WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

Permit Application Analysis
A0001224

December 11, 2015

NAME OF FIRM:	Ramaco Wyoming Coal Co., LLC
NAME OF FACILITY:	Brook Mine
FACILITY LOCATION:	T57N, R84W and R85W Sheridan County, Wyoming
TYPE OF OPERATION:	Highwall and Surface Coal Mine
RESPONSIBLE OFFICIAL:	Randall Atkins, Chief Executive Officer
MAILING ADDRESS:	1101 Sugarview Drive Sheridan, WY 82801
TELEPHONE NUMBER:	(307) 674-8000
REVIEWERS:	Andrew Keyfauver, NSR Permit Engineer Nathan Henschel, NSR Air Quality Modeler

1.0 PURPOSE OF APPLICATION

Ramaco Wyoming Coal Co., LLC submitted an application to establish the Brook Mine, a surface and highwall coal mining facility to be located in Sheridan County, Wyoming. The Brook Mine is projected to produce 2 million tons of coal per year (MMtpy). The Brook mine is to be located approximately six (6) miles north of Sheridan, in Sheridan County, Wyoming.

2.0 PROCESS DESCRIPTION

2.1 Mine Plan

The proposed Brook Mine will be a surface and highwall coal mine with a maximum permitted annual coal production of 2.0 MMtpy. Coal and overburden is proposed to be removed using dozers, rubber-tired front-end loaders and trucks from the surface mine. Continuous miners along with a conveyor system will be utilized to mine coal from the highwall mining operation. The mine is anticipated to have 12 years of coal production. Coal will be shipped by railcar from the mine to industrial customers. Figure 2-1 shows the projected mine plan for the Brook Mine. This figure is also contained in the application as Exhibit 5 – Coal Removal Sequence.

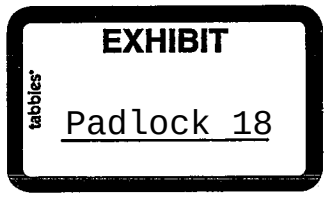
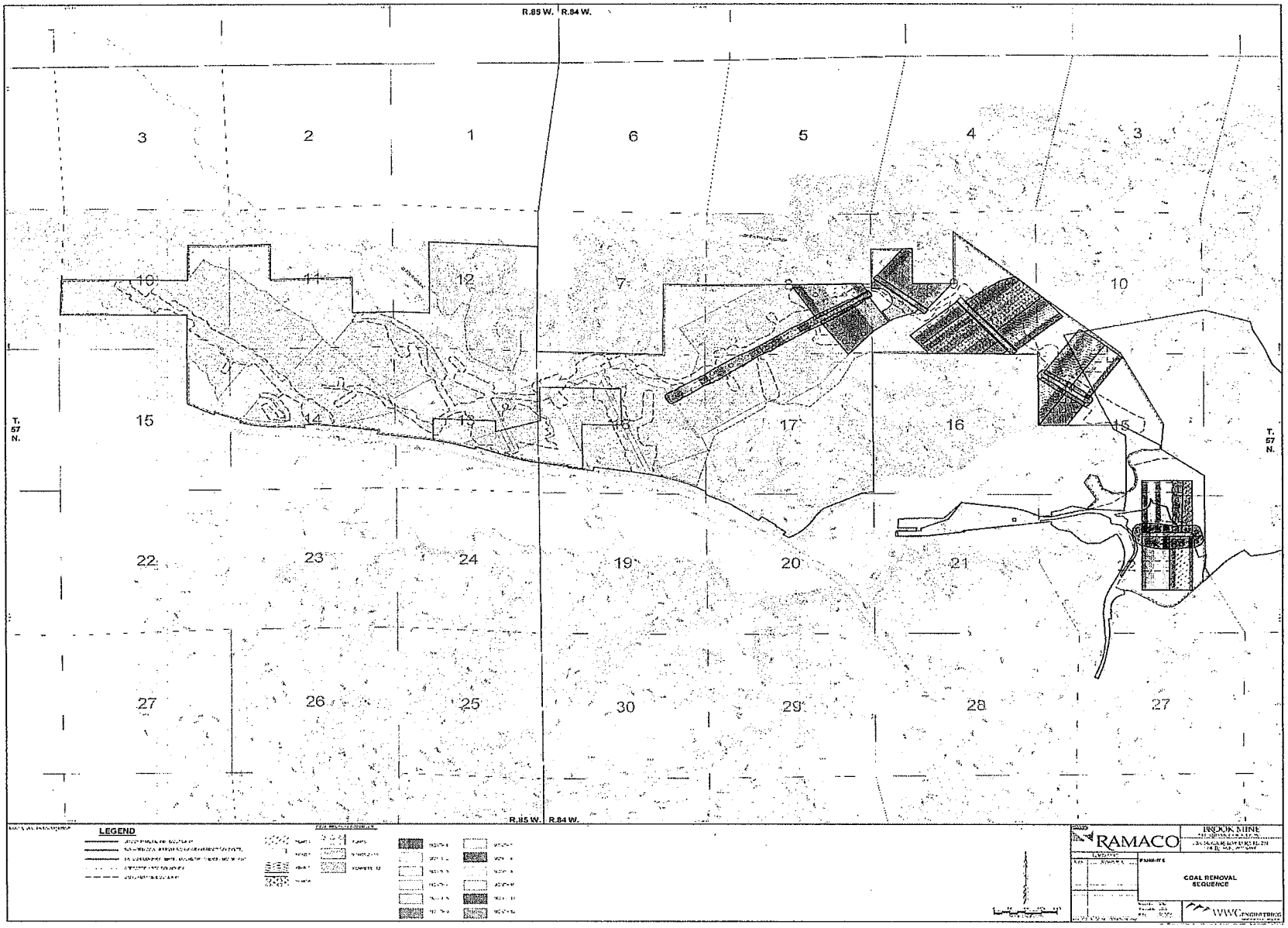


Figure 2-1 – Coal Remoal Progression for the Brook Mine



2.2 Coal Preparation Facilities

Coal from both highwall and surface mining will be hauled with covered side-dump trucks to a completely enclosed truck dump and 20,000 ton coal storage facility. In the initial years of coal production (Phase 1), coal will be dumped inside the building and moved by a loader to a coal storage pile. From the storage pile the coal will be pushed by a dozer into a feeder/breaker. Dust from coal dumping, handling, and surface reclaim inside the building will be controlled by water spray and a baghouse. Dust from the feeder/breaker will be controlled with an atomizer/fogger system. From the feeder/breaker the coal will be conveyed to a secondary crusher, which will also be controlled with an atomizer/fogger system. The crushed coal will be routed by conveyor to the loadout where it will be loaded onto railcars. Transfer points along the conveyor will be controlled with passive enclosure control systems. Figure 2-2 shows a flow diagram of the proposed coal preparation plant. This figure is also contained in the application as Exhibit 2.

If the future (Phase 2), a conventional truck dump with a stilling shed is planned for the facility. This modification will require a separate permitting action from that being proposed.

