	24-hour	13[10]	35	35	65	—	—
	Annual	4[10]	15	15	15	—	—

µg/m³ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; WAAQS = Wyoming Ambient Air Quality Standards; PSD = Prevention of Significant Deterioration increment values; CO = carbon monoxide; NO_2 = nitrogen dioxide; 0_3 = ozone; SO_2 = sulfur dioxide; PM_{10} = particulate matter measuring 10 microns or less in diameter; $PM_{2.5}$ = particulate matter measuring 2.5 microns or less in diameter.

1 Annual standards are not to be exceeded; short-term standards are not to be exceeded more than once per year.

2 Primary standards are designed to protect public health; secondary standards are designed to protect public welfare.

3 All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

4 Data collected by Amoco at Ryckman Creek for an 8-month period during 1978–1979, summarized in Riley Ridge EIS (BLM 1983).

5 Data collected at Thunder Basin National Grassland, Campbell County, Wyoming in 2002.

6 Data collected at Thunder Basin National Grassland, Campbell County, Wyoming in 2002–2004 (8-hour 4th high).

7 Data collected by Black Hills Power & Light at Wygen 2, Campbell County, Wyoming in 2002.

8 On October 17, 2006, the EPA published final revisions to the NAAQS for particulate matter that took effect on December 18, 2006. The revision strengthens the 24-hour $PM_{2.5}$ standard from 65 to 35 µg/m³ and revokes the annual PM10 standard of 50 µg/m³. The State of Wyoming entered into rulemaking to revise the WAAQS.

9 Data collected at the Eagle Butte Mine, Campbell County, Wyoming in 2002.

10 Data collected at the Buckskin Mine 2002.

Source: BLM 2005a and WDEQ/AQD 2002 annual report for each mine, unless otherwise noted above.

Attainment/Non-Attainment Area Designations

Pursuant to the CAA, the EPA has developed a method for classifying existing air quality in distinct geographic regions known as air basins, or air quality control regions, and/or metropolitan statistical areas. For each federal criteria pollutant, each air basin (or portion of a basin or statistical area) is classified as in “attainment” if the area has “attained” compliance with the adopted NAAQS for that pollutant, or is classified as in “non-attainment” if the levels of ambient air pollution exceed the NAAQS for that pollutant. Areas for which sufficient ambient monitoring data are not available to define attainment status are designated as “unclassified” for those particular pollutants.

States use the EPA method to designate areas within their borders as being in “attainment” or “non-attainment” with the NAAQS. Most of the Wyoming PRB, including the general analysis area, is designated an attainment area for all pollutants. However, the town of Sheridan, Wyoming, located in Sheridan County about 100 miles northwest of the general analysis area, is a moderate non-attainment area for PM_{10} due to localized sources and activity. No other non-attainment areas are within 150 miles of the general analysis area.

Prevention of Significant Deterioration

Under requirements of the CAA, the EPA has established prevention of significant deterioration (PSD) rules, intended to prevent deterioration of air quality in attainment and unclassifiable areas. Increases in ambient concentrations of NO_2, SO_2, and PM_{10} are limited to modest increments above the existing or “baseline” air quality in most attainment areas of the country (Class II areas discussed below), and to very small incremental increases in pristine attainment areas (Class I areas discussed below).

For the purposes of PSD, the EPA has categorized each attainment area in the U.S. into one of three area classifications. PSD Class I is the most restrictive air quality category, and was created by Congress to prevent further deterioration of air quality in national and international parks, national memorial parks, and national wilderness areas of a given size threshold which were in existence prior to 1977, when the CAA was enacted, or those additional areas which have since been designated Class I under federal regulations (40 CFR 52.21). Such parks and wilderness areas are considered “mandatory” Class I areas, because they cannot be redesignated. Attainment areas defined as Class I at the request of a state or tribe (e.g., Northern Cheyenne Reservation) are considered “designated” Class I areas; this category is intended to protect air quality in areas of particular interest to the requesting entity. Because designated Class I areas are given that status by request rather than by assignment from the EPA, they can be redesignated at the option of the requesting state or tribe. For all practical purposes, however, both Class I categories are treated the same in terms of air quality and visibility impact modeling. All remaining areas outside of mandatory or designated Class I boundaries were classified as Class II areas, which allow a relatively greater deterioration of air quality over that in existence in 1977, although still within the NAAQS. No Class III areas, which would allow further degradation, have been defined.

The federal land managers have also identified certain federal assets with Class II status as "sensitive" Class II areas for which air quality and/or visibility are valued resources.

The closest mandatory Class I areas to the general analysis area are Wind Cave National Park and Badlands National Park in South Dakota, located about 123 miles east and 165 miles east-southeast of the site, respectively. The closest designated Class I area is the Northern Cheyenne Indian Reservation (in Montana), located about 74 miles from the general analysis area. The closest sensitive areas are the Class II Devils Tower National Monument and the Class II Cloud Peak Wilderness Area, which are approximately 42 and 81 miles from the general analysis area, respectively. PSD regulations limit the maximum allowable increase (increment) in ambient PM_{10} in a Class I airshed resulting from major stationary sources or major modifications to 4 $\mu g/m^3$ (annual geometric mean) and 8 $\mu g/m^3$ (24-hour average). Increases in other criteria pollutants are similarly limited. Specific types of facilities listed in the PSD rules which emit, or have the potential to emit, 100 tons per year or more of PM_{10} or other criteria air pollutants, or any other facility which emits, or has the potential to emit, 250 tons per year or more of PM_{10} or other criteria air pollutants, are considered major stationary sources and must demonstrate compliance with those incremental standards during the new source permitting process. Fugitive emissions are not counted against the PSD major source applicability threshold unless the source is so designated by federal rule (40 CFR 52.21). As a result, the surface coal mines in the PRB have not been subject to permitting under the PSD regulations because the mine emissions that are subject to PSD applicability levels fall below these thresholds.

Best Available Control Technology

All sources being permitted in Wyoming must meet state-specific BACT requirements, regardless of whether the source is subject to state/federal PSD review. During new source review, a BACT analysis is developed for the proposed project. The BACT analysis must evaluate all control options on the basis of technical, economic, and environmental feasibility. BACT for mining operations in the PRB is largely dictated by categorical control requirements defined in the WAQSR. BACT decisions are mandated through the new source review pre-construction permit.

New Source Performance Standards

The New Source Performance Standards are a program of "end-of-stack" technology-based controls/approaches required by the CAA and adopted by reference into the WAQSR. These standards, which apply to specific types of new, modified or reconstructed stationary sources, require the sources to achieve some base level of emissions control. For surface coal mining in the PRB, this includes certain activities at coal preparation plants. Specifically, the applicable requirements can be found at 40 CFR Part 60, Subpart Y (Standards of Performance for Coal Preparation Plants), and in the WAQSR. However, these standards are typically less stringent than state-level BACT limits.

