APPENDIX K

SUPPLEMENTAL AIR QUALITY INFORMATION FOR THE BELLE AYR NORTH, WEST COAL CREEK, CABALLO WEST, AND MAYSDORF II LBA TRACTS

K-1.0 INTRODUCTION

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 air quality discussion in Chapter 3 of this Environmental Impact Statement (EIS) focuses on potential air quality impacts specific to the Belle Ayr, Coal Creek, Caballo, and Cordero Rojo Mines and the Belle Ayr North, West Coal Creek, Caballo West, and Maysdorf II Lease by Application (LBA) Tracts (Figure K-1). Cumulative air quality-related impacts associated with coal leasing in the Powder River Basin (PRB) of Wyoming are addressed in Section 4.2.3 of this EIS, which summarizes the results the Task 1A (Current Air Quality Conditions) and Task 3-A (Cumulative Air Quality Effects) Reports of the Powder River Basin Coal Review, prepared by the ENSR Corporation for the Bureau of Land Management (BLM) Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office, September 2005.

K-2.0 REGULATORY FRAMEWORK

Ambient air quality and air pollution emissions are regulated under federal and state laws and regulations. In Wyoming, the Wyoming Department of Environmental Quality/Air Quality Division (WDEQ/AQD) is responsible for managing air quality through state regulations promulgated in the Wyoming Air Quality Standards and Regulations (WAQSR) and through the Wyoming SIP. WDEQ/AQD has also been delegated authority by the Environmental Protection Agency (EPA) to implement federal programs of the Clean Air Act Amendment (CAAA) of 1990.

The WDEQ/AQD implements WAQSR and CAAA requirements 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 on-going compliance, WDEQ/AQD also implements an operating permit program that can require on-going monitoring of emissions sources and/or source control systems.

K-2.1 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 Act 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