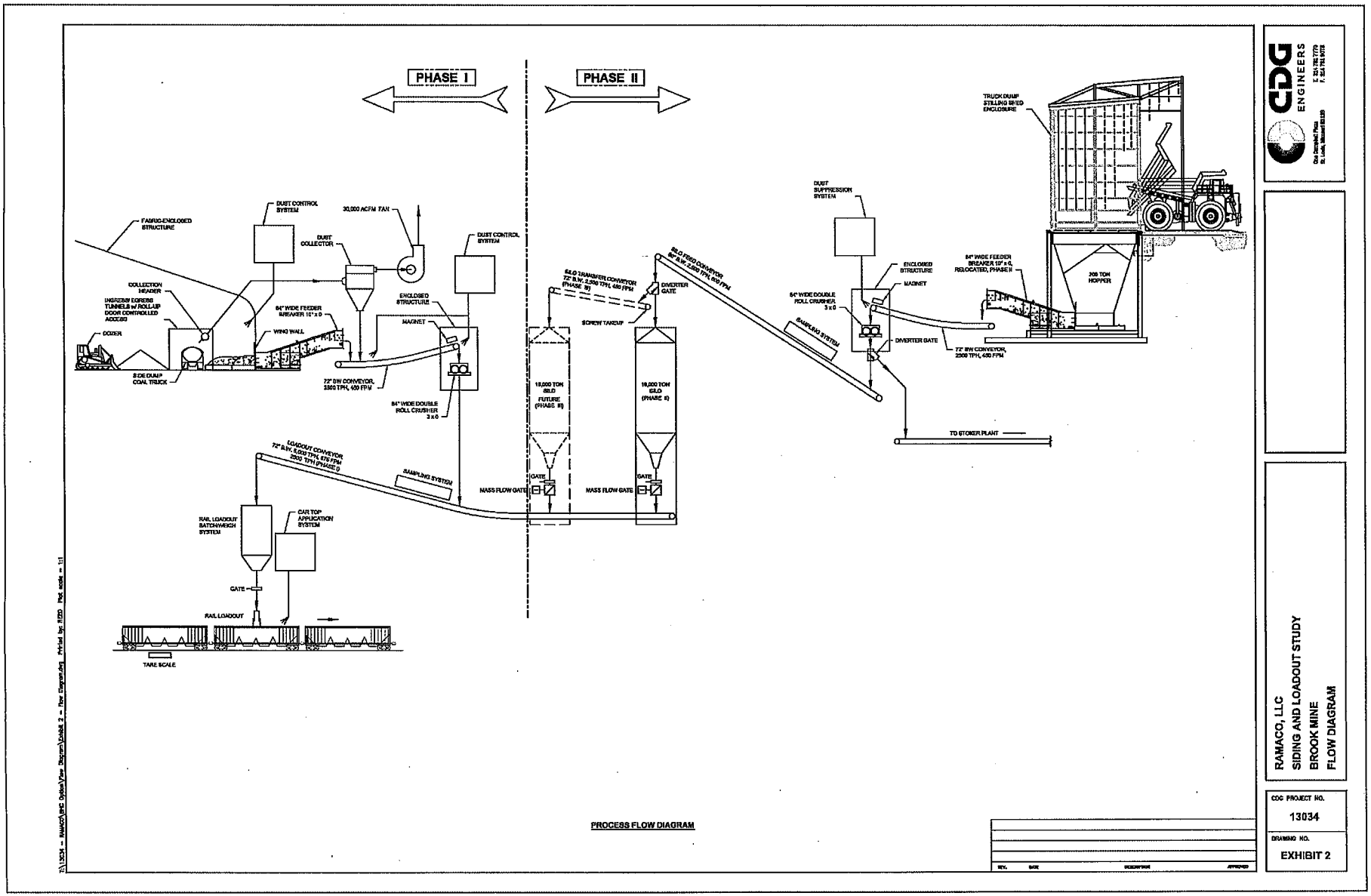
2.3 Mining Equipment

Equipment utilized at a mine typically changes from year to year depending on several operational factors. In general, as older, smaller equipment is retired, it is replaced with new, larger equipment. Table 2-1 provides a projection of major mining equipment to be used at the mine to produce at a mining rate of 2 MMtpy.

Table 2-1
Mining Equipment

Quantity	Description
2	CAT 992K Wheel Loader
4	CAT 777G Off-Highway rock Truck
1	CAT MD6240 Rotary Drill
1	CAT D11T Crawler Tractor
2	CAT D10T Crawler Tractor
2	CAT 16G Motor Grader
1	CAT 988K Wheel Loader
6	Coal Truck (Mack Titan w/ Pup
2	CAT 627G Scraper
1	Water Truck

Figure 2-2: Coal Preparation Plant



2.4 Disturbed Acreage

Ramaco Wyoming Coal Co., LLC estimated annual acres to be disturbed and reclaimed each year, and estimated the additional stabilization activities that might reasonably be expected through time. Projected open acres for the Brook Mine are shown in Table 2-2.

Table 2-2
Brook Mine
Potential Open Acres

Year	Estimated Open Acres
2017	121
2018	23
2019	93
2020	85
2021	33
2022	77
2023	77
2024	77
2025	77
2026	77
2027	30
2028	30

3.0 ESTIMATED EMISSIONS

The applicant developed a summary of the mining activity for the Brook Mine for all of the years in the mining plan, and then developed NO_x and PM_{10} inventories from this information. Table 3-1 shows the estimated fugitive/mobile source emissions from the Brook Mine for the life-of-mine based on the original application submittal of 3 MMtpy. Emissions in the table are considered to be conservative based on the revised maximum proposed production rate of 2 MMtpy.

Table 3-1: Brook Mine Fugitive/Mobile Source Emissions (tpy)

Year	NO_x	PM_{10}
1	30.2	42.3
2	77.1	137.8
3	79.9	136.8
4	128.1	174.8
5	114.5	174.2
6	74.5	122.7
7	76.1	128.5
8	77.7	133.8
9	79.2	139.1
10	80.8	144.3
11	32.3	82.4
12	31.9	79.3

4.0 CHAPTER 6, SECTION 3 – MAJOR SOURCE APPLICABILITY (TITLE V)

The Division determines major source applicability based on point sources and includes fugitive emissions from sources which are subject to new source performance standards, which were in effect as of August 7, 1980. The truck dumps at the mine are subject to a new source performance standard (Subpart Y); therefore, emissions from the truck dumps are counted toward major source applicability. The truck dump and associated coal handling is controlled with a baghouse; therefore, applicable emissions are associated with the baghouse. Table 4-1 shows the total major source applicable emissions for the Brook Mine.

Table 4-1: Major Source Applicability (tpy)

	PM_{10}	NO_x	SO_2	CO
Point Sources				
Truck Dump Baghouse	5.6	--	--	--
Shop Heater	--	0.2	--	0.1
Office Heater	--	0.1	--	<0.1
Emergency Generator	--	0.4	<0.1	0.1
Fugitives				
Truck Dump fugitives [1]	--	--	--	--
Totals	**5.6**	**0.7**	**<0.1**	**0.2**

[1] Truck dump controlled with an enclosure that utilizes a baghouse.

5.0 CHAPTER 6, SECTION 4 – PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

A major stationary source under Chapter 6, Section 4 of the Wyoming Air Quality Standards & Regulations (WAQSR) is a named facility which emits, or has the potential to emit, one hundred (100) tons per year or more of any air pollutant or any stationary source which emits or has the potential to emit two hundred and fifty (250) tons per year or more of any pollutant for which standards are established. The Brook Mine is not a named source under Chapter 6, Section 4; therefore, the 250 tpy threshold is applicable to this facility. The proposed permitting action is not subject to Prevention of Significant Deterioration (PSD) review under Chapter 6, Section 4 of the WAQSR as applicable emissions are not 250 tpy or greater (see Table 4-1). Applicable emissions are emissions from point sources and fugitive emissions from named sources or from sources which were subject to an NSPS as of August 7, 1980.

6.0 CHAPTER 6, SECTION 13 – NONATTAINMENT PERMIT REQUIREMENTS

The Brook Mine is located in an area that has been designated as unclassifiable/attainment for NO_2, PM_{10}, and $PM_{2.5}$. Therefore, this permitting action is not subject to the permitting requirements of Chapter 6, Section 13 of the WAQSR.

7.0 CHAPTER 6, SECTION 2 – BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

7.1 Coal Dumping, Crushing, Processing & Preparation Facility Controls

7.1.1 Coal Truck Dump and run of mine coal Handling

Ramaco Wyoming Coal Co., LLC has proposed to utilize an enclosed truck dump at the Brook Mine to handle all run of mine coal at the coal preparation plant. Dust from coal dumping, handling, and surface reclaim inside the building will be controlled by water spray and a baghouse. The 30,000 cubic feet per minute (cfm) baghouse is proposed to have an outlet grain loading of 0.005 gr/dscf. The Division considers the use of an enclosure for truck dumping, handling, and reclaim to be representative of BACT. In addition, the Division considers the proposed emission rate for the baghouse (0.005 gr/dscf) to also represent BACT.

7.1.2 Atomizer/fogger and Passive Enclosure Control Systems

Ramaco Wyoming Coal Co., LLC has proposed to utilize atomizer/fogger systems as well as passive enclosure control (PEC) systems. The Division considers atomizer/fogger and PEC systems to be as efficient as traditional baghouse control devices which have been considered for BACT for these types of applications, and is satisfied that the atomizer/fogger and PEC systems can operate as effective control devices on a continuous basis. The Division considers monitoring and proper maintenance of these systems to be critical to their control effectiveness.

The atomizer/fogger systems and PEC systems are to be operated and maintained so that the system enclosures exhibit no visible emissions. As a condition of this permit, the Division will establish a no visible emissions limit on the atomizer/fogger systems and PEC systems as determined by Method 22 of 40 CFR part 60, appendix A. Ramaco Wyoming Coal Co., LLC is to conduct daily inspections of each of the atomizer/fogger systems and PEC systems to determine the presence of visible emissions. Results of the daily observations are to be recorded, and if any emissions are noted, immediate corrective action is to be taken.

7.2 Haul Road Dust Control Program

Ramaco Wyoming Coal Co., LLC has proposed to implement a dust control program using water and chemical dust suppressants on haul roads. Water and chemical application will vary depending upon specific circumstances such as the location and duration of mining activities, the amount of precipitation, and residual chemicals remaining from prior treatments. Ramaco Wyoming Coal Co., LLC has also proposed to treat the pit haul road with chemical dust suppressant at least twice per year. The Division will consider the use of chemical dust suppressant along with the application of water on an as needed basis as being representative of BACT for the haul roads.

7.3 Disturbed Acreage

The Division considers acreage within the mine boundary that is subject to wind erosion as disturbed acreage. Contemporaneous reclamation helps minimize wind erosion from mined areas. Vegetation of soil is to be done in a timely manner to help minimize wind erosion emissions. Permanent reclamation is to be done as soon as possible after mining is completed, and seeding is to occur during the first favorable planting conditions. Temporary revegetation is not only used to prepare reclaimed areas for permanent

reclamation, but is the main method for minimizing emissions from wind erosion. Temporary revegetation will also be utilized to minimize windblown dust from areas that may be inactive for long periods of time. Windrows are to be bladed in pit advance areas where topsoil has been stripped. Topsoil stockpiles and sediment control structures are to be seeded during the first normal period favorable for planting. Surface preparation techniques, some of which include mulching, surface pitting or contour ripping, are to be used to control wind erosion and vegetation growth.