Federal Operating Permit Program

The Clean Air Act Amendments require the establishment of a facility-wide permitting program for larger sources of pollution. This program, known as the Federal Operating Permit Program, or Title V, requires that major sources of air pollutants obtain a federal operating permit. Under this program, a "major source" is a facility that has the potential to emit more than 100 tons per year of any regulated pollutant, 10 tons per year of any single hazardous air pollutant, or 25 tons per year or more of any combination of hazardous air pollutants, from applicable sources. The operating permit is a compilation of all applicable air quality requirements for a facility and requires an ongoing demonstration of compliance through testing, monitoring, reporting and recordkeeping requirements. Under its proposed permit application, the Buckskin Mine's relevant potential to emit PM_{10} would be 15.8 tons per year, well below the 100 tons per year threshold. Fugitive emissions at coal mines do not contribute to the Title V applicability determination.

Summary of Pre-Construction Permitting Procedures

The WDEQ/AQD administers a permitting program to assist the agency in managing the state's air resources. Under this program, anyone planning to construct, modify, or use a facility capable of emitting designated pollutants into the atmosphere must obtain an air quality permit to construct. Coal mines fall into this category. A new coal mine, or a modification to an existing mine, must be permitted by WDEQ/AQD, pursuant to the provisions of WAQSR Chapter 6, Section 2. Under these provisions, a successful permittee must demonstrate that it will comply with all applicable aspects of the WAQSR including state and federal ambient air standards.

When a permittee decides to construct a new surface coal mine or modify operations at an existing surface coal mine that will cause an increase in pollutant emissions, they must submit an application, which is reviewed by WDEQ/AQD new source review staff and the applicable WDEQ/AQD field office. Typically, a company will meet with the WDEQ/AQD prior to submitting an application to determine issues and details that need to be included in the application. A surface coal mining application will include the standard application, BACT measures that will be implemented, an inventory of point and fugitive sources for the mine in question as well as neighboring mines and other sources, and air quality modeling analyses addressing cumulative impacts in the mining region.

The BACT must be employed at all sources permitted/exempted in Wyoming. Per WAQSR Chapter 6, Section 2, BACT at large mining operations typically include but are not be limited to: paving of access roads, treating of haul routes with chemical dust suppressant (and water), and storage of large amounts of materials/coal awaiting shipment in enclosures such as silos, troughs or barns. These and other mitigation measures are considered in the development of emission inventories used for modeling/permitting.

For the modeling analyses, an applicant must compile an emission inventory of PM_{10} from their mining operation, neighboring mines, and other surrounding sources. For PM_{10} from the applicant mine, both point source and fugitive dust emissions are quantified. The emissions are based on the facility's potential to emit in each year of the life of the mine. The applicant also examines the surrounding coal mining operations and their most recent air quality permits to determine their emissions throughout the life of the mine. Two or more worst-case years (generally with the highest potential emissions) are then modeled in detail for ambient air quality impacts. Other surrounding emission sources may also be considered in the modeling analysis. The model years used for this analysis were 2011 and 2012. More information about modeling conducted at the Buckskin Mine and the neighboring northern group of mines is provided in attachment A to this appendix.

Long-term PM_{10} modeling is conducted for the permit application to demonstrate compliance with the annual PM_{10} standard. For the point and area sources, the Industrial Source Complex Long Term model, version 3 (ISCLT3), is typically used.

The WDEQ/AQD has recently required all mines in the PRB to "submit and justify a background PM_{10} concentration with each permit application" (WDEQ/AQD 2006). A site specific PM_{10} background concentration of 12 $\mu g/m^3$ was developed in the modeling analysis and submitted to the WDEQ/AQD for approval in March 2006, prior to submitting the Application to Modify the Buckskin Mine. With WDEQ/AQD approval, the PM_{10} modeling results were added to this background and compared to the annual standard. Likewise, compliance with the annual NO_2 standard was verified using ISCLT3 and added to the WDEQ/AQD-approved NO_2 background concentration.

Short-term PM_{10} modeling is not required by WDEQ/AQD, nor does the agency consider it to be an accurate representation of short-term impacts. Section 234 of the Clean Air Act Amendments mandates the administrator of the EPA to analyze the accuracy of short-term modeling of fugitive particulate emissions from surface coal mines. A June 26, 1996 letter from EPA Region VIII to Wyoming State Representative Ms. Barbara Cubin, details the results of an EPA study wherein the short-term model failed to meet evaluation criteria and tended to significantly overpredict 24-hour impacts of surface coal mines. The memorandum of agreement of January 24, 1994 between EPA Region VIII and the State of Wyoming allows WDEQ/AQD to conduct monitoring in lieu of short-term modeling for assessing coal mining-related impacts in the PRB. This agreement remains in effect and ambient particulate monitoring is required of each coal mine through conditions of their respective permits. The 1994 Memorandum of Agreement also requires WDEQ/AQD to implement "Best Available Work Practice" mitigation measures at any mine where an exceedance of the PM_{10} air quality standard has occurred (Federal Register: September 12, 1995,Volume 60, Number 176).

The permit application is reviewed by WDEQ/AQD to determine compliance with all applicable air quality standards and regulations. This includes review of compliance with emission limitations established by New Source Performance Standards, review of compliance with ambient standards through modeling analyses, and establishment of control measures to meet BACT requirements. The WDEQ/AQD proposed permit conditions are sent to public notice for a 30-day review period, after which a final decision on the permit is made (or a public hearing is held prior to a final permit decision).

The Buckskin Mine has prepared permit applications and conducted air quality modeling analyses (Attachment A) when mine plan changes have dictated and as required by WDEQ/AQD. These applications and analyses demonstrate that mining operations have complied, and will continue to comply, with all applicable aspects of the WAQSR and the Clean Air Act Amendments.

Coal mines in the PRB are also required to quantify nitrogen oxides (NO_x) emissions from their operations. Dispersion modeling is required to demonstrate compliance with the ambient NO_2 standard. Potential emissions from diesel powered mining equipment, blasting, and locomotive emissions (on mine property) are considered in the modeling analyses. In a fashion similar to the PM_{10} analysis, neighboring mining operations and other surrounding sources are also included in the NO_x /NO_2 analysis. Regional NO_x sources generally include power plants, natural gas compressor stations, paved highways, long-haul railroad lines, and municipalities.