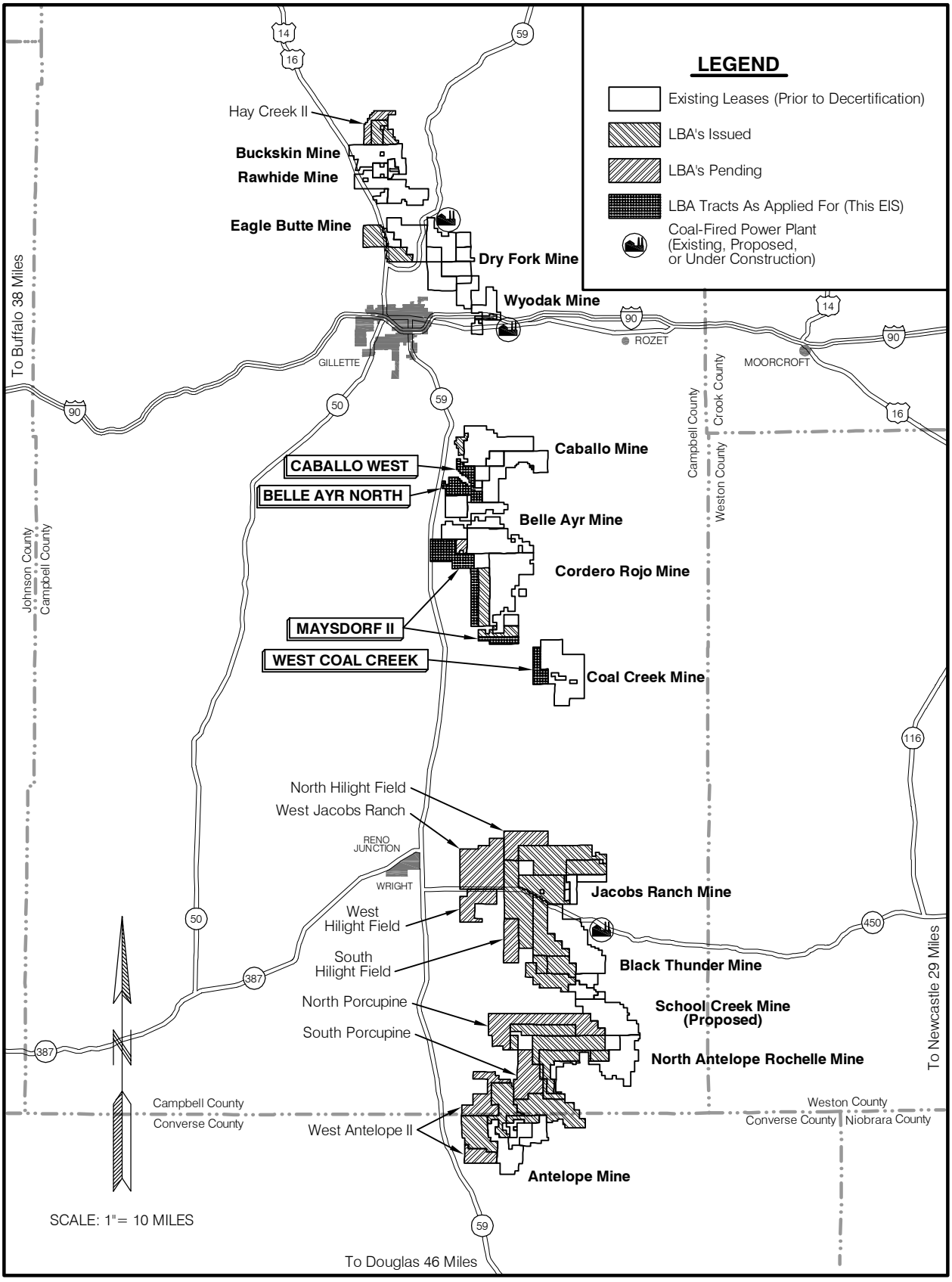

Figure K-1. General Location Map with Federal Coal Leases and LBA Tracts.

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 CAAA allow states to promulgate additional ambient air standards that are at least as stringent, or more stringent, than the NAAQS. A list of the criteria pollutants regulated by the CAA, and the currently applicable NAAQS set by the EPA for each, is presented in Table K-1. The Wyoming Ambient Air Quality Standards (WAAQS), set by the WDEQ/AQD are also listed in this table. In some instances, the Wyoming standards are more stringent than the NAAQS.

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.

K-2.2 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 (MSAs). For each federal criteria pollutant, each air basin (or portion of a basin or MSA) is classified as in "attainment" if the area has "attained" compliance with (that is, not exceeded) 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. Existing air quality throughout most of the PRB in Wyoming, including the South Gillette Area Coal analysis area, is designated an attainment area for all pollutants. However, the town of Sheridan, Wyoming, located in Sheridan County about 150 miles northwest of the project area, is a moderate non-attainment area for PM_{10} due to localized sources and activity within the town. There are no other non-attainment areas within 150 miles of the project area.

K-2.3 Prevention of Significant Deterioration (PSD)

Under requirements of the CAA, the EPA has established 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

Table K-1. Assumed Background Air Pollutant Concentrations, Applicable AAQS, and PSD Increment Values (in $\mu g/m^3$).

Criteria Pollutant	Averaging Time[1]	Background Concentration	Primary NAAQS[2]	Secondary NAAQS[2]	WAAQS	PSD Class I Increments	PSD Class II Increments
Carbon monoxide	1-hour	3,336[4]	40,000	40,000	40,000	---	---
	8-hour	1,381	10,000	10,000	10,000	---	---
Nitrogen dioxide	Annual	5[5]	100	100	100	2.5	25
Ozone	8-hour	70[6]	157	157	157	---	---
Sulfur dioxide	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	---	---

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 eight-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, 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 $\mu g/m^3$ and revokes the annual PM_{10} standard of 50 $\mu g/m^3$. The State of Wyoming will enter 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 in 2002.

Source: (BLM 2005b and WDEQ/AQD)

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 within the United States into one of three PSD 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, or those additional areas which have since been designated Class I under federal regulations (40 CFR 52.21). All remaining areas outside of the designated Class I boundaries were designated 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 designated.

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.