7.4 Coal Fires

Ramaco Wyoming Coal Co., LLC has proposed to operate a program to mitigate natural or accidental coal fires at the Brook Mine. All employees are responsible for reporting coal fires when they are discovered. Operations personnel will determine the best way to handle a particular fire. Common practices used in extinguishing coal fires include digging them out and burying them in backfill, smothering them with overburden, or using water. Reported fires are to be extinguished within 24 hours unless operational safety issues prevent accessing the area. For significant fires, operation personnel will document the measures utilized to extinguish the fire as well as the timeframe it took to extinguish the fire.

7.5 Other BACT Practices Addressed at the Brook Mine Include:

- The access road to the mine is to be paved along with parking areas wherever practical.
- Emissions from coal conveying at the coal preparation plant are reduced through the use of covered conveyors and coal storage silos.
- Ramaco Wyoming Coal Co., LLC has committed to the use of water on temporary haul roads.
- Overburden loading and coal loading emissions are controlled by limiting the drop height between the bucket and truck bed.
- At the coal loadouts, emissions are controlled through the use of telescoping chutes which limit the drop height of coal into the train cars.

8.0 NEW SOURCE PERFORMANCE STANDARDS (NSPS)

The coal preparation facilities at the Brook Mine are subject to 40 CFR part 60, subpart Y. Subpart Y limits the opacity from sources which have been constructed, reconstructed, or modified before April 28, 2008 to less than 20 percent as determined by Method 9 of 40 CFR part 60, appendix A. Sources which have been constructed, reconstructed, or modified after April 28, 2008 are subject to an opacity limit of less than 10 percent as determined by Method 9 of 40 CFR part 60, appendix A. The coal preparation facilities at the Brook Mine will be subject to an opacity standard of less than 10 percent as the coal preparation facilities are new.

9.0 PROJECTED IMPACT ON EXISTING AMBIENT AIR QUALITY

9.1 OVERVIEW OF MODELING ANALYSIS

9.1.1 Project Overview

The applicant proposes to construct the Brook Mine with a maximum annual coal production rate of 3.0 million tons per year (MMtpy). The Division required the applicant to submit a demonstration of protection of the ambient air quality standards for particulate matter less than 10 microns in diameter (PM_{10}), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), Ozone (O_3), and nitrogen dioxide (NO_2). The demonstrations for the standards based on an annual averaging period for PM_{10}, $PM_{2.5}$ and NO_2 were conducted using dispersion modeling.

9.1.2 Model Selection

The Division reran the applicant's ambient air quality impact analysis using the Environmental Protection Agency's (EPA) AERMOD, version 15181, for evaluating concentrations of nitrogen oxides, PM_{10} and $PM_{2.5}$. All model runs were simulated using recommended regulatory defaults. Options used were rural dispersion with no exponential decay, elevated terrain algorithms, stack-tip downwash (except for building downwash cases), calms processing, and missing data processing. The topography in the geographic area can be characterized as complex terrain due to some terrain elevations being greater than stack top elevations. EPA has specified that the model of choice for complex terrain in an industrial setting with multiple sources is AERMOD.

Since stack heights are less than the Good Engineering Practice (GEP) height, all direction specific building dimensions from the Building Profile Input Program – Prime were included into the AERMOD simulations. The applicant used the EPA BPIP – Prime program to determine downwash parameters to include in the model runs.

As the applicant's model run exceeded the required receptor grid, the Division created a limited receptor grid which only extended 20 km from the facility fenceline.

9.1.3 Meteorological Data

The applicant used a meteorological dataset which included five (5) years of surface data collected from January 1, 2010 through December 31, 2014 at the Automated Surface Observing System (ASOS) meteorological tower at the Sheridan County Airport near Sheridan, Wyoming. Upper-air data consisting of twice-daily soundings from Rapid City, South Dakota were merged with the surface meteorological data.

The AERMET processing included the use of 1-minute ASOS wind data in TD-6405 format. This data was available for all, but a portion of 2013, so 5-minute data was used in its place. These 1-minute files are used to reduce the number of calm/missing hours that result from the use of the standard surface files that utilize a single observation to represent a given hour. AERMINUTE version 15272 and AERMET version 15181 were used to produce the dataset described here.

Stage 3 of AERMET processing (also called the METPREP stage) requires the input of surface

characteristics of the area from which the surface meteorological data were collected. These surface characteristics, which are used by AERMET to determine heat fluxes and atmospheric stability, include:

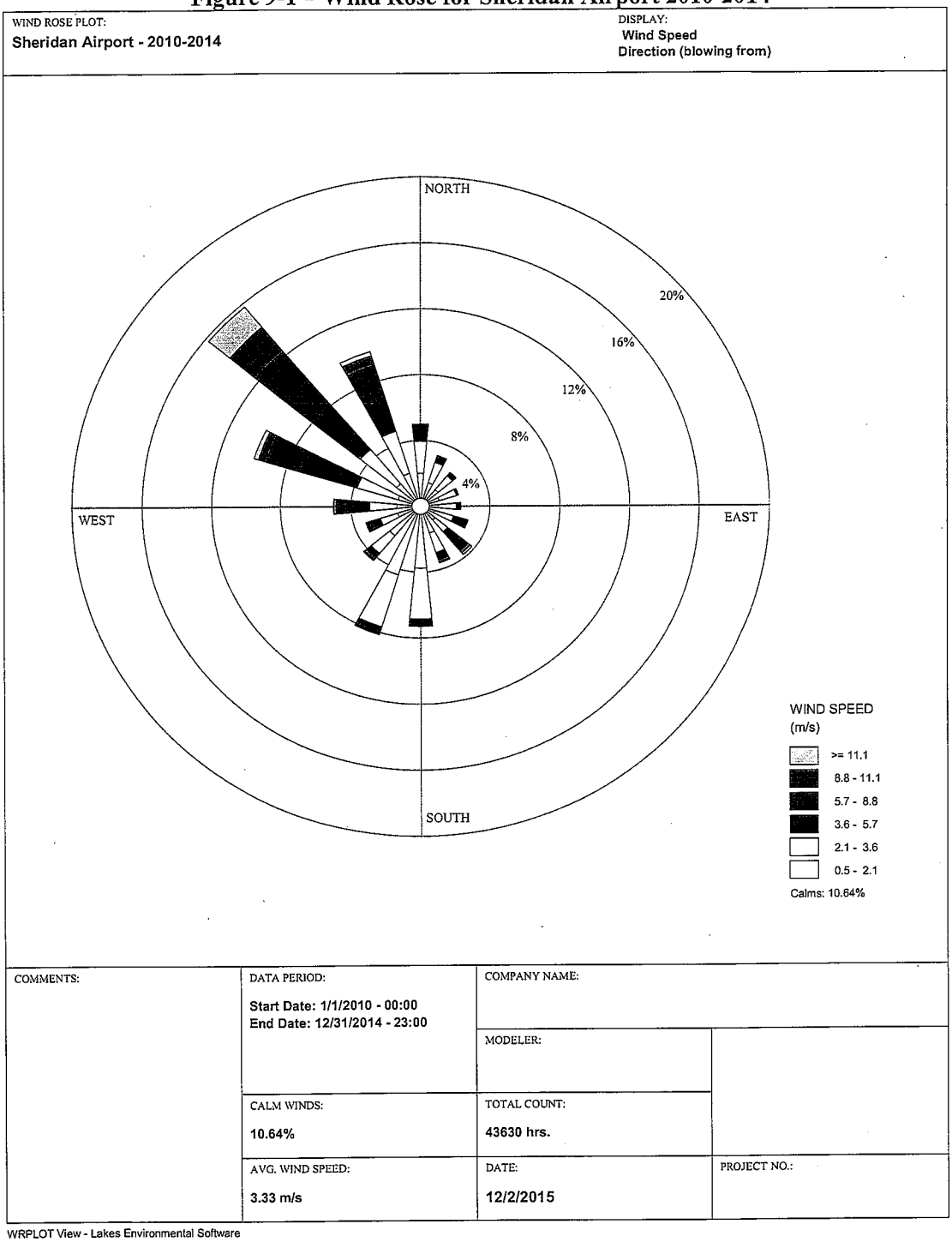
- midday albedo – fraction of solar radiation reflected at the surface
- daytime Bowen ratio – indicator of surface moisture
- surface roughness length – height of obstacles to the wind flow

Surface characteristics for this dataset were entered for twelve sectors on a seasonal basis, and were determined using the EPA AERSURFACE program (13016). This program, which was released in January 2013, makes use of electronic land cover data from the U.S. Geological Survey to calculate surface characteristics for a given modeling domain.

An AERSURFACE user has the option of choosing Bowen ratios that are tailored for dry, average, or wet conditions. The applicant compiled annual precipitation totals for 2010-2014 for the Sheridan area and compared them to long-term records. Any yearly total in the upper 30th -percentile of the 30-year record could be classified as "wet". Similarly, any yearly total in the lower 30th -percentile could be classified as "dry", and any yearly total in the middle 40th -percentile could be classified as "average". In this case, the total precipitation for each year from 2010-2014 was at or very near the long-term average, and therefore "average" moisture was used for each of the years. The seasonal classifications for the year followed the standard AERMET/AERSURFACE breakdown (e.g. summer = June, July, August).

A wind rose for the 2010-2014 data is presented in Figure 9-1.