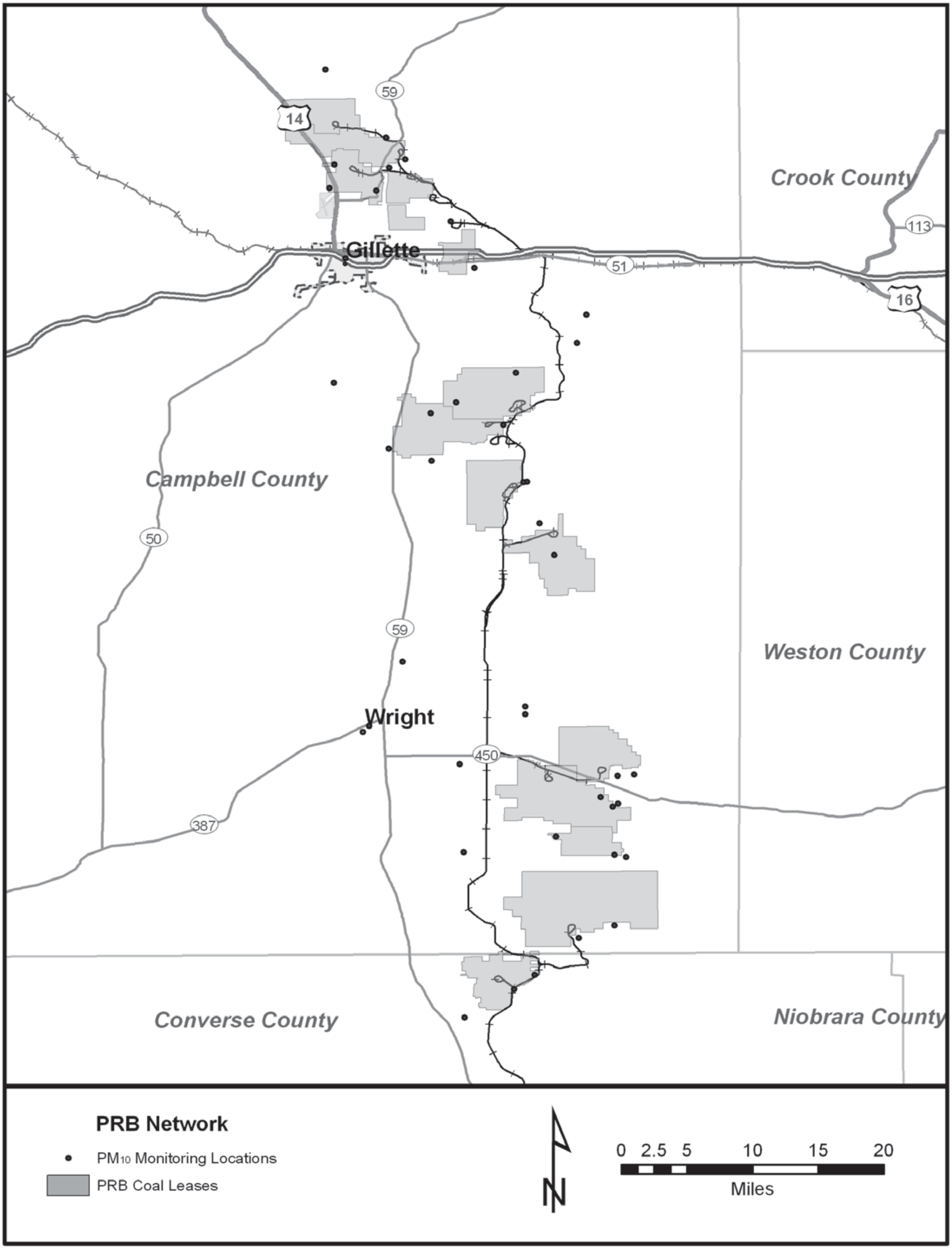
Existing Air Quality

WDEQ/AQD monitors air quality through an extensive network of air quality monitors throughout the state. The eastern portion of the PRB has an extensive network of PM_{10} monitors operated by the mining industry due to the density of coal mines in the region (Figure G-1). Monitors are also located in Sheridan, Gillette, Arvada, and Wright, Wyoming.

This network is sited to measure ambient air quality and to infer impacts from specific sources. Source-specific monitors may also be used for developing trends in PM_{10} concentrations. The WDEQ/AQD uses data from this monitoring network to identify potential air quality problems and to anticipate issues related to air quality. With this information, the WDEQ/AQD can stop or reverse trends that negatively affect the ambient air. Part of that effort has resulted in the formation of a coalition involving the counties, coal companies, and coal bed natural gas (CBNG) operators to focus on minimizing dust from roads.

The WDEQ/AQD may also take enforcement action to remedy a situation where monitoring shows a violation of any standard. If a monitored standard is exceeded at a specific source, the state agency may initiate enforcement against that source. In those instances, the state agency may use a negotiated settlement agreement to seek corrective action.

WDEQ/AQD operates two visibility monitoring stations in the PRB, both of which are Interagency Monitoring of Protected Visual Environments (IMPROVE) sites. One of these sites is located north of Gillette. This site includes a nephelometer, a transmissometer, an aerosol monitor (IMPROVE protocol), and meteorological instruments to measure wind speed, direction, temperature, and relative humidity. The site is also equipped with a digital camera and analyzers for ozone and NO_x. The second visibility monitoring station is located west of Buffalo and includes a nephelometer, a transmissometer, an aerosol monitor (IMPROVE), meteorological instruments to measure wind speed, direction, temperature, and relative humidity, plus a digital camera.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure G-1
Active PM_{10} Monitoring Stations in Northeastern Wyoming

Air quality monitoring equipment for NO_2 within the PRB includes a WARMS operated by the BLM to detect sulfur and nitrogen concentrations near Buffalo, Sheridan, and Newcastle and a National Atmospheric Deposition Program (NADP) monitoring system for precipitation chemistry in Newcastle. WDEQ/AQD operates ambient NO_x monitoring systems near the Belle Ayr and Antelope mines.

Particulates

The WDEQ/AQD requires monitoring data to document the air quality at all of the PRB mines. Each mine monitored PM_{10} for a 24-hour period every six days at multiple monitoring sites through the end of 2001. This frequency was increased by the WDEQ/AQD to one in every three days at many sites beginning in 2002. Continuous PM_{10} monitoring in the PRB began in 2001 and the number of continuous monitors has increased steadily since. As a result, the eastern PRB is one of the most densely monitored areas in the country (Figure G-1). Table G-2 uses the annual arithmetic average of all sites to summarize these data.

The long-term trend in particulate emissions was relatively flat from 1980 through 1998, despite a six-fold increase in coal production and a ten-fold increase in overburden stripping. This relatively flat trend in particulate emissions is due in large part to the BACT requirements of the Wyoming air quality program. These control measures include watering and chemical treatment of roads, limiting the amount of area disturbed, temporary revegetation of disturbed areas to reduce wind erosion, and expedited final reclamation.

The increases PM_{10} concentrations in 1999 and 2000 (table G-2) may be related to drought conditions as well as increases in coal and overburden production at the PRB mines, and coincident increases in other natural resource development activities such as CBNG.

The average annual PM_{10} concentration increased from 15.3 $\mu g/m^3$ in 1997 to 24.4 $\mu g/m^3$ in 2000. The average monitored concentrations decreased to 19.6 $\mu g/m^3$ in 2004, but increased to 25.4 $\mu g/m^3$ by 2007, the latest year for which complete statistics are available.