Table K-2 is a list of mandatory federal Class I areas, tribal Class I areas, and federal Class II areas that are of special interest in the region and their distance from the general South Gillette Area Coal analysis area. The closest Class I area to the South Gillette Area Coal analysis area is Wind Cave National Park in South Dakota, located about 98 miles east-southeast of the site. The next closest Class I area is the Northern Cheyenne Indian Reservation (tribal federal Class I area), located about 108 miles to the north-northwest. The closest sensitive Class II areas are the Devils Tower National Monument, the Jewel Cave National Monument, and the Cloud Peak Wilderness Area, which are approximately 50 miles northeast, 80 miles east-southeast, and 81 miles west of the South Gillette Area Coal 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 micrograms per cubic meter ($\mu g/m^3$) (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 therefore demonstrate compliance with those incremental standards during the new source permitting process. However, 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.

Table K-2. Approximate Distances and Directions from the General South Gillette Analysis Area to PSD Class I and Class II Sensitive Receptor Areas.

Receptor Area	Distance (miles)	Direction to Receptor
Mandatory Federal PSD Class I Area		
Badlands Wilderness Area[1]	147	E
Bridger Wilderness Area	206	WSW
Fitzpatrick Wilderness Area	208	WSW
Gates of the Mountain Wilderness Area	364	NW
Grand Teton National Park	256	W
North Absaroka Wilderness Area	202	WNW
Red Rocks Lake Wilderness Area	312	W
Scapegoat Wilderness Area	408	WNW
Teton Wilderness Area	215	W
Theodore Roosevelt National Park (North Unit)	266	NNE
Theodore Roosevelt National Park (South Unit)	218	NNE
U.L. Bend Wilderness Area	264	NNW
Washakie Wilderness Area	183	W
Wind Cave National Park	98	ESE
Yellowstone National Park	224	WNW
Tribal Federal PSD Class I		
Fort Peck Indian Reservation	275	N
Northern Cheyenne Indian Reservation	108	NNW
Federal PSD Class II		
Absaroka-Beartooth Wilderness Area	210	WNW
Agate Fossil Beds National Monument	137	SE
Badlands National Park	127	ESE
Bighorn Canyon National Recreation Area	150	WNW
Black Elk Wilderness Area	91	E
Cloud Peak Wilderness Area	81	W
Crow Indian Reservation	103	NW
Devils Towner National Monument	50	NE
Fort Belknap Indian Reservation	302	NNW
Fort Laramie National Historic Site	134	SSE
Jewel Cave National Monument	80	ESE
Mount Rushmore National Memorial	96	E
Popo Agie Wilderness Area	201	WSW
Soldier Creek Wilderness Area	126	SE

[1] The U.S. Congress designated the Wilderness Area portion of Badlands National Park as a mandatory Federal PSD Class I area. The remainder of Badlands National Park is a PSD Class II area.

K-2.4 Best Available Control Technology (BACT)

All sources being permitted within 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.

K-2.5 New Source Performance Standards (NSPS)

The NSPS 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 re-constructed 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, in Wyoming these standards are typically less stringent than state-level BACT limits.

K-2.6 Federal Operating Permit Program

The CAAA of 1990 required 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" (codified at Title V of the 1990 CAAA), 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 tpy of any regulated pollutant, 10 tpy of any single HAP, or 25 tpy or more of any combination of HAPs, from applicable sources. An 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. The potential to emit for PM_{10} under the existing air quality permits for the Belle Ayr, Coal Creek, Caballo, and Cordero Rojo Mines were well below the 100 tpy applicability threshold.

K-2.7 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.

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 may 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 mine (LOM). The applicant also examines the surrounding coal mining operations and their previous air quality permits to determine their emissions throughout the LOM. Two or more worst-case years (generally with the highest potential emissions) are then modeled in detail. Other surrounding emission sources, such as power plants, compressor stations, paved highways, long-haul railroad lines and municipalities are also considered in the modeling analysis.

Coal mines in the PRB are also required to quantify 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.

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

The AQD has recently required all mines in the PRB to "submit and justify a background PM_{10} concentration with each permit application" (WDEQ-AQD, 2006b). A site specific PM_{10} background concentration of 15 $\mu g/m^3$ was developed in the modeling analysis for the Belle Ayr, Coal Creek, and Cordero Rojo Mines, while a background concentration of 14.4 $\mu g/m^3$ was developed for the Caballo Mine. The modeling results are added to the background and compared to the annual standard. Likewise, compliance with the annual NO_2 standard is verified using ISCLT3 and an NO_2 background concentration of 20 $\mu g/m^3$.