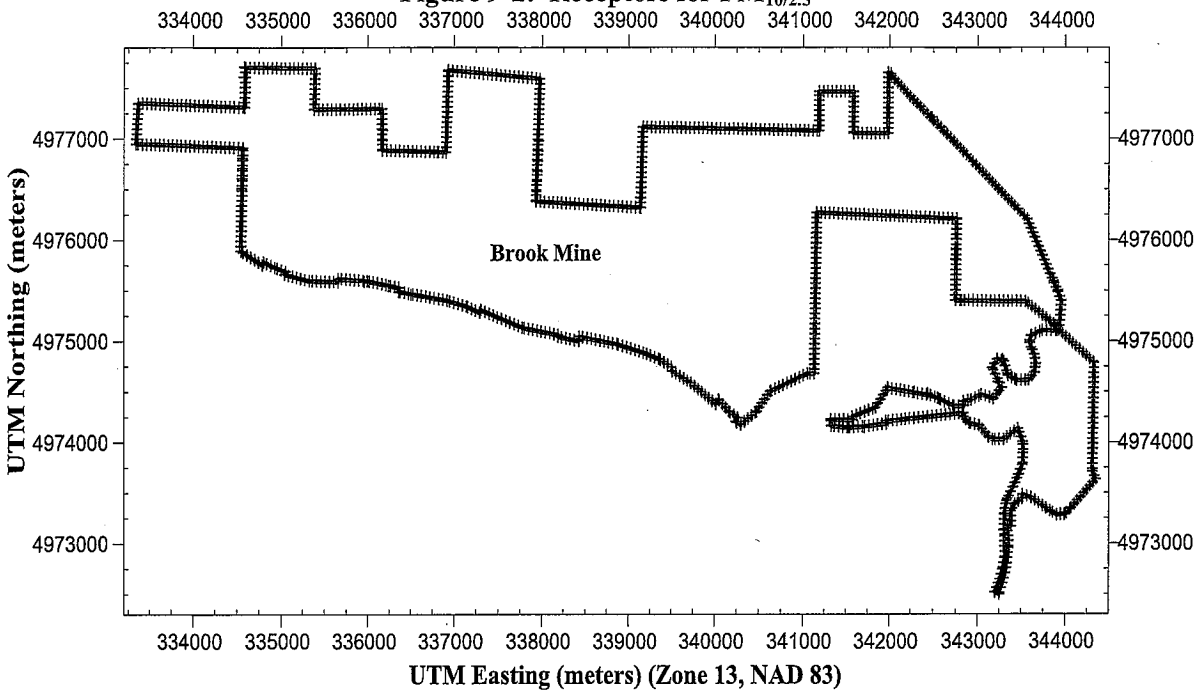
Figure 9-1 – Wind Rose for Sheridan Airport 2010-2014



9.1.4 Receptors used in the PM_{10} and NO_2 Ambient Impact Analyses

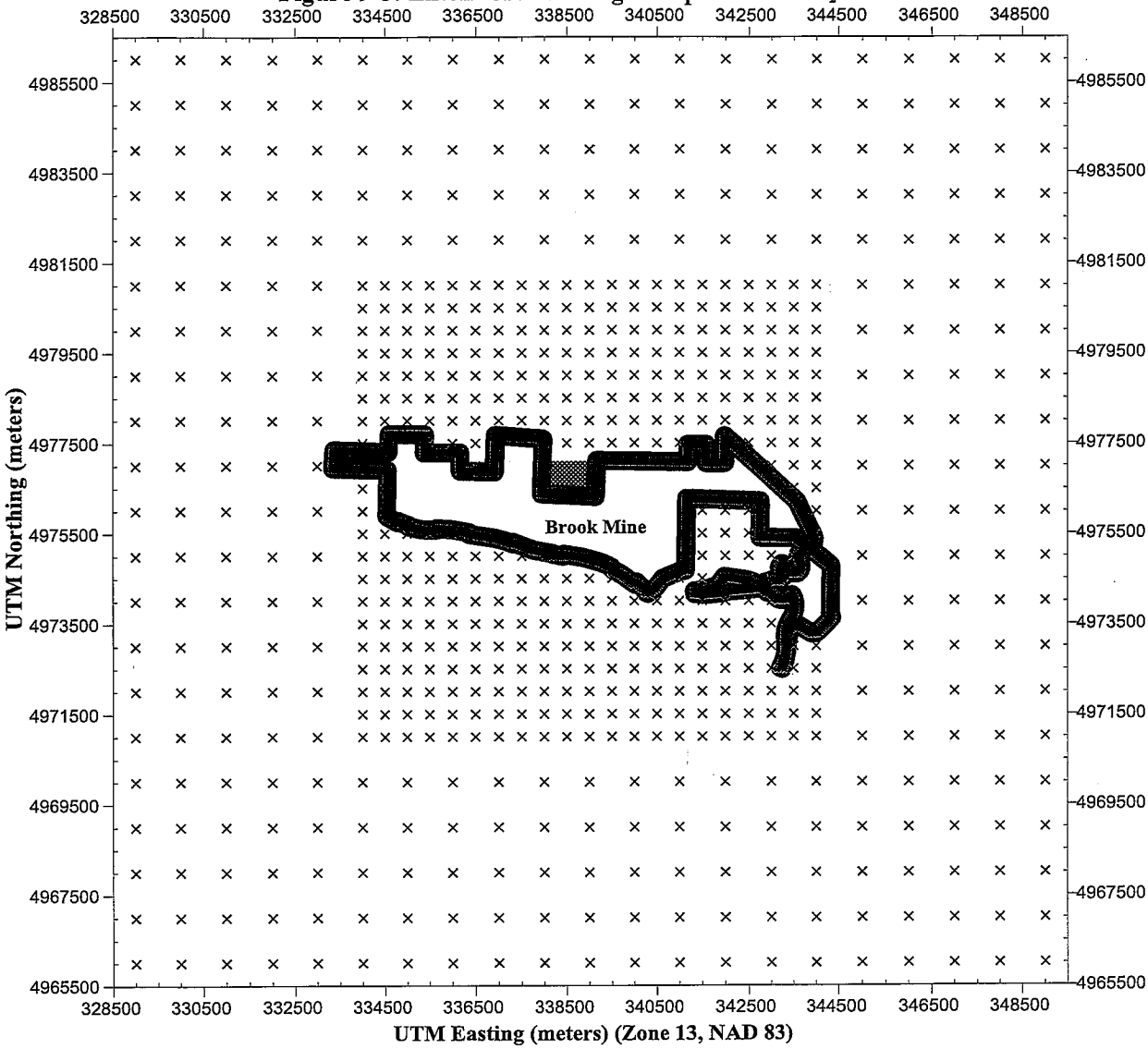
The receptors used in the modeling analyses were developed separately for the $PM_{10/2.5}$ and NO_2 modeling runs. The modeling analysis for $PM_{10/2.5}$ was conducted using discrete Cartesian receptors placed at 500-meter intervals along the ambient boundary for the Brook Mine. Figure 9-2 shows the receptor grid used for the $PM_{10/2.5}$ modeling.

Figure 9-2: Receptors for $PM_{10/2.5}$



The initial NO_2 modeling was conducted with the receptor grid shown in Figure 9-3. This grid was used to model Brook Mine source configurations for the 4th year of operation, as this has been determined to be the worst case scenario based upon, production, location of point sources, and the location of the proposed haul roads that will be in use, to determine which receptors would yield a significant impact of 1.0 $\mu g/m^3$ or greater for an annual averaging period. For the WAAQS model runs the base receptor grid was reduced to include only the significant impact areas that were modeled for each year.

Figure 9-3: Extent of Modeling Receptors for NO_2



9.2 Analysis of Long-Term PM_{10} Impacts

9.2.1 Annual $PM_{10/2.5}$ Emission Inventories

The applicant developed a summary of the mine activity proposed for the Brook Mine for all of the years in the mining plan and then developed fugitive $PM_{10/2.5}$ inventories from this information. Because it is not practical to model all of the years in the life of a mine, the applicant compared life-of-mine fugitive emissions for the mine, and determined the year which would likely yield the highest modeled impacts. These "worst-case" years were modeled and the results were compared to the annual ambient air quality standard. If the maximum impact is below the standard, then it is assumed that the impact from other years in the life of the mine will fall below the ambient standard.

Annual fugitive $PM_{10/2.5}$ emissions were summarized and evaluated, not just as to the highest total, but also the location of the mining activity in relation to the ambient boundary. If the distance from the mining activity to the ambient boundary is small, impacts to the receptors along the ambient boundary may be more significant. Point source emissions are assumed not to vary significantly from year to year and are usually excluded from the process of selecting the worst-case years. Based on the operating parameters and projected fugitive $PM_{10/2.5}$ emission inventories for the Brook Mine, the 4th year of activity was determined to represent the "worst-case" years to simulate in the modeling analyses for $PM_{10/2.5}$ and NO_2.

Table 9-1 presents calculated fugitive $PM_{10/2.5}$ emissions for Brook Mine.