Table G-2. Summary of PM_{10} Monitoring in Wyoming's Powder River Basin, 1997–2007

Year	Number of Monitors	Average Concentration
1997	18	15.3
1998	19	15.8
1999	20	21.4
2000	23	24.4
2001	28	23.4
2002	32	21.9
2003	34	20.8
2004	36	19.6
2005	36	21.1

Year	Number of Monitors	Average Concentration
2006	36	23.9
2007	35	25.4

Source: EPA AirExplorer, 2009

County roads are also responsible for some portion of the fugitive dust related to transportation. To help address this problem, the Campbell County Commissioners, CBNG and oil production companies, and coal mine operators have formed a coalition to implement the most effective dust control measures on a number of county roads. Measures taken have ranged from the implementation of speed limits to paving of heavily traveled roads. The coalition has used chemical treatments and alternative road surface materials to control dust as well as closing roads where appropriate or necessary and rebuilding existing roads to higher specifications. The coalition requested money from the Wyoming State Legislature to fund acquisition of Rotomill (ground up asphalt) to be mixed with gravel for use in treating some of the roads in the PRB. The Rotomill/gravel mixture has been demonstrated to be effective in reducing dust; the life of the mixture on treated roads is estimated to be from five to six years (Bott 2006).

The most recent air permit action for the Buckskin Mine used a background concentration of 12 $\mu g/m^3$ for PM_{10}, based on a five-year history of continuous monitoring at two Buckskin sites. Modeled PM_{10} impacts include this background and the impacts from other coal mines in the northern PRB. The NO_2 background concentration was assumed to be 14 $\mu g/m^3$ based on recently monitored values at the Belle Ayr Mine in 2001 and 2002. Modeled NO_2 impacts include this background and the impacts from regional sources such as other coal mines in the northern PRB, natural gas compressors, power plants, railroads, highways and urban sources.

In 2006, the Buckskin Mine submitted detailed modeling analyses to the WDEQ/AQD in support of a request for a permit modification, which addressed the impacts associated with a proposed production increase to its current permitted level of 42 million tons per year and proposed improvements to mine facilities. These analyses considered all emissions sources and included the neighboring Eagle Butte, Rawhide, Dry Fork, Wyodak and Fort Union mines. The WDEQ/AQD approved the mine modification in Permit MD-1379, issued January 17, 2007.

Nitrogen Dioxide

Annual mean NO_2 concentrations have been periodically measured in the PRB since 1975. The annual mean NO_2 concentrations recorded by those monitoring efforts have all been well below the 100 $\mu g/m^3$ standard. The highest annual mean concentration recorded to date was 22 $\mu g/m^3$ at two separate sites between March 1996 and April 1997.

NO_2 is a product of incomplete combustion at sources such as gasoline- and diesel-burning engines or from mine blasting activities. Incomplete combustion during blasting may be caused by wet conditions, fractured geological formations, deformation of bore holes, and other factors. Generally, blasting-related NO_x emissions are more prevalent at operations that use the blasting technique referred to as cast blasting (Chancellor pers. comm.). Cast blasting refers to a type of direct blasting in which the blast is designed to cast the overburden from on top of the coal into the previously mined area. The Buckskin mine does not use this technique and does not anticipate doing so in the future. The higher strip ratios at Buckskin do not lend themselves to dragline excavation, with which cast blasting is commonly associated.

Mining sources of NO_x were modeled as fugitive emissions from the areas where mining activities were projected to occur. These included overburden and coal blasting emissions, tailpipe emissions from mobile equipment, and locomotive tailpipe emissions from the Buckskin, Rawhide, Eagle Butte, Dry Fork, Fort Union and Wyodak mines. Stationary equipment tailpipe emissions from Buckskin were also modeled. NO_x emissions from blasting were estimated using emission factors provided from EPA guidance document AP-42, Section 13.3, “Explosives Detonation.” EPA emission factors were also used for NO_x emissions from tailpipes and locomotives (EPA 2009).

In the mid-to late-1990s, OSM received complaints from several citizens about NO_2 emissions from blasting (particularly cast blasts) from several mines in the PRB. The EPA expressed concerns that NO_2 levels in some of those blasting clouds may have been sufficiently high at times to cause human health effects. The WDEQ/AQD also had general concerns about levels of NOx from all types of development in the PRB. In response to those concerns, the coal mining industry instituted a monitoring network in cooperation with the WDEQ/AQD to gather data on NOx emissions beginning in 2001. Additional monitoring was conducted throughout the PRB from 2003 to 2006. Coal mines in the PRB, including the Buckskin Mine, have voluntarily modified their blasting techniques; the WDEQ/AQD has imposed additional blasting restrictions at a limited number of mines (excluding Buckskin). More information about these studies and restrictions is presented in the following discussion.

On the order of the Director of the WDEQ, members of the mining industry in the PRB conducted a comprehensive, multi-year monitoring and modeling study of NO_2 exposures from blast clouds. The study was conducted at the Black Thunder Mine in the southern PRB, which is one of the largest surface coal mines in the nation. Results of the study (Thunder Basin Coal Company 2002), conducted pursuant to protocols reviewed and approved by the WDEQ/AQD, were provided to the agency and the public in July 2002.

Using a combination of NO_2 measurements collected near 91 blast sites (78 valid runs) and a conservative modeling/extrapolation approach, the authors developed a series of “safe” setback curves for coal, overburden, and cast shots for various wind speed classes. The curves were derived from the sampled data, conservative projections of concentrations at greater/lesser distances than measured, and an assumed safe level (based on a comprehensive review of available health effects data) of 5.0 parts per million for 10 minutes.

Subsequently, the data in the 2002 report were augmented with monitored data/analyses from an additional 45 validated blast events at the Eagle Butte, North Antelope Rochelle, Buckskin, and Cordero-Rojo mines. New curves were developed, based on the entire basin-wide data set, encompassing 123 valid tests, but they differed only slightly from the original Black Thunder curves.

Other regional sources of NO_x are also modeled. These included power plants (Neil Simpson I and II, Wygen I, II, and III, Wyodak, Two Elk, and Dry Fork Station), gas compressor stations, railroads, highways and the City of Gillette. The KFx coal upgrading facility was also modeled. Emission factors and rates for these regional sources were provided by the WDEQ/AQD. Highways, railroads and urban areas were modeled as area sources, while the power plants, compressor stations and KFx were treated as point sources.

Individual and combined impacts from Buckskin, the other northern mines, and regional sources were evaluated at all model receptors. These receptors were placed around the perimeter of the North Area mines and outward in a rectangular grid with 500-meter spacing. The extent of the receptor grid was sufficient to encompass the area of significant NO_x impact from the Buckskin Mine (1.0 $\mu g/m^3$ or more). NO_2 impacts were derived by multiplying modeled NO_x concentrations by 75% (per Section 6.2.3 of EPA's Guideline on Air Quality Models, Appendix W to 40 CFR Part 51) and adding a background NO_2 concentration of 14 $\mu g/m^3$. This background was based on WDEQ/AQD guidance and ambient NO_x monitoring results at Foundation Coal's Belle Ayr Mine in 2001 and 2002.

Sources of fugitive NO_x emissions at the Buckskin Mines include overburden removal and coal blasting events, tailpipe emissions from the mining equipment, and emissions from the trains used to haul the coal from the mine. The mine does not have any point sources for NO_x.

NO_x modeling was conducted in support of the Buckskin Mining Company's June 2006 air permit application. Similar in scope to the PM_{10} analysis, emissions from Buckskin, neighboring mines and other regional sources were modeled for the two worst-case years of 2011 and 2012.