Short-term PM_{10} modeling is not required by WDEQ-AQD, nor does WDEQ-AQD consider it to be an accurate representation of short-term impacts. Section 234 of the 1990 CAAA 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.

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 NSPS, 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 Belle Ayr, Coal Creek, Caballo, and Cordero Rojo Mines have prepared permit applications and conducted air quality modeling analyses 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 federal CAAA.

In conducting an analysis of air quality impacts in the PRB for the Wyoming and Montana BLM, the Task 1a Report for the Powder River Basin Coal Review reports a background concentration of 5 $\mu g/m^3$ for NO_x for the entire PRB. The air permit actions for the Belle Ayr, Coal Creek, and Cordero Rojo Mines used a background concentration of 15 $\mu g/m^3$ for PM_{10} and the Caballo Mine used a background concentration of 14.4 $\mu g/m^3$. These concentrations are based on recently monitored values in Gillette, Wyoming and at the Belle Ayr, Coal Creek, Caballo, and Cordero Rojo Mines, and include all sources operating at the time the value was measured, including existing coal mine operations located around Gillette.

K-2.8 Natural Events Action Plan (NEAP)

In response to the measured exceedances of the PM_{10} NAAQS in certain areas of the PRB and in anticipation of possible future exceedances, the WDEQ/AQD has collaborated with the Wyoming Mining Association to develop a Natural Events Action Plan for the coal mines of the PRB, based on EPA Natural Event Policy guidance. The plan was submitted to and approved by EPA. A report describing the plan can be accessed on the WDEQ/AQD's website on the Internet (<http://deq.state.wy.us/AQD/NEAP%20Files/1-23-07NEAP.pdf>).

The Natural Events Action Plan recognizes that certain NAAQS exceedances due to natural events are uncontrollable. While all practical mitigation measures need be implemented during those events, the exceedances should not be considered against the NAAQS attainment designation for the region. Specific NEAP goals include:

- Provide for the protection of public health,
- Develop public information program,
- Provide a mechanism for "flagging" exceedances due to uncontrollable natural events,
- Implement Best Available Control Measures (BACM) and Reactionary Control Measures (RACM) based on the severity of the event, and
- Provide mechanism for excluding flagged data when they meet specific wind speed criteria and BACM and RACM are in place.

The Natural Events Action Plan identifies, in addition to the BACT measures generally included in individual mine air quality permits, two other categories of control measures designed to prevent exceedances during high wind events (WDEQ/AQD 2007). One of these, BACM, is an additional list of control measures that the mines can implement continuously so that they are in place before a high wind event occurs. These measures are not current requirements

in all of the mines' air quality permits. They primarily address the principal mine-controlled sources of fugitive dust, which are large contiguous disturbed areas. These measures include:

1. Stabilizing topsoiled area as soon as practicable following topsoil replacement.
2. Ripping, windrowing, mulching, temporarily seeding or chemically treating areas greater than 300 contiguous acres in size that have been stripped of topsoil but will not be mined in the near future.
3. Ripping, windrowing, temporarily seeding or chemically treating graded backfill areas greater than 300 contiguous acres in size.
4. Ripping, mulching, temporarily seeding or chemically treating long-term out-of-pit overburden and topsoil stockpiles that have been graded.
5. Applying non-vegetative barriers such as gravel or other large-diameter particles to erodible surfaces to reduce surface erosion where appropriate.
6. Cleaning, treating, and maintaining pads in front of truck dumps to prevent accumulations of spilled materials from getting pulverized.
7. Scheduling topsoil removal, backfill grading and topsoil replacements concurrently to minimize open areas when possible.
8. Requiring contractors to apply water and/or chemical dust suppressants in their haulage areas.

The second additional category of control measures discussed in the Natural Events Action Plan includes measures that are not currently required by all individual air quality permits but are actions that can be taken during a high wind event, depending on site specific conditions (WDEQ/AQD 2007). These include:

1. The mine operator will consider relevant information, including National Weather Service (NWS) forecasts and local meteorological information, to confirm that a high wind event is occurring.
2. The mine operator will visually determine areas of mining activity that are generating excessive visible dust and direct water trucks to those areas.
3. The mine operator should direct overburden operations to the shortest haul distance available during a high wind event.
4. The mine operator will evaluate the practicality of dumping the overburden as low as possible.
5. Mine employees will inspect for and extinguish coal fires.
6. The mine operator will evaluate shutting down scoria crushing operations that appear to be generating excess dust.
7. The mine operator will evaluate shutting down road maintenance activities that are generating dust.