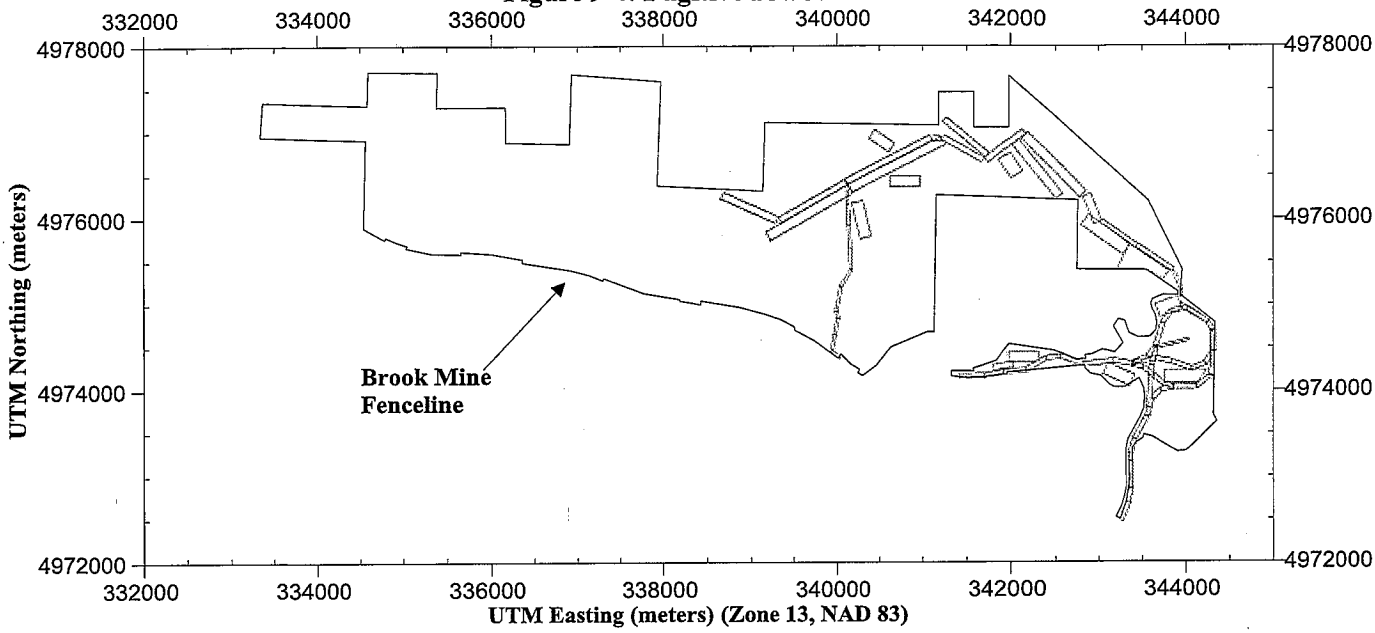
Table 9-1: Brook Mine
Annual Fugitive $PM_{10/2.5}$ Emissions (4th year)

Emission Source	PM_{10} Emission Rate (tpy)	$PM_{2.5}$ Emission Rate (tpy)
992K Wheel Loader	9.35	1.4
988K Wheel Loader	0.38	0.06
988H Loader - 9.0 cy bucket	0.31	0.05
988H Loader - pizza pan attachment	0.00	0.00
777G Off-Hwy Rock Truck	12.37	1.24
Coal Truck - Mack Titan w/ Pup Paved Rds	5.94	0.59
Coal Truck - Mack Titan w/ Pup Unpaved Rds	34.15	3.42
MD6240 Rotary Drill	1.27	0.19
Water Truck	0.37	0.04
D11T Crawler Tractor	3.13	0.47
D10T Crawler Tractor	3.13	0.47
16G Motor Grader	9.38	1.41
627G Scraper	3.11	0.47
Fuel and Lube Truck	1.3	0.13
Maintenance Service Truck	2.6	0.26
Bulk Prill Truck	1.3	0.13
Explosive Supplies Truck	1.3	0.13
3/4 Ton Pickup Truck	7.62	0.76
Bus	0.08	0.01
Commercial Delivery Truck	0.09	0.01
Passenger Vehicle	0.91	0.09
Blasting Overburden	0.75	0.04
Blasting Surface/Trench Coal	0.26	0.02
Wind Erosion on Disturbed Areas	26.63	3.99
Highwall Miner In-Pit Coal Transfers	2.35	0.36
Explosives Consumption	0.00	0.00
Locomotive	0.42	0.42
Pit Dewatering Well Pump	0.66	0.64
Light Plant	0.16	0.16
Totals	**129.32**	**16.96**

9.2.2 Emissions Apportioning

A detailed accounting of the apportioned particulate emissions and sources is contained in the permit application. The area sources that were used to represent the $PM_{10/2.5}$ emissions at the mines are shown in Figure 9-4.

Figure 9-4: Fugitive PM Sources



9.2.3 Annual $PM_{10/2.5}$ Background Concentration

The Division requires that an annual background PM_{10} concentration to be used to represent all background sources that are not explicitly input to dispersion modeling analyses. For this analysis, the Division determined that a background concentration of 12.0 $\mu g/m^3$ was appropriate for PM_{10} and 5.2 $\mu g/m^3$ for $PM_{2.5}$.

9.2.4 Annual $PM_{10/2.5}$ Dispersion Modeling Results

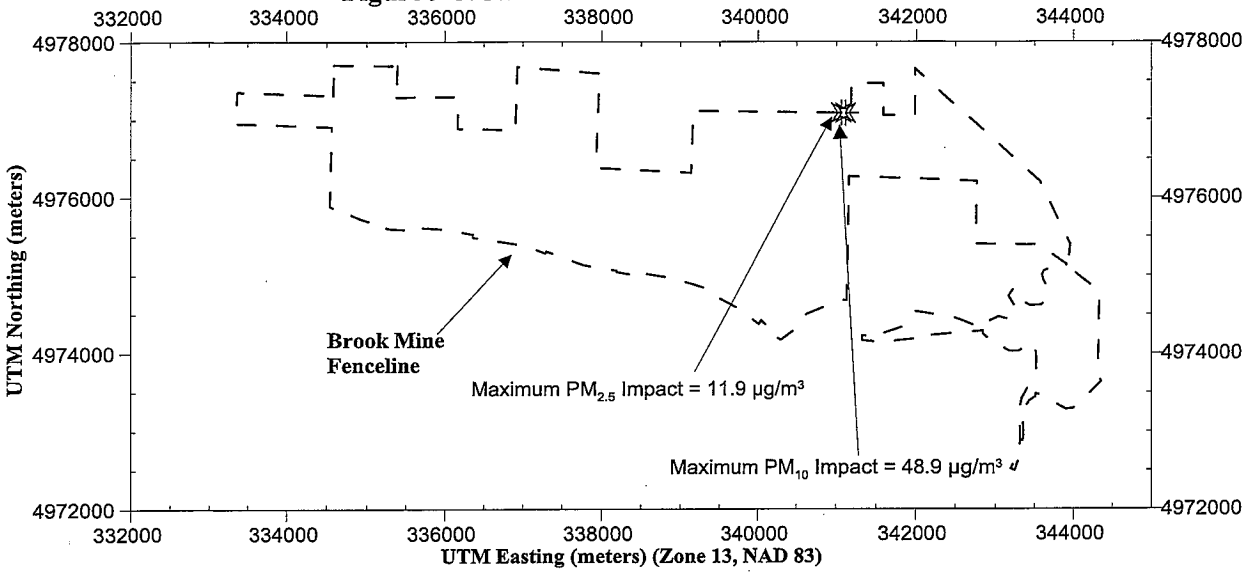
The maximum model-predicted PM_{10} and $PM_{2.5}$ concentrations for Brook Mine, including background, are shown in Table 9-2. Figure 9-5 shows the location of the maximum predicted impacts.

Table 9-2: Summary of Modeled Annual $PM_{10/2.5}$ Impacts

Pollutant	UTM Location		Predicted PM_{10} Impact ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Predicted Impact ($\mu g/m^3$)	WAAQS ($\mu g/m^3$)
	X (m)	Y (m)				
PM_{10}	341064	4977080	36.9	12.0	48.9	50
$PM_{2.5}$	341114	4977079	6.7	5.2	11.9	12.0

Note: UTM Coordinates are expressed in NAD 83, Zone 13.

Figure 9-5: Maximum Predicted PM Locations



9.2.5 Analysis of Short-Term $PM_{10/2.5}$ Impacts

Monitoring of $PM_{10/2.5}$ on the basis of a 24-hour averaging period indicates that the 24-hour NAAQS of 150 $\mu g/m^3$ for PM_{10} and 35 $\mu g/m^3$ is not threatened at any of the nearby monitoring sites through 2014. The applicant reported information from five (5) nearby monitors. The Division has operated three (3) monitors in Sheridan, WY, which are located 7-9 miles from the proposed Brook Mine. Highland Park School was run through 2012. Meadowlark School started operation in 2012 and is currently still active. The Sheridan Police Station has been in operation since 1985. The Decker Mine, with a current production of 3.0 MMtpy, is located in Montana, approximately fifteen (15) miles north east of the location of the proposed Brook Mine, and operates under an ambient PM_{10} Monitoring network. Montana Department of Environmental Quality (MDEQ) currently has a monitor located at Birney, MT, approximately thirty-five (35) miles northeast of the proposed Brook Mine.