Maximum annual NO_2 impacts (including regional sources and background concentration) at any model receptor of 38.0 $\mu g/m^3$ and 37.8 $\mu g/m^3$ were predicted in 2011 and 2012 respectively, as compared to the annual NO_2 NAAQS of 100 $\mu g/m^3$. At the model receptor where these maximum values occurred, Buckskin's contributions were 1.6 $\mu g/m^3$ in 2011 and 1.8 $\mu g/m^3$ in 2012. This receptor is in an area impacted primarily by neighboring mines.

Ozone

O_3 has the same chemical structure whether it occurs miles above the earth or at ground-level and can be "good" or "bad," depending on its location in the atmosphere. In the earth's lower atmosphere, ground-level O_3 is considered "bad." Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents as well as natural sources emit NO_x and VOC that help form O_3. Ground-level O_3 is the primary constituent of smog. Sunlight and hot weather cause ground-level O_3 to form in harmful concentrations in the air. As a result, it is known as a summertime air pollutant. Many urban areas tend to have high levels of "bad" O_3, but even rural areas are also subject to increased O_3 levels because wind carries O_3 and pollutants that form it hundreds of miles away from their original sources.

Under the Clean Air Act, EPA has set protective health-based standards for O_3 in the air we breathe. Prior to May 27, 2008, the NAAQ 8-hour standard for O_3 was 0.080 parts per million (157 $\mu g/m^3$). On March 27, 2008 (effective May 27, 2008) the EPA revised the 8-hour standard to 0.075 parts per million (147 $\mu g/m^3$). Ozone monitoring is not required by the WDEQ/AQD at the Buckskin Mine but levels have been monitored at WDEQ/AQD operated and maintained ambient air quality monitor sites in the PRB since 2001. An exceedance of the O_3 8-hour standard occurs if the 4th-highest daily maximum value is above the level of the standard (0.08 parts per million prior to 2008 and 0.075 parts per million since 2008).

References

Bott, Kelly. WDEQ/AQD, Cheyenne, WY. November 28, 2006—email to Nancy Doelger, BLM, Casper, WY.

Chancellor, Rick. Wyoming Department of Environmental Quality, Cheyenne State Office, Cheyenne, WY. June 16, 2003.

McVehil-Monnett Associates (MMA). 2007. Draft Air Quality Technical Support Document (AQTSD) for the West Antelope II LBA. March. Englewood, CO

Thunder Basin Coal Company. 2002. Black Thunder Mine Report for Development of SAE Setback Distances for Blasting Activities at the Black Thunder Mine. July.

U.S. Bureau of Land Management. 1987. Data Adequacy Standards for the Powder River Coal Region. November.

U.S. Environmental Protection Agency. 2009. AP-42 Volume II, Mobile Sources, Compilation of Air Pollutant Emission Factors. Available: <http://www.epa.gov/oms/ap42.htm>.

Wyoming Department of Environmental Quality/Air Quality Division (WDEQ/AQD). 2006. PRB Coal Mine Permitting Guidance Memorandum. Available: <http://deq.state.wy.us/aqd/sec21/PRB%20Permit%20Guidance_4.pdf>. Accessed: February 24, 2007.

ATTACHMENT A – AIR QUALITY MODELING SUMMARY

for **Bureau of Land Management**

BLM Wyoming State Office
Casper Field Office
Casper, Wyoming

Air Quality Modeling Summary
Buckskin Mine Permit MD-1513

April 2009 ***by IML Air Science***

INTER-MOUNTAIN LABS

555 Absaraka
Sheridan, WY 82801
(307) 674-7506

1.0 Introduction

In June 2006, IML Air Science. (IML) submitted a modeling study to the Wyoming Department of Environmental Quality, Air Quality Division (AQD) on behalf of the Buckskin Coal Company (BCC). This study was performed in support of a BCC permit application to increase annual coal production at the Buckskin Mine from 27.5 MMTPY to 42 MMTPY and to install a new truck dump, primary and secondary crusher, conveyor, transfer tower and coal silo to accommodate this increase. Based on the modeling and permit application, Permit MD-1513 was subsequently issued on January 17, 2007 by the AQD. This document summarizes the modeling process and results from that study, as referenced in the Hay Creek II Environmental Impact Study.

Since mine plan changes were necessitated by this coal production increase, the goal of this modeling study was to demonstrate that the proposed changes would not prevent the attainment or maintenance of the PM_{10} and NO_2 air quality standards in Wyoming. To that end, air quality modeling in Wyoming consists of the following steps:

- Development of an updated mine plan to account for the coal production increase
- Generating an updated list of equipment required to achieve the production increase
- Determination of "open acreage" requirements
- Determination of BACT for qualifying fugitive and point sources
- Determination of miscellaneous emission control practices
- Development of emission inventories and "worst-case" year determination
- Determination of background PM_{10} and NO_2 concentrations
- Model selection, execution and results

The following sections describe this process for the Buckskin Mine in greater detail.

2.1 Mine Plan

BCC's Buckskin Mine is an existing multiple-pit surface coal mine that utilizes traditional truck and shovel techniques to mine coal. To account for the proposed production increase, BCC developed an updated topsoil stripping, coal mining and reclamation sequence, which would allow for coal extraction at the Buckskin Mine through the year 2018. This mine plan was finalized and subsequently submitted to IML for use in the model.

2.2 Mine Equipment List

BCC developed an inventory of mine equipment required to attain the proposed production increase. This inventory varies from year to year depending on haul distance, overburden thickness, and other factors. The percentage of larger equipment generally increases through time as older, smaller equipment is retired. Accompanying the production increase, BCC was to install a second truck dump, primary crusher, conveyor system, secondary crusher, and transfer tower, along with an additional coal storage silo. This information was submitted to IML for use in the model.

2.3 Open Acreage

Permitting requirements established by AQD in 2002 include a discussion of open acreage potentially subject to wind erosion. More specifically, the requirement is to discuss, summarize, and map the land status for the current year and for the years modeled. This is similar to a Wyoming Department of Environmental Quality, Land Quality Division (LQD) annual report requirement. Some of the information used in the model was obtained from the annual report to LQD for the 2005 reporting year, which represented the "current year" for the application.

BCC projected the amount of open acreage for the modeled years of 2011 and 2012, based on the current open acreage and the revised topsoil stripping and reclamation sequence. These figures provided the "disturbed acres" subject to wind erosion in each of the modeled years' emission inventories.

2.4 BACT

For this modeling study, a Best Available Control Technology (BACT) analysis was performed by IML to take into account control measures, such as chemical applications to roads, enclosing silos, bins and other storage areas and treatment of active work areas. These active work areas include those for scrapers, blasting, overburden/coal loading areas, coal dumping, haul road repair and areas susceptible to wind erosion. Once these control measures were determined, they were used in the development of the emission inventory.

2.5 Miscellaneous Emission Control Practices

Other control practices contained in the emission inventory include a coal fire mitigation program and a haul road dust suppression program. Both of these programs act to minimize fugitive emissions at the mine.