8. The mine operator will evaluate ordering contractors to increase water, reduce operating equipment or shut down haulage.
9. The mine operator will evaluate the need to shut down and/or reduce earthmoving activities as the mine schedule and conditions will allow.

If a Natural Events Action Plan is designed and implemented to minimize PM_{10} concentrations, EPA will exercise its discretion, under Section 107(d)(3) of the CAA, not to redesignate areas as nonattainment, provided that the exeedances are demonstrated to be the result of natural events. Based on EPA's Natural Events Policy, PM_{10} concentrations due to dust raised by unusually high winds will be treated as uncontrollable natural events under the following conditions: 1) the dust originated from non-anthropogenic sources, or 2) the dust originated from anthropogenic sources controlled with BACM.

The WDEQ/AQD Natural Events Action Plan includes a public education plan, a public notification and health advisory program, and a plan to abate or minimize appropriate contributing controllable sources of PM_{10}, which includes three categories of control measures. The Natural Events Action Plan approved by EPA only includes measures for control of coal mine sources since it is the ambient monitoring systems around the large surface coal mines that have recorded the exceedances of the 24-hour PM_{10} NAAQS. If it is demonstrated that there are non-coal sources contributing to elevated measurements in an area of concern, WDEQ/AQD may address these additional sources separately from the approved Natural Events Action Plan or as a future update of the plan.

K-3.0 EXISTING AIR QUALITY

K-3.1 Regional Particulates

The federal and state standards for particulate matter pollutant are discussed in Chapter 3, Section 3.4.2.1 of the EIS.

As a result of WDEQ/AQD requirements for the PRB mines to collect air quality data, which is discussed in Section 3.4.2.3 of the EIS, the eastern PRB is one of the most intensely monitored areas in the world. There are numerous monitors located at and adjacent to mining operations in the PRB, as shown in Figure K-2. According to EPA AirData, in 2007 there were six total suspended particulates (TSP) monitors, five $PM_{2.5}$ monitors and 36 PM_{10} monitors in the Wyoming portion of the PRB. Data for TSP date back to 1980 and data for PM_{10} date back to 1989. Through 2004, approximately 57,000 TSP samples had been collected and approximately 47,550 PM_{10} samples had been collected through 2007. Table K-3 summarizes the annual arithmetic average of these data from 1980 through 2007 of all sites located at Campbell and Converse County mining operations.