Table 9-3: 24-Hour $PM_{10/2.5}$ Monitored Values

Pollutant	Monitoring Site	2010	2011	2012	2013	2014
PM_{10}	Meadowlark School	--	--	34	30	19
$PM_{2.5}$		--	--	19.3	14.4	13.9
PM_{10}	Highland Park School	24	35	21	--	--
$PM_{2.5}$		13.8	14.5	10.3	--	--
PM_{10}	Sheridan Police Department	61	57	73	52	65
$PM_{2.5}$		27	23	18.9	16.7	14.6
PM_{10}	Decker Mine, MT	40	49	63	35	27
PM_{10}	MDEQ – Birney Monitoring Site	51	65	86	59	65
$PM_{2.5}$		10.9	17.3	28.9	10.9	19.4

The 24-hour ambient standards for $PM_{10/2.5}$ are based upon the 2nd High 24-hour concentration averaged over three (3) years. Based upon these values the Division anticipates that the operation of the Brooks Mine will not prevent the attainment or maintenance of the 24-hour NAAQS/WAAQS for $PM_{10/2.5}$. The Brook Mine will be required to operate an ambient monitoring network for PM_{10}.

9.3 Analysis of Long-Term NO_2 Impacts

To determine compliance with the WAAQS for NO_2, the applicant submitted a dispersion modeling analysis of NO_x sources at the Brook Mine and regional sources. The modeled NO_x concentrations were converted to nitrogen dioxide (NO_2) concentrations using EPA's *national default ratio* of 0.75. Appendix W of 40 CFR Part 51, also known as the EPA's Guideline on Air Quality Models (GAQM) describes the use of the *national default ratio*, which provides for a 25% reduction in modeled NO_x concentrations for purposes of estimating the partial conversion of NO_x to NO_2.

9.3.1 NO_x Emission Inventories

Several types of NO_x sources at the Brook Mine were modeled, including haul trucks, graders, loaders, rubber tired (RT) dozers, track dozers, water trucks, and fugitive NO_x emissions from activities such as drilling and blasting. Additionally, NO_x emissions from locomotive sources operating within the Brook Mine rail loop were included.

9.3.2 Tailpipe and Fugitive Sources

The main sources of gaseous emissions at the Brook Mine are the tailpipes of heavy-duty, diesel-powered mining equipment, railroad locomotives operating on the mine property, and the detonation of explosives. The largest source of NO_x emissions are the diesel-powered mobile equipment. A NO_x emissions inventory consisting of tailpipe and fugitive sources at the Brook Mine was prepared based on operating statistics and the mine plan for the worst case year of activity, the fourth (4th) year.

Emissions from haul trucks, scrapers, graders, dozers, locomotives, and blasting were calculated by the applicant using emission factors from the EPA documents and AP-42. NO_x emissions from mobile sources operating within the pit areas were assumed to occur in all active areas, and coal blasting emissions were assumed to occur only within the location of the pit for the current year.

A breakdown of the tailpipe, locomotive, and fugitive emissions that were included in the applicant's modeling analyses for the Brook Mine are provided in Table 9-4. These data were tabulated for the worst-case year, and were calculated based on an operational schedule of 8,760 hours/year.

Table 9-4: Brook Mine Annual NO_x Emissions Modeled	
Emission Source	**NO_x Emission Rate (tpy)**
988H Loader - pizza pan attachment	2.03
777G Off-Hwy Rock Truck	19.21
Coal Truck - Mack Titan w/ Pup Paved Rds	4.10
Coal Truck - Mack Titan w/ Pup Unpaved Rds	8.84
MD6240 Rotary Drill	2.25
Water Truck	0.94
D11T Crawler Tractor	6.37
D10T Crawler Tractor	4.49
16G Motor Grader	3.74
627G Scraper	1.90
Fuel and Lube Truck	0.41
Maintenance Service Truck	0.82
Bulk Prill Truck	0.41
Explosive Supplies Truck	0.41
3/4 Ton Pickup Truck	1.28
Bus	0.01
Commercial Delivery Truck	0.01
Passenger Vehicle	0.22
Blasting Overburden	0.00
Blasting Surface/Trench Coal	0.00
Wind Erosion on Disturbed Areas	0.00
Highwall Miner In-Pit Coal Transfers	0.00
Explosives Consumption	7.08
Locomotive	16.98
Pit Dewatering Well Pump	9.26
Light Plant	2.31
Shop Heater	0.24
Office Heater	0.08
Total	**93.39**

9.4.3 NO_2 Background Concentration

A background NO_2 concentration of 13.2 $\mu g/m^3$ was taken from ambient monitoring conducted at the Belle Ayr Mine from 2011 through 2014. The Division considers the Belle Ayr Mine NO_2 ambient data to be the best available estimate of a conservative background NO_2 concentration for the project area.

9.4.4 NO_x Dispersion Modeling Results

For each receptor used in the WAAQS modeling analysis, the raw model results for NO_x were multiplied by the *national default ratio* 0.75 to account for partial chemical conversion to NO_2, and the background concentration of 13.2 $\mu g/m^3$ was added to the modeled concentrations.

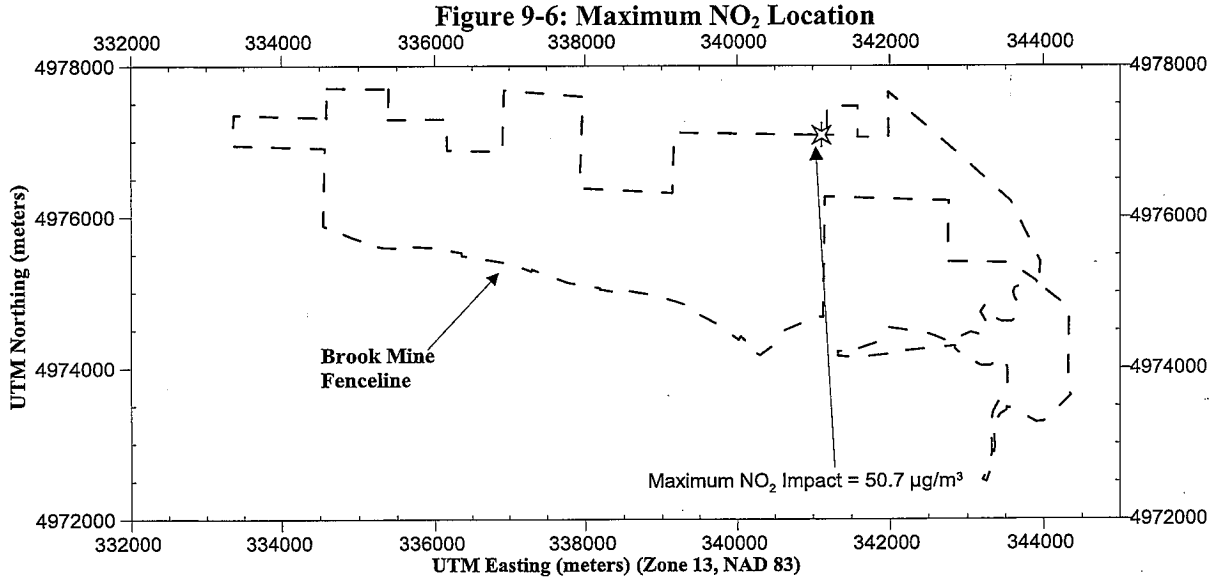
The maximum model-predicted NO_x concentration, including background, was 50.7 $\mu g/m^3$ located along the central ambient boundary of the Brook Mine. All modeled impacts were below the WAAQS of 100 $\mu g/m^3$. Results of the modeling are summarized in Table 9-5. Figure 9-6 shows the locations of the maximum predicted impacts.

Table 9-5: Summary of Modeled NO_2 Impacts

UTM Location [1]		Predicted NO_2 Impact ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Predicted Impact ($\mu g/m^3$)	Wyoming Standard ($\mu g/m^3$)
X (m)	Y (m)				
341114	4977079	37.5	13.2	50.7	100

[1] UTM Coordinates are expressed in NAD 83, Zone 13.