2.6 Emission Inventory Development and Worst-Case Year Selection

Fugitive and point source emission inventories for PM_{10} and NO_x were developed for the Buckskin Mine based on site-specific information provided by the mine. Fugitive and point source emissions for PM_{10} and NO_x from nearby mines (Rawhide, Eagle Butte, Dry Fork, Wyodak and Fort Union Mines) were also developed from current permit information. The resultant particulate emission inventories were used to determine the years that would be modeled.

Projections of future mine-wide emissions from Buckskin and other regional sources were based on methodologies prescribed by the AQD. Specifically, those methodologies were discussed with AQD staff in a pre-application conference on December 20, 2005. Subsequently, it was decided to use the most recent Memorandum, *PRB Coal Mine Permitting Guidance*, issued by WDEQ-AQD on February 27, 2006 (WDEQ-AQD, 2006a). This memo forms the primary basis for how the permitting analysis was performed. To supplement mine emission sources in the regional NO_x modeling, AQD provided an updated inventory of NO_X emissions from regional sources. These sources included coal bed methane (CBM) compressor stations, power plants, railroads, highways and urban sources.

2.6.1 Fugitive and Point Source PM_{10} Emission Inventory

BCC provided life-of-mine (LOM) coal production, overburden handling and related operational parameters needed for emission inventory development for the 42 MMTPY mine plan evaluated for this study. The parameters were used in conjunction with a set of emission factors endorsed by the AQD (WDEQ-AQD, 1979) and EPA's AP-42 to calculate annual emissions of PM_{10} and NO_x from each emission-producing activity. Note that the AQD emission factors calculate TSP emissions, which are then multiplied by AQD's factor of 0.30 to arrive at the PM_{10} emission factors.

The Buckskin coal preparation and processing facilities include crushers, material transfers and loadouts. All existing point sources at the coal preparation facilities are outfitted with either baghouses or Passive Enclosure Systems (PECS). The PECS eliminate the points' potential to emit fugitive emissions. Such controls are deemed by WDEQ-AQD to be zero emitters.

2.6.2 Mobile and Stationary Source PM_{10} Emission Inventory

Mobile PM_{10} emission sources at the Buckskin Mine include scrapers, haul trucks, graders, dozers, water trucks, support vehicles, locomotives, drills and loaders. Emissions were calculated using AQD emission factors for all sources except locomotives, where the exhaust emission factor was calculated from EPA's AP-42 mobile source guidance.

PM_{10} emissions from stationary diesel engines were calculated using operating hours from calendar year 2005 as a baseline, with appropriate increases to reflect a maximum coal production level of 42 million tons per year. These engines include light plants, compressors, pumps, welders and generators.

2.6.2 Mobile and Fugitive Source NO_x Emission Inventory

Emission sources included in this inventory are the exhaust from mobile source mining equipment such as scrapers, haul trucks, graders, dozers, water trucks and locomotives, and fugitive sources such as overburden and coal blasting events. Mobile source (tailpipe) NO_x emissions were calculated using estimated operating hours necessary to mine coal at the future projected production rate and EPA approved mobile source emission factors. NO_x emissions from blasting were calculated using estimated explosive usage necessary to mine coal at the future projected rate and an EPA approved emission factor.

2.6.2 Stationary Engine NO_x Emission Inventory

NO_x emissions from stationary engines were calculated using actual operating hours from calendar year 2005 as a baseline, with appropriate increases to reflect a maximum coal production level of 42 million tons per year. The emission factor for stationary engines came from EPA's AP-42.

2.7 Regional Source Emission Inventories

The following neighboring mines in the Nouth Group were included in the PM_{10} modeling analysis: Eagle Butte, Rawhide, Dry Fork, Wyodak and Fort Union. These mines, plus regional sources provided by AQD (regional power plants and point sources, CBM sources, mainline trains, urban areas, and road emissions), were considered in the NO_x analysis. All regional NO_x sources and emissions were obtained in accordance with methodologies approved by AQD.

2.7.1 Railroad, Road, Power Plant, Urban, Coal Bed Methane and Regional Point Sources

The information for railroads, highways, power plants, urban areas, and regional point sources was provided by AQD on May 5, 2005. These sources generally fell within a 40 km by 60 km screening area prescribed by AQD for the regional NO_x analysis. Power plants included Two Elk Power Plant (slightly outside the screening area), Neil Simpson I and II Power Plants, Wyodak Power Plant, WYGEN Unit I Power Plant and two power plants with air quality permit applications under review by AQD at the time of Buckskin's submittal. These two, the Dry Fork Station and WYGEN Unit II were included at the advice of AQD. The sole urban source included in the modeling analysis was the town of Gillette. The KFx coal upgrading facility was also included in the analysis. Other point sources included compressor stations supporting oil/gas/CBM activities. Only NO_x emissions were considered from these sources and no scale-up factors were used at the instructions of AQD.

2.8 Selection of Worst-Case Years

AQD policy requires that the maximum PM_{10} and NO_x impacts (during the life-of-mine) from all mine sources be identified and compared to the applicable air quality standards. Because it is not practical to model all of the years in the life-of-mine, years with maximum annual emissions from mining operations are determined and then modeled. Model results for these "worst-case" emission years are then compared to the applicable ambient air quality standards. If the maximum impact is below the air quality standard, it can be assumed that the standard will be achieved throughout the LOM.

Based on Buckskin Mine and regional emission inventories, LOM years 2011 and 2012 were chosen as worst-cases to be modeled. Year 2012 was selected primarily because it represents the highest annual PM_{10} emission year for the Buckskin Mine (1,180 tons/year); 2011 represents the highest annual PM_{10} emissions for all North Group mines combined.

These model years are also among the worst-case for Buckskin NO_x emissions, with 2012 having the highest annual emissions (1,689 tons/year), and 2011 having the third highest annual emissions (1,625 tons/year). Year 2011 also has the highest NO_x emission total for the North Group mines. Therefore, the selection of these worst-case years will also provide the maximum potential NO_x impacts on the Nouth Group modeling area.

2.9 Dispersion Modeling Methodology

Cumulative PM_{10} impacts from Buckskin Mine and neighboring mines were modeled using the Industrial Source Complex Long-Term (ISCLT3) Model. PM_{10} impacts were modeled for all facilities for the two worst-case years, and concentrations were calculated at receptors located along the Lands Necessary to Conduct Mining (LNCM) boundaries for the North Group mines. The cumulative PM_{10} concentrations at each receptor location were compared to the Wyoming and Federal annual ambient air quality standard of 50 $\mu g/m^3$ to determine compliance with that standard.

NO_2 impacts from Buckskin and neighboring sources were also modeled for the two worst-case years. However, an initial model run was first performed for each worst-case year to determine the significant impact area ($\geq 1 \mu g/m^3$ annual average NO_x impact) produced on a regional receptor grid from sources within the Buckskin Mine only. Then, additional model runs for each worst-case year considered all sources from the area mines, as well as the regional sources, to determine cumulative NO_2 impacts at receptors within the significant impact area. The cumulative NO_2 concentrations were compared to the Wyoming and Federal ambient air quality standard of 100 $\mu g/m^3$ to determine compliance. Emissions were modeled as NO_x, and the final concentrations were multiplied by 0.75 to account for chemical conversion to NO_2. The 0.75 factor is in accordance with Section 6.2.3 of EPA's Guideline on Air Quality Models (40 CFR Part 51, Appendix W).