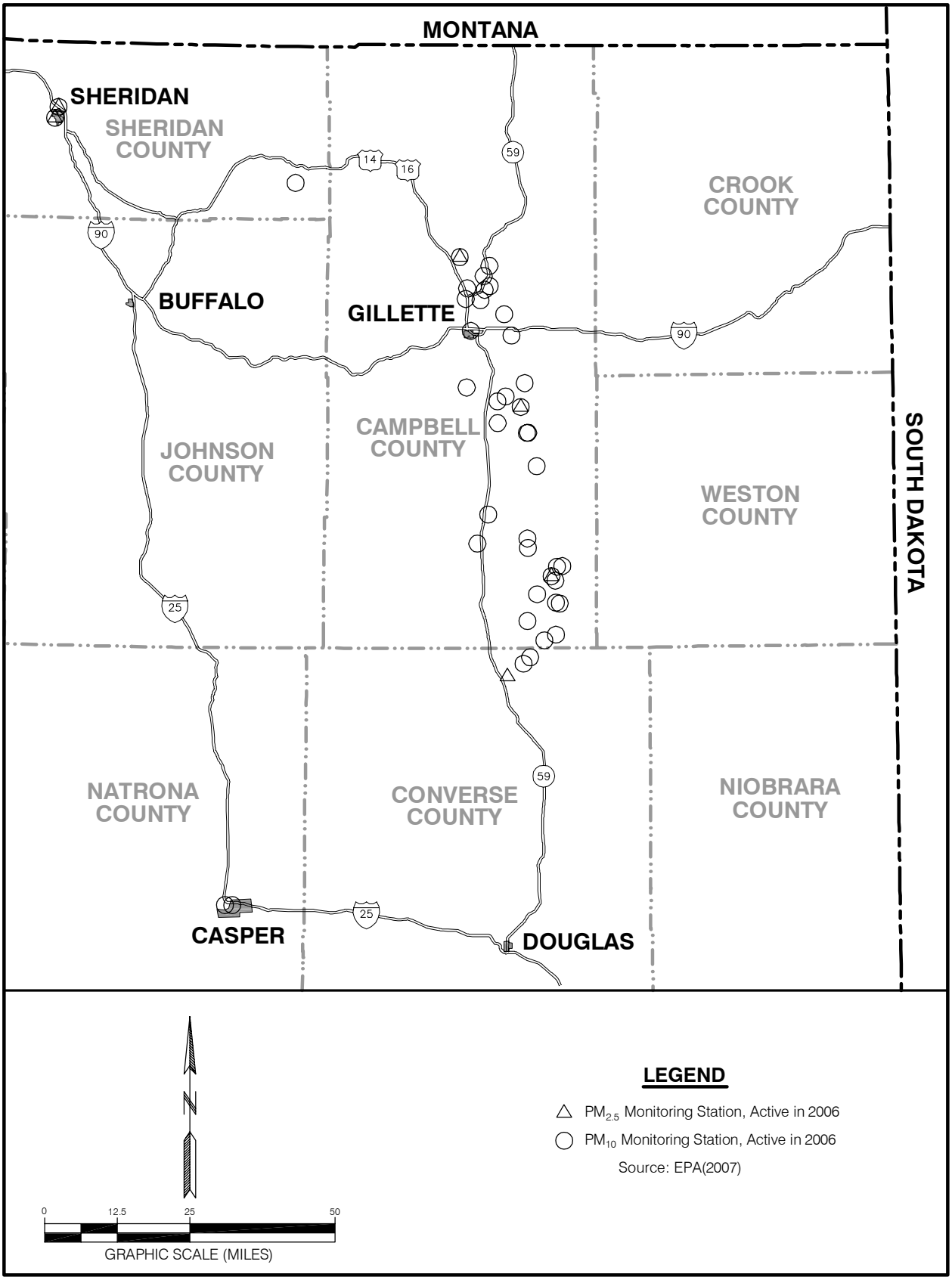

Figure K-2. Active Particulate Monitoring Stations in Northeastern Wyoming.

Table K-3. Summary of WDEQ/AQD Reports on Air Quality Monitoring for Surface Coal Mines[1] in Wyoming's PRB, 1980-2006.

Year	Coal Produced (mmtpy)	Overburden Moved (mmbcy)	Number of Mines Operating/ Monitoring TSP/ Monitoring PM_{10}[1]	Number of TSP/PM_{10} Monitoring Sites[2]	TSP Average ($\mu g/m^3$)	PM_{10} Average ($\mu g/m^3$)
1980	58.7	105.3	10/14/0	34/0	35.5	na[3]
1981	71.0	133.4	11/13/0	35/0	39.4	na
1982	76.1	141.1	11/14/0	40/0	31.2	na
1983	84.9	150.9	13/14/1	41/1	32.6	11.2
1984	105.3	169.5	14/16/1	42/1	33.9	11.1
1985	113.0	203.4	16/17/0	49/0	32.3	na
1986	111.2	165.7	16/17/0	45/0	29.3	na
1987	120.7	174.6	16/17/0	43/0	31.7	na
1988	138.8	209.7	16/17/0	43/0	37.7	na
1989	147.5	215.6	15/17/3	40/3	32.1	15.9
1990	160.7	220.1	17/17/5	47/5	34.3	14.8
1991	171.4	242.3	17/17/5	46/6	32.7	16.5
1992	166.1	296.0	17/17/7	41/7	31.7	15.9
1993	188.8	389.5	17/17/8	40/11	27.8	14.5
1994	213.6	483.9	17/18/8	44/11	31.7	15.5
1995	242.6	512.7	16/18/8	41/12	29.6	12.9
1996	257.0	605.4	17/18/8	41/12	35.4	16.0
1997	259.7	622.0	16/17/10	39/15	33.3	15.9
1998	293.5	669.0	16/17/12	36/17	33.9	15.9
1999	317.1	762.9	15/17/12	36/18	55.3	21.6
2000	322.6	868.9	15/15/12	31/17	56.1	23.4
2001	354.1	927.7	12/11/12	29/29	57.5	27.2
2002	359.7	1,032.1	13/11/13	23/38	56.0	23.3
2003	363.6	1,044.2	13/10/13	16/34	51.9	20.8
2004	381.6	1,184.4	13/6/13	7/33	--[4]	20.3
2005	390.3	1,147.6	12/6/12	7/33	--[4]	21.5
2006	431.9	1,256.7	13/5/13	6/33	--[4]	24.2
2007	436.5	1,268.5	14/4/14	4/33	--[4]	25.2