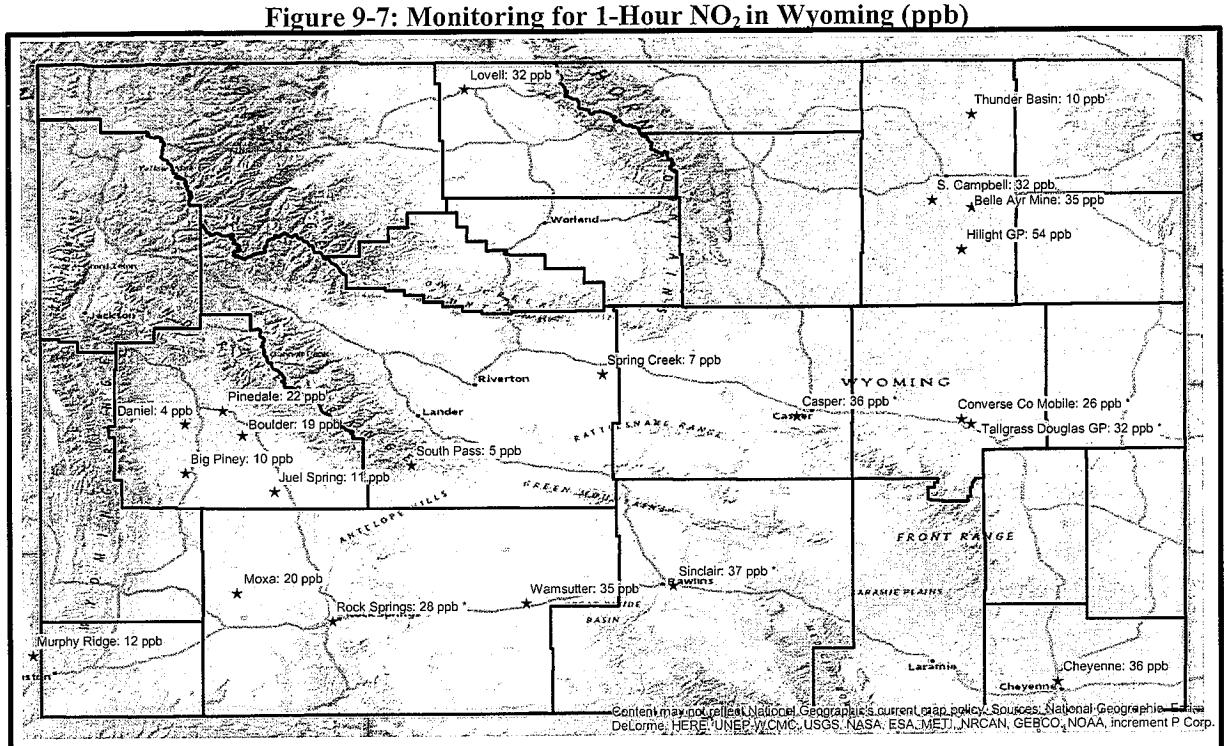
Figure 9-6: Maximum NO_2 Location



9.5 Analysis of 1-hour NO_2 Impacts

Statewide monitoring of NO_2 on the basis of a 1-hour averaging period indicates that the 1-hour NAAQS of 100 ppb is not threatened at any of twenty-one (21) monitoring sites through 2014 (see Figure 9-7). Several of the Wyoming monitors are located in areas of concentrated industrial development. County-wide NO_x emissions in Sweetwater County were an estimated 38,280 tons in 2011. Multiple monitors are also located in Campbell County (estimated 44,420 tons of NO_x in 2011), Converse County (estimated 19,280 tons in 2011) and Sublette County (estimated 4,970 tons NO_x in 2011). Based on the current statewide 1-hour NO_2 monitoring and the minor-source NO_x emissions total from the Brook Mine, the Division is satisfied that the operation of the Brook Mine will not prevent the attainment or maintenance of the 1-hour NAAQS for NO_2.

Figure 9-7: Monitoring for 1-Hour NO_2 in Wyoming (ppb)



Note: To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour averages must not exceed 100 ppb. Concentrations shown in the figure above from Wyoming monitoring stations are 3-year (2012-2014) averages of the 98th percentile of the daily maximum 1-hour averages. If three years of data were not available for a particular station, the 98th percentile of the daily maximum 1-hour averages over the period of available data is shown.

* Less than three (3) years of complete data reported

9.6 Ozone

Ozone is a pollutant that does not directly emerge from the stacks of air pollution sources, but forms due to "precursor" emissions [NO_x and volatile organic compounds (VOC)] from a number of sources over larger (regional) areas. Because of the uncertainty and expense associated with the models currently available to predict ozone formation, computer modeling to demonstrate compliance with the ozone NAAQS is not typically performed for single facilities, and was not performed for the Brook Mine. To assess the potential impact of the proposed project on local ozone levels, ozone monitoring data was examined to determine the current ambient levels, and the expected emissions of ozone precursors from the proposed project were compared to county-wide levels of the same pollutants.

Ozone levels are measured at monitoring stations in the Thunder Basin National Grassland area, thirty (30) miles northeast of Gillette, Wyoming, at the Campbell County Monitor, fifteen (15) miles southwest of Gillette, Wyoming, and at the Montana DEQ Birney Monitor, located fifteen (15) miles northeast of the proposed Brook Mine. Table 9-6 presents a summary of measured ozone values at these sites.
Note that attainment of the 8-hour NAAQS for ozone is based on the 3-year average of the annual 4th highest daily maximum 8-hour concentrations.

Table 9-6: Monitored Concentrations of 8-Hour Ozone (O_3)

Monitor Location	Measured Concentration (ppb)	NAAQS/WAAQS (ppb)
Thunder Basin National Grasslands Campbell County, WY [(1)]	63	70 [(2)]
Campbell County Monitor Campbell County, WY [(1)]	63	
Montana DEQ - Birney Monitor [(1)]	57	

[(1)] 3-year average of annual 4th highest (99th percentile) daily maximum 8-hour concentration (2012-14).
[(2)] This value will become effective December 28, 2015. The current value is 75 ppb.

In the original submittal, the applicant also compared the expected emissions of ozone precursors from the Brook Mine to the nearby point and mobile sources in Sheridan County and from the nearby Decker Mine in Montana. The maximum occurrence of NO_x and VOC emissions from the Brook Mine, were calculated to total 128 tpy and 7 tpy, respectively. The current iteration of the application uses a reduced run time for the mining equipment, which reflects a decrease in NO_x and VOC emissions from the original application. As shown in Table 9-7, the expected increase in emissions of ozone precursors from the Brook Mine represent less than three percent (3%) of the total of the precursors that existed in 2014. This information and the current monitored levels of ozone show that the proposed Brook Mine will not prevent the attainment or maintenance of the ozone NAAQS/WAAQS.

Table 9-7: Emissions of Ozone Precursors vs. Potential Emissions from Brook Mine		
Category	NO_x (tpy)	VOC (tpy)
Proposed Brook Mine	**128**	**7**
Decker Mine (Montana DEQ Permit)	701	100
Spring Creek Mine	1,200	85
Point Sources Within 20 km [1]	2,417	92
Sheridan County Mobile Sources [1]	200	100
Total Emissions	**4,640**	**384**
% of Nearby Emissions (from Brook Mine)	2.8%	1.8%

[1] Source: 2011 emissions inventory for Title V and minor sources.

9.7 Summary

The applicant's dispersion modeling analyses were conducted using U.S. EPA approved models and methodologies, and the Division has reviewed and verified the source parameters, default settings, and related modeling inputs used in the applicant's modeling analyses. Through the required dispersion modeling analyses and other components of the ambient impact analysis, the applicant has successfully demonstrated to the Division that all applicable air quality standards will be attained if the proposed mine plan and mining operations are approved.

10.0 LAND USE PLANNING AND GREATER SAGE -GROUSE PROTECTION

Ramaco Wyoming Coal Co., LLC provided the Division information that the proposed location for the Brook Mine is currently zoned for Heavy Industry. The provided documentation meets the WAQSR requirement for proper land use planning [Chapter 6, Section 2(c)(iv)].

The proposed operation of the Brook Mine must comply with the Greater Sage-Grouse Executive Order 2015-4. Ramaco Wyoming Coal Co., LLC must get a permit from Wyoming Department of Environmental Quality – Land Quality Division for the coal mining operation. These permits include recommendations from the Wyoming Game & Fish Department for the protection of sage grouse habitat.

11.0 CONCLUSIONS AND PROPOSED PERMIT CONDITIONS

With continued emphasis on application of BACT and BMP work practices, and on continued operation of an approved ambient monitoring network, the Division is satisfied that the proposed Brook Mine can be implemented while maintaining ambient air quality standards.

Specifically, the applicant's dispersion modeling analyses were conducted using U.S. EPA approved models and methodologies, and the Division has reviewed and verified the source parameters, default settings, and related modeling inputs used in the applicant's modeling analyses. Through the required dispersion modeling analyses and other ambient impact analyses, the applicant has successfully demonstrated to the Division that all applicable air quality standards will be attained if the proposed changes in the applicant's mine plan and mining operations are approved. Therefore, the Division is proposing to issue a construction permit to Ramaco Wyoming Coal Co., LLC for the Brook Mine with the following conditions:

1. That authorized representatives of the Division of Air Quality be given permission to enter and inspect any property, premise or place on or at which an air pollution source is located or is being constructed or installed for the purpose of investigating actual or potential sources of air pollution and for determining compliance of non-compliance with any rules, standards, permits or orders.

2. That all substantive commitments and descriptions set forth in the application for this permit, unless superseded by a specific condition of this permit, are incorporated herein by this reference and are enforceable as conditions of this permit.

3. That a permit to operate, in accordance with Chapter 6, Section 2(a)(iii) of the WAQSR, is required after a 120-day startup period in order to operate this facility.

4. That all notifications, reports and correspondences associated with this permit shall be submitted to the Stationary Source Compliance Program Manager. Submissions may also be done electronically through https://airimpact.wyo.gov to satisfy requirements of this permit.

5. That written notification of the anticipated date of initial startup, in accordance with Chapter 6, Section 2(i) of the WAQSR, is required not more than sixty (60) days or less than thirty (30) days prior to such date. Notification of the actual date of startup is required within fifteen (15) days after startup.

6. That the date of commencement of construction shall be reported to the Administrator within thirty (30) days of commencement. In accordance with Chapter 6, Section 2(h) of the WAQSR, approval to construct or modify shall become invalid if construction is not commenced within twenty-four (24) months after receipt of such approval or if construction is discontinued for a period of twenty-four (24) months or more. The Administrator may extend the period based on satisfactory justification of the requested extension.