2.9.1 Dispersion Model

The Industrial Source Complex Long-Term (ISCLT3) Model was used to model annual average PM_{10} and NO_2 concentrations from both fugitive emission sources and point sources per AQD directive (WDEQ-AQD, 2006a). The latest version of ISCLT3 was downloaded from EPA's Support Center for Regulatory Models. The number of sources and receptors was expanded to 2,000 and 10,000 respectively, and the model was recompiled. ISCLT3 was run in regulatory default mode with rural dispersion parameters. In addition, the model was run using elevations for all point sources and receptors. Elevations were determined from USGS 7.5-minute digital elevation models (DEM's).

2.9.2 Terrain Data

The DEM's, all source locations, and receptor locations for each worst-case year were used as inputs into the EPA's terrain processor, AERMAP. AERMAP uses the input data to extract elevations in meters for all sources and receptors. These elevations were then used in each respective ISCLT3 input file.

2.9.3 Meteorological Data

Hourly on-site meteorological data collected at the Eagle Butte Mine were used in this modeling analysis. AQD provided IML with the Eagle Butte six-year (1995 – 2000) Joint Frequency Distribution (JFD) of wind speed, wind direction, and atmospheric stability class. Annual average temperatures were taken from values recorded from 1925 to 2001 at the Gillette National Weather Service meteorological station. Atmospheric mixing heights were provided by AQD.

2.9.4 Receptors

For PM_{10} modeling, receptors were placed along the LNCM boundaries for the Buckskin, Dry Fork, Eagle Butte, Rawhide, Fort Union and Wyodak Mines with a spacing of 500 meters. The AQD "Mine A/Mine B" policy for cumulative impacts applied to this analysis because the

Rawhide and Buckskin mines have LNCM boundaries that overlap. Receptors were placed on these overlapping LNCM boundaries to model the impact of Buckskin PM_{10} emissions on Rawhide Mine's overlapping boundary. Following the WDEQ-AQD Mine A/Mine B policy, the receptors from overlapping boundaries were not included in the top ten receptor concentrations.

Compliance and significant impact receptor networks were created for the NOx modeling analysis. The significant impact receptor network comprised a rectangular grid 33 by 54 kilometers on 500-meter spacing. This proved sufficiently large to encompass modeled significant impacts (greater than or equal to 1 $\mu g/m^3$) from Buckskin Mine for years 2011 and 2012. The NO_2 compliance receptor network included the North Group Mine LNCM boundary receptors in addition to a rectangular grid receptor network fully containing the Buckskin-related NO_x significant impact isopleths (1 µg/m3) for years 2011 and 2012. This network extended 28 km in the east-west direction and 50 km in the north-south direction. All NO_2 modeling receptors were spaced at 500-meter intervals.

2.9.5 Emission Apportioning

Fugitive PM_{10} and NO_x emissions for each of the worst-case years were apportioned into area sources based on the activity type and location. The number and location of the area sources, as well as their dimensions and orientation, were based on the pit configuration and road orientation provided in the mining progression map. Emissions were divided by the area of each area source in which they occurred to arrive at an emission rate in grams/second/square meter. NO_x emissions for the regional roads and mainline trains were also apportioned into area sources.

2.9.6 Point Source Modeling Parameters

Prior to this permit application, Buckskin Mine reduced the number of point sources of PM_{10} emissions by converting all but four baghouses at their coal preparation facilities to PECS. PECS is considered a zero emission technologyl, effectively eliminating emissions from all but four point sources at Buckskin. Point source parameters from North Group mines were used in the model as identified in each mine's most recent permit.

2.9.7 PM_{10} and NO_2 Background Concentration

For both PM_{10} and NO_2, background concentrations were added to the predicted annual average concentrations at each model receptor to yield total ambient concentrations. The levels of these background concentrations were developed in consultation with the Air Quality Division. The AQD has required all mines in the PRB to "submit and justify a background PM_{10} concentration with each permit application" (WDEQ-AQD, 2006a). Buckskin Mine submitted such an analysis to the AQD on March 20, 2006. Hourly data from the Buckskin meteorological station and two continuous particulate monitoring stations were studied to determine PM_{10} concentrations in ambient air not impacted by the Buckskin mining operation. Four years worth of data were used (2002 through 2005). Approximately 60,000 hourly average PM_{10} concentrations were compiled and correlated with wind directions spanning the southwest and northwest quadrants, the most likely sources of background air. As expected, each of the two particulate monitors demonstrated minimum ambient PM_{10} concentrations during periods when the wind was blowing toward the center of Buckskin mining activity. The study produced a site-specific PM_{10} background concentration of 12 $\mu g/m^3$. This level was approved by the AQD prior to submittal of the permit Application in June, 2006.

A background nitrogen dioxide (NO_2) concentration of 14 µg/m3 was obtained through ambient monitoring conducted in 2001 and 2002 at the Foundation Coal Belle Ayr Mine. The NO_2 background concentration has been revised from the previous value of 20 $\mu g/m^3$, which was obtained from pre-construction monitoring conducted for the 1978-79 Wyodak project. The AQD considers the more recent Belle Ayr Mine NO_2 data to be a more accurate representation of background NO_2 concentrations due to the larger amount of data collected and tighter quality assurance procedures placed on that data. The background value of 14 $\mu g/m^3$ represented the highest annual average (from Belle Ayr Mine in both 2001 and 2002) taken from the four NO_2 monitors located in the area of coal bed methane activity.

2.10 Modeling Results

2.10.1 PM_{10} Modeling Analysis and Results

The PM_{10} area source and point source characteristics for Buckskin Mine and the North Group mines were input into ISCLT3 for each worst-case year. The LNCM receptors and local meteorological parameters were also input to the model. The site-specific background concentration of 12 μg/m^3 was added to the results from the model to obtain the total impact from the fugitive and point sources.

All model results from the Buckskin Mine impact analysis show concentrations, after adding background, below the Federal and Wyoming annual PM_{10} air quality standard of 50 μg/m^3. The maximum cumulative concentration predicted in 2011 was 40.3 μg/m^3 (including 12.0 μg/m^3 background) and occurred along the Eagle Butte LNCM. For year 2012, the maximum predicted cumulative concentration of 40.6 μg/m^3 (including background) also occurred along the Eagle Butte LNCM. Note that in 2012 sources within the Buckskin Mine contributed only 0.59 μg/m^3 to this maximum cumulative concentration.

2.10.2 NO_2 Modeling Analysis and Results

Buckskin mine emission sources were modeled for each worst-case year in order to determine the extent of the annual average 1 μg/m^3 contour defining the significant impact area. Receptors within the significant impact areas were then modeled to determine compliance with the ambient air standard in the cumulative impact modeling assessment, as discussed below.

The area source and point source NO_x information for Buckskin and other North Group mines were input into ISCLT3 for each worst-case year along with the significant impact area receptor grid and JFD. Annual NO_x emissions from other regional sources were also input into the model. Emissions were modeled as NO_x, with the resulting concentrations multiplied by 0.75 to account for chemical conversion to NO_2. The AQD-specified background concentration of 14 μg/m^3 NO_2 was then added to the model results to obtain the total impact.