[1] Mines include Buckskin, Rawhide, Eagle Butte, Dry Fork, Fort Union (acquired by Dry Fork), Clovis Point (acquired by Wyodak), Wyodak, Caballo, Belle Ayr, Caballo Rojo, Cordero (Caballo Rojo now combined with Cordero), Coal Creek, Jacobs Ranch, Black Thunder, North Rochelle, North Antelope, Rochelle (North Rochelle, North Antelope & Rochelle now combined), Antelope, and Dave Johnston (no longer producing coal).

[2] Some sites include more than one sampler, so the number of samplers is greater than the number of sites.

[3] Not applicable because no monitoring for PM_{10} was done.

[4] Data no longer pertinent due to paucity of monitoring sites.

Sources: 1980 through 1996 emissions and production data from April 1997 report prepared by WMA for WDEQ/AQD. 1997 through 2007 emissions data from EPA AirData and WDEQ/AQD databases (EPA 2005a, WDEQ/AQD 2005b). 1997 through 2007 production data from WDEQ/AQD and Wyoming State Inspector of Mines (WDEQ/AQD 2005c and 2008 and Wyoming Department of Employment 1997-2004).

As indicated in Table K-3, the long-term trend in particulate emissions remained relatively flat through 1998. The overall average annual TSP concentration was 33.1 µg/m^3 from 1980 through 1998, with annual averages ranging between 27.8 µg/m^3 and 39.4 µg/m^3. There were increases in 1988 and 1996, which may have been the result of fires in the region during those years. Annual average PM_{10} concentrations from 1989 through 1998 were similarly relatively flat, ranging between 12.9 µg/m^3 and 16.5 µg/m^3, with an overall average of 15.4 µg/m^3.

The 1980-1998 time period was associated with significant growth in the surface coal mining industry. Coal production increased from about 59 million tons per year (mmtpy) to over 293 mmtpy (an increase of almost 400 percent), and associated overburden production increased from 105 million bank cubic yards (mmbcy) to 669 mmbcy per year (an increase of over 537 percent). From 1990 through 2007, the average annual increase in coal production was 6.3 percent, while annual overburden production increased an average of 11.3 percent over the same time period. The larger annual increase in overburden production is probably due to the fact that the mines are gradually moving into deeper coals as the shallower reserves are mined out.

The relatively flat trend in particulate emissions from 1980 through 1998 is due in large part to the Wyoming Air Quality Program that requires BACT at all permitted facilities. BACT control measures, which include watering and chemical treatment of roads, limiting the amount of area disturbed, temporary revegetation of disturbed areas to reduce wind erosion, and timely final reclamation, are discussed in Section 3.4.2.3 of the EIS.

The average annual TSP concentration increased from 33.9 µg/m^3 in 1998 to 55.3 µg/m^3 in 1999, and remained greater than 50.0 µg/m^3 through 2003, when tracking of TSP concentrations was discontinued. The average annual PM_{10} concentration was 15.9 µg/m^3 in 1998 and peaked in 2001 (27.2 µg/m^3) and have been less than 27.2 µg/m^3 since that time as shown in Table K-3. The increases in coal production over the last 5 years (an average of 4.0 percent per year and 15.4 mmtpy per year over the 5-year period) and associated overburden production (an average of 6.6 percent per year and 68.8 mmbcy per year over the 5-year period) were less than a majority of the previous 20 5-year running average periods, but the particulate concentrations remained relatively constant. There were no major fires in the region between 1998 and 2005 but major fires were experienced in the region in 2006 and 2007. There was an increase in CBNG development in the PRB between 1998 and 2005 and northeastern Wyoming has experienced extreme drought conditions as well as a dramatic increase in surface disturbance activities associated with CBNG development since 1999. All of these factors have exacerbated particulate emissions.