7. That performance tests be conducted, in accordance with Chapter 6, Section 2(j) of the WAQSR, within thirty (30) days of achieving a maximum design rate but not later than ninety (90) days following initial startup, and a written report of the results be submitted. The operator shall provide fifteen (15) days prior notice of the test date. If a maximum design rate is not achieved within ninety (90) days of startup, the Administrator may require testing be done at the rate achieved and again when a maximum rate is achieved.

8. Initial performance testing, as required by Condition 7 of this permit, shall be conducted on the following sources:

   i. Atomizer/fogger and PEC systems associated with the coal loadout:

      Opacity: Performance testing shall follow the requirements of Chapter 5, Section 2(i) of the WAQSR.

   ii. Truck Dump Baghouse:

      PM_{10} Emissions: Testing shall consist of three (3) 1-hour tests following EPA Reference Methods 1-4 and 5 (front half only).

      Opacity: Performance testing shall follow the requirements of Chapter 5, Section 2(i) of the WAQSR.

   A test protocol shall be submitted for review and approval prior to testing. Results shall be submitted to the Division within forty-five (45) days of completing the tests.

9. That the following requirements shall be met for all atomizer/fogger systems and passive enclosure control (PEC) systems at the Brook Mine:

   a. The atomizer/fogger systems and PEC systems shall be operated and maintained so the system enclosure exhibits no visible emissions as determined by Method 22 of appendix A, 40 CFR part 60.

   b. That the atomizer/fogger systems and PEC systems and associated monitoring equipment shall be operated during all times that the respective coal preparation facilities are in operation.

   c. Ramaco Wyoming Coal Co., LLC shall conduct, at minimum, daily visual observations of the atomizer/fogger systems and PEC systems to determine the presence of visible emissions on any day the respective coal preparation facilities are in operation. Records shall be kept documenting whether visual emissions are noted and the corrective action taken. These records shall be maintained for a period of five (5) years and shall be made available to the Division upon request.

   d. Ramaco Wyoming Coal Co., LLC may utilize 40 CFR §60.255(f) of Subpart Y in lieu of utilizing (c) of this condition to demonstrate continuous compliance with (a) of this condition.

10. That the feeder/breaker system associated with the coal preparation plant shall be controlled with an atomizer/fogger system.

11. That conveyor transfer points associated with the coal preparation plant shall be controlled with atomizer/fogger systems or passive enclosure control (PEC) systems.

12. That the truck dump enclosure baghouse shall be limited to the following:

IMPACT ID	PM_{10}		
	gr/dscf	lb/hr	tpy
LUD001	0.005	1.3	5.6

13. That the truck dump enclosure shall be limited to no visible emissions as determined by Method 22 of 40 CFR part 60, appendix A.

14. The truck dump baghouse shall be limited to an opacity limit of ten percent (10%) as determined by Method 9 of 40 CFR part 60, appendix A.

15. That all permanent haul roads shall be treated with a chemical dust suppressant at least two (2) times per year in addition to water to control fugitive dust emissions, and shall be maintained continuously to the extent that such treatment remains a viable control measure.

16. That all temporary haul routes, including pit floor haul routes, shall be treated with water and/or chemical dust suppressants to control fugitive dust emissions, on a schedule such that treatment remains a viable control measure.

17. That Ramaco Wyoming Coal Co., LLC shall submit to the Division by April 1st of each year, a report addressing road dust control measures employed during the past year and a disturbed acreage report for the year. This plan shall include the following:

    a. A map based on the past year end conditions with the following information:
        - All roads existing at the end of the calendar year, which have been treated with water and/or dust suppressant.
        - Locations of active operations, treated disturbed areas, and reclaimed areas.
    b. Type and annual quantity of dust suppressants used for the past year and a description of the general application procedures and schedule.
    c. Number of water trucks, capacities of each water truck, and quantity of water used for the past year.
    d. Operating hours by water truck and total water truck fleet hours for the past year.
    e. Total length in miles of permanent and temporary haul roads existing at the end of the calendar year, which have been treated with water and/or dust suppressant.
    f. Overburden and coal production rates for the past year.
    g. A table summarizing the acreages and control measures or BMP uses/applied by active operations, treated disturbed areas, and reclaimed areas.

18a. Topsoiled areas greater than 150 contiguous acres that will not be revegetated within 60 days of completion of topsoil laydown and regraded backfill areas greater than 150 contiguous acres that will not be topsoiled within 60 days, shall be ripped or chiseled to create a roughened surface, seeded with a temporary vegetative cover, or otherwise effectively stabilized against wind erosion.

18b. Topsoiled areas less than 150 contiguous acres that will not be immediately revegetated and regraded backfill areas less than 150 contiguous acres that will not be topsoiled for an extended period of time, shall be ripped or chiseled to create a roughened surface, seeded with a temporary vegetative cover, or otherwise effectively stabilized against wind erosion as soon as feasible.

19. That Ramaco Wyoming Coal Co., LLC shall utilize a program to mitigate coal fires that result from spontaneous combustion. Attempts to extinguish coal fires must be initiated within twenty-four (24) hours of discovering the fire and pursued until the fire is extinguished, unless operational safety issues are present. For all coal fires where efforts to extinguish the fire were not initiated within twenty-four (24) hours, or for fires which were not extinguished within twenty-four (24) hours of the initial attempt to extinguish the fire, Ramaco Wyoming Coal Co. LLC shall document the measures taken to extinguish the fire and the reasons for any delays.

20. That Ramaco Wyoming Coal Co., LLC shall operate, in accordance with the requirements of 40 CFR parts 50 and 58 an approved ambient monitoring program that includes an ambient PM_{10} monitoring network at the Brook Mine to demonstrate compliance with the ambient PM_{10} standards in Chapter 2, Section 2 of the WAQSR. Ramaco Wyoming Coal Co. LLC shall maintain a quality assurance plan for the monitoring network, as required by 40 CFR part 58. The quality assurance plan for the monitoring network, and any proposed changes to the plan or to the monitoring network, shall be approved by the Division's Air Quality Monitoring Section prior to implementation.

21. Ramaco Wyoming Coal Co., LLC shall comply with all commitments made in the quality assurance plan for the ambient PM_{10} monitoring network in Condition 20 for the Brook Mine, and the data generated by the ambient PM_{10} monitoring network shall be submitted in a Division approved format on a quarterly basis, within 60 days following the end of the quarter.

22. Ramaco Wyoming Coal Co., LLC shall not emit pollutants in a manner that would cause any monitor in the ambient monitoring network described in Condition 20 to exceed the ambient air quality standards, in accordance with 40 CFR Part 50 and as described in Chapter 2 of the WAQSR.

23. Ramaco Wyoming Coal Co., LLC shall notify the Division within 15 days of a monitored exceedance at any of the continuous monitors, and within 30 days of a monitored exceedance at any filter based monitor in the ambient PM_{10} monitoring network at the Brook Mine.

24. That annually, Ramaco Wyoming Coal Co., LLC shall submit to the Division, a demonstration that the ambient PM_{10} monitoring network is sufficient for monitoring impacts and demonstrating compliance with the ambient particulate standards in Chapter 2, Section 2 of the WAQSR from current as well as future (5-year projection) mining activities. This demonstration shall consist of a discussion of the ambient monitoring network along with an annual windrose, and current UTM coordinate locations of the monitors. In addition, a map showing current monitor locations in relation to active mining areas along with projected mining areas shall be included. The ambient monitoring network demonstration shall be submitted along with the annual report required for dust control measures in Condition 17, and a copy shall be submitted to the Air Quality Monitoring Program located in Cheyenne. The Administrator may require Ramaco Wyoming Coal Co. LLC to modify their ambient monitoring network, including monitor locations, based on a review of the demonstration.

25. That Ramaco Wyoming Coal Co., LLC shall submit, if required by the Administrator, a contingency action plan for high particulate events at the Brook Mine. Upon approval, the contingency action plan shall be considered part of this permit, and may be revised without administratively amending the permit, but revisions shall be approved by the Division prior to implementation.

26. That Ramaco Wyoming Coal Co. LLC shall maintain a meteorological station at the Brook Mine acceptable to the Division. Surface air meteorological data measurements shall be collected at the Brook Mine, as specified in the EPA document: Meteorological Monitoring Guidance for Regulatory Modeling Applications. The meteorological data measurements shall consist of hourly observations of:

    a. Wind speed using an anemometer height of 10 meters
    b. Wind direction
    c. Ambient temperature
    d. Vertical temperature difference (delta-temperature) between 2 meters and 10 meters
    e. Solar radiation

27. The meteorological data specified in Condition 26 shall be submitted in an electronic format on a quarterly basis along with the ambient monitoring data in Condition 17.

28. The maximum coal production by year at the Brook Mine shall not exceed a total production rate of 2 million tons as described in the mine plan contained in the application. Mining may continue through the twelfth (12^{th}) year after startup as described in the mine plan contained in the application for this permit. Annual coal and overburden production rates shall be reported with the annual report required for dust control measures by Condition 17.

29. That Ramaco Wyoming Coal Co., LLC shall retain, at the Brook Mine, records of inspections, observations, and support information as required by this permit for a period of at least five (5) years from the date such records are generated and the records shall be made available to the Division upon request.