The Wyoming and Federal annual NO_2 air quality standard, to which the model results are compared, is 100 μg/m^3. All model results for the Buckskin impact analysis show concentration predictions well below this value.

The maximum cumulative concentration predicted in 2011 was 38.0 μg/m^3 (including background) and occurred along the Eagle Butte boundary. Buckskin's contribution to this highest concentration was 1.61 μg/m^3. For 2012, the maximum predicted cumulative concentration was 37.8 μg/m^3 (including background) and also occurred along the Eagle Butte LNCM boundary. Buckskin's contribution to this highest concentration was 1.79 μg/m^3.

2.10.3 Short-term Particulates

AQD does not require modeling of fugitive dust emissions to predict compliance with the 24-hour PM_{10} standard (which is 150 μg/m^3, not to be exceeded more than one time per year). Neither EPA nor the AQD have been able to demonstrate that available modeling tools and emission factors are adequate for this task. Section 234 of the 1990 Clean Air Act Amendments required EPA to demonstrate that it had adequate modeling tools before the agency could require states to employ 24-hour modeling at surface coal mines. To date, that demonstration has not been made.

Instead, it has been AQD's position that ambient air monitoring data collected by the mines demonstrate that compliance with short-term ambient standards can be achieved when a mine employs BACT. A memorandum of agreement dated January 24, 1994 between EPA and the state of Wyoming allows AQD to use particulate monitoring in lieu of short-term modeling to assess 24-hour compliance and to predict short-term ambient impacts from mining. In 2002 AQD also began requiring a demonstration that "…mining operations will not cause or contribute to ambient violations…" (WDEQ-AQD, 2006a). The following discussion is a demonstration that Buckskin will not cause or contribute to a 24-hour PM_{10} ambient air violation in the area of the North Group.

2.10.4.1 Historical Ambient Air Quality

2.10.4.2 Buckskin Mine

Ambient PM_{10} concentrations are monitored at two locations at the Buckskin Mine. These locations are identified as the West Teom and North Teom sites. Each site is equipped with a low-volume Rupprecht & Patashnick Tapered Element Oscillating Microbalance (TEOM) PM_{10} continuous monitor. The monitors meet the US EPA Automated Equivalency Method (EQSA-0495-100). The particulate and meteorological monitoring network is operated in accordance with Buckskin Mine Quality Assurance Project Plan (QAPP) approved in August 2008. Both monitors record hourly average and 24-hour average PM_{10} concentrations, with the latter being reported to AQD quarterly. The highest yearly second-high 24-hour PM_{10} concentration at the Buckskin Mine was 139 $\mu g/m^3$, which occurred at the West Teom site in 2003.

While none of the annual second-high PM_{10} concentrations at the Buckskin Mine has ever been over the 24-hour standard of 150 $\mu g/m^3$, during the last six years three of the monitored first-high concentrations have exceeded this 24-hour standard. The first exceedance occurred at the North Teom site on August 16, 2002 and resulted in a maximum 24-hr PM_{10} concentration of 181.7 $\mu g/m^3$. This exceedance correlated with strong winds and was judged an "exceptional event" by the AQD. A second exceedance occurred at the West Teom site on December 27, 2003 and resulted in a maximum 24-hr concentration of 202.4 $\mu g/m^3$. The third exceedance occurred at the West Teom site on March 27, 2007, resulting in a maximum 24-hr concentration of 244.0 $\mu g/m^3$. WDEQ-AQD deemed the 2007 exceedance an "exceptional event," as provided for by the recently implemented Natural Events Action Policy (NEAP). Winds on that day averaged over 33 mph with a peak hourly average of 42 mph. Buckskin followed all mitigation and documentation procedures as required by the NEAP. In all three cases detailed reports of the exceedance and accompanying meteorological conditions were submitted to WDEQ-AQD.

2.10.4.3 North Group Mines (Rawhide, Eagle Butte, Dry Fork Wyodak and Fort Union)

The northern mines consist of five mines in addition to Buckskin: Dry Fork Mine, Eagle Butte Mine, Fort Union Mine, Rawhide Mine, and Wyodak Mine. All of the mines, with the exception of Fort Union, operate in accordance with a Quality Assurance Project Plan specific to each mine. The Fort Union mine has not been in operation for the last several years. Besides Buckskin, the four other active mines in the North Group currently operate a total of 9 PM_{10} monitors. Among these mines the 24-hr PM_{10} NAAQS of 150 $\mu g/m^3$ was exceeded three times. The Wyodak mine recorded a value of 165 $\mu g/m^3$ in 2005. In 2007 the Rawhide and Eagle Butte mines recorded 178 $\mu g/m^3$ and 168 $\mu g/m^3$ respectively. All three values were deemed "Exceptional Events" by WDEQ, due to high winds.

2.10.4.4 Compliance Demonstration

Under the revised mining operation modeled in this application, the Buckskin Mine will not cause or contribute to a violation of the 24-hour ambient air standard. The following points form the reasoning for this conclusion.

- By virtue of monitored concentrations collected at the Buckskin Mine over the past three years, it is clear that mining activities at the Buckskin Mine do not cause or significantly contribute to violations of the 24-hour ambient air standard. The maximum highest second-high 24-hour PM_{10} concentration monitored at the Buckskin Mine during the past three years was below the standard at 107 $\mu g/m^3$, and the average of the highest second-high concentrations was 75 $\mu g/m^3$. The maximum first-high concentration in 2007 did exceed the standard, but was deemed the result of extremely high winds.
- The replacement of baghouse controls with zero-emission PECS on all but four of the point sources will reduce dust emissions at Buckskin Mine. This will have a beneficial effect on air quality and monitored concentrations.
- Modeling results indicate that it is unlikely that the Buckskin Mine will contribute in the future to a violation of the annual PM_{10}.standard of 50 $\mu g/m^3$. As discussed above, the highest modeled annual concentrations at any of the North Group receptors in 2011 and 2012 were 40.3 and 40.6 $\mu g/m^3$ respectively. For both years, Buckskin's contribution to the highest modeled average concentrations was less than the significant impact threshold of 1 $\mu g/m^3$.
- During the times when mining emissions from the Buckskin Mine blow towards neighboring mines, it is unlikely that such emissions will contribute to a violation because of the nature of the emissions released and the distance that they must travel before impacting an air monitor. Mining emissions are typically low-level releases consisting of particulate matter that is subject to gravitational settling. Emissions from current Buckskin mining operations would have to travel several miles before reaching Rawhide Mine, which is the closest mine to Buckskin. Particulate settling over these distances will minimize possible contributions to violations.

REFERENCES

WDEQ-AQD, 2006a, (2/27/06) Memorandum From Bernie Dailey to Powder River Basin Coal Mine Operators. *PRB Coal Mine Permitting Guidance.*

WDEQ-AQD, 1979, Memorandum from Charles Collins. (Wyoming) *Fugitive Dust Emission Factors*.