There were no monitored exceedances of the 24-hour PM_{10} standards anywhere in the PRB through year 2000. From 2001 through 2006, there were 29

monitored exceedances of the 24-hour PM_{10} standard at seven operating mines in the Wyoming PRB, five of which are located within the southern portion of the basin. Nineteen of these exceedances occurred in 2001 and 2002, while two, three, and five exceedances occurred in 2003, 2004, and 2005, respectively. There were no exceedances in 2006 (Shamley 2007). Most of the exceedances (26) took place in the group of mines located south and east of the town of Wright; the remaining three exceedances occurred in the group of mines located north and east of Gillette (Figure K-1). In 2007, there were 11 exceedances at six mines. The group of mines located between Gillette and Wright, which includes the Belle Ayr, Coal Creek, Caballo, and Cordero Rojo Mines, has not recorded any exceedances of the 24-hour PM_{10} standard. PRB monitoring data show no exceedances of the annual PM_{10} standard to date.

There were no monitored exceedances of the 24-hour PM_{10} standards anywhere in the Wyoming PRB through year 2000. From 2001 through 2006, there were 29 monitored exceedances of the 24-hour PM_{10} standard, at seven operating mines and in 2007 a total of 11 exceedances were reported at six mines. A majority of the 29 exceedances reported between 2001 and 2006 were associated with elevated winds exceeding 20 mph, which could have qualified as a high wind event under the NEAP. Of the 11 exceedances reported in 2007 within the PRB, five have been designated as exceptional events by EPA under the NEAP and will be treated as uncontrollable natural events (not considered when determining the region's air quality designation). Five of the remaining six exceedances are currently under review by EPA and may be designated as an exceptional event under the NEAP (Shamley 2008). Within the PRB, 27 of 30 of the valid exceedances (not considered exceptional events under NEAP) took place in the group of mines located south and east of the town of Wright; the remaining three valid exceedances occurred in the group of mines located north of Gillette (Figure K-1).

K-3. 2 Regional NO2 Concentrations

Nitrogen oxides form when fuel is burned at high temperatures. They can be formed naturally or by human activities. The primary manmade sources are motor vehicles, electric utilities, and other fuel-burning sources. According to EPA, motor vehicles produce about 55 percent of the manmade NO_x emissions, utilities and industrial/commercial/residential activities each produce about 22 percent of the manmade NO_x emissions, and other sources account for the remaining 1 percent of the manmade emissions (EPA 2007b). The primary direct source of emissions of nitrogen oxides during coal mining operations is tailpipe emissions from large mining equipment and other vehicle traffic inside the mine permit area.

Blasting that is done to remove the material overlying the coal (the overburden) can result in emissions of several products, including NO_2, as a result of the incomplete combustion of nitrogen-based explosives used in the blasting

process. When this occurs, gaseous, orange-colored clouds may be formed and they can drift or be blown off mine permit areas.

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 in the overburden, incompetent or fractured geological formations, deformation of bore holes, and blasting agent factors. Generally, blasting-related NO_x emissions are more prevalent at operations that use the blasting technique referred to as cast blasting (Chancellor 2003). 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 Belle Ayr Mine has never conducted cast blasting but may use that blasting procedure in the future.

In the mid-to late-1990s, OSM received complaints from several citizens about blasting clouds from several mines in the PRB. 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. In response to those concerns, several studies have been conducted, the mines have modified their blasting techniques, and the WDEQ has imposed blasting restrictions on several mines. 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. Results of the study (TBCC 2002), conducted pursuant to protocols reviewed and approved by the WDEQ, were provided to the WDEQ 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 ppm for 10 minutes.

Subsequently, the data in the 2002 report (collected at the Black Thunder Mine) 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, based on the entire basin-wide data set encompassing 123 valid tests, were developed but differed only slightly from the original Black Thunder curves.

Measures that are used by the mines to control NO_2 emissions related to blasting by the PRB mines are discussed in Chapter 3, Section 3.4.3.3 of the EIS.