BEFORE THE ENVIRONMENTAL QUALITY COUNCIL
STATE OF WYOMING

IN THE MATTER OF:	)	
BASIN ELECTRICAL POWER COOPERATIVE	)	
DRY FORK STATION,	)	Docket No. 07-2801
AIR PERMIT CT-4631	)	

RESPONDENT DEPARTMENT OF ENVIRONMENTAL QUALITY'S MEMORANDUM IN SUPPORT OF MOTION FOR PARTIAL SUMMARY JUDGMENT

Schlichtemeir Affidavit

EXHIBIT V

The State
of Wyoming

Department of Environmental Quality

Jim Geringer, Governor

Herschler Building • 122 West 25th Street • Cheyenne, Wyoming 82002

ADMIN/OUTREACH	ABANDONED MINES	AIR QUALITY	INDUSTRIAL SITING	LAND QUALITY	SOLID & HAZ. WASTE	WATER QUALITY
(307) 777-7758	(307) 777-6145	(307) 777-7391	(307) 777-7368	(307) 777-7756	(307) 777-7752	(307) 777-7781
FAX 777-3610	FAX 777-6462	FAX 777-5616	FAX 777-6937	FAX 777-5864	FAX 777-5973	FAX 777-5973

September 25, 2002

Mr. Tom Ohlmacher
Senior V.P. Power Supply and Operations
Black Hills Corporation
P.O. Box 1400
Rapid City, SD 57709-1400

Permit No. CT-3030

Dear Mr. Olmacher:

The Division of Air Quality of the Wyoming Department of Environmental Quality has completed final review of Black Hills Corporation's application to construct a 500 megawatt (MW) pulverized coal fired electric generating facility, known as WYGEN 2, located at 13151 Hwy 51 approximately five (5) miles east of Gillette in Campbell County, Wyoming.

Following this agency's proposed approval of the request as published May 2, 2002 and in accordance with Chapter 6, Section 2(m) of the Wyoming Air Quality Standards and Regulations, the public was afforded a 30-day period in which to submit comments concerning the proposed new source, and an opportunity for a public hearing. Public comments have been received and a public hearing on the proposal was held on July 2, 2002. On the basis of the information provided to us in the application and comments received during the public notice period and the public hearing, approval to construct the WYGEN 2 coal fired power plant as described in the application is hereby granted pursuant to Chapter 6, Section 2, Section 4, and Section 6 of the regulations with the following conditions:

1. 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 or non-compliance with any rules, regulations, standards, permits or orders.

2. 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. A major source, as defined by Chapter 6, Section 3 (b)(xvii) of the WAQSR, shall file a complete application to obtain an operating permit within 12 months after commencing operations.

4. All notifications, reports and correspondence required by this permit shall be submitted to the Stationary Source Compliance Program Manager, Air Quality Division, 122 West 25th Street, Cheyenne, WY 82002 and a copy shall be submitted to the District Engineer, Air Quality Division, 1043 Coffeen Ave, Suite D, Sheridan, WY 82801.

5. Owner or operator shall furnish the Administrator written notification of: (i) the anticipated date of initial startup not more than 60 days or less than 30 days prior to such date, and; (ii) the actual date of initial start-up within 15 days after such date in accordance with Chapter 6, Section 2(i) of the WAQSR.

6. The date of commencement of construction shall be reported to the Administrator within 30 days of such date. The permit shall become invalid if construction or modification is not commenced within 24 months of the date of permit issuance or if construction is discontinued for a period of 24 months or more in accordance with Chapter 6, Section 2(h) of the WAQSR. The Administrator may extend such time period(s) upon a satisfactory showing that an extension is justified.

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

8. Emission rates shall not exceed levels in the following tables:

PC Boiler Emissions (PC-001)

Pollutant	lb/MMBtu	lb/hr	lb/MW-hr	tpy
NO_x	0.07 (30-day rolling)	360.2 (30-day rolling)	1.6 (30-day rolling)	1,578
SO_2	0.10 (30-day rolling) 0.15 (3-hr block) 70% minimum removal efficiency (30 day rolling)	514.6(30-day rolling) 771.9(3-hr block)		2,254
PM/PM_{10}	0.012	61.7		270
CO	0.15	771.9		3,381
VOCs	0.01	51.5		225

Material Handling PM/PM_{10} Emissions

Source No.	Source	gr/dscf	lb/hr	tpy
CDC-001	Coal Storage Silo Top Dust Collector	0.009	1.8	8.0
CDC-002	Coal Storage Silo Bottom Dust Collector	0.009	0.6	2.5
CDC-003	Coal Transfer Building Dust Collector	0.009	0.6	2.5
CDC-004	Unit Transfer and Silos Dust Collector	0.009	2.5	11.0
LDC-001A	Lime Unloading Silo Dust Collector	0.01	0.1	0.5
LDC-001B	Lime Unloading Silo Dust Collector	0.01	0.1	0.5
RDC-001	FGD Waste Recycle Storage Bin Dust Collector	0.01	0.2	1.0
RDC-002A/B[1]	FGD Waste Loadout Silo Dust Collectors	0.01	0.4	2.0

[1] Only one of these units (RDC-002A or RDC-002B) will be in service at any one time.

9. Initial performance tests, required by Condition 7 of this permit, shall consist of the following unless an alternative is approved in writing by the Division:

A) NO_x 30 day rolling average - Initial testing and compliance determination shall follow 40 CFR 60.46a, 40 CFR 60.47a, and 40 CFR 60.48a.

B) SO_2 - EPA Method 6C or equivalent shall be employed to determine initial compliance with the SO_2 3 hour emission limit. Tests shall consist of 3 runs of 2 hours each.

C) SO_2 30 day rolling average/Percent Reduction Requirements - Initial testing and compliance determination shall follow 40 CFR 60.46a, 40 CFR 60.47a, and 40 CFR 60.48a.

D) PM/PM_{10} - Material Handling: EPA Methods 1-5, front half only, shall be employed to determine initial compliance with the particulate emission limits established by this permit.

~~PC Boiler: Testing shall follow 40 CFR 60.48a~~

E) Opacity - PC Boiler and Coal Handling: EPA Method 9 and the procedures in WAQSR, Chapter 5, Section 2(i) shall be employed to determine initial compliance with opacity limits established by this permit.

FGD Waste and Lime Handling: EPA Method 9 shall be employed to determine initial compliance with opacity limits established by this permit.

F) CO - EPA Method 10 or equivalent shall be employed to determine initial compliance with the CO emission limit established by this permit.

G) VOCs - EPA Method 18 and Method 25 or equivalent shall be employed to determine initial compliance with the VOC emission limit established by this permit.

10. The following testing shall be performed and a written report of the results submitted within 90 days after initial start-up:

A) PC Boiler Stack shall be tested to determine NH_3 emissions following EPA Conditional Test Method 27 (CTM-027) or equivalent methods. Results of the tests shall be reported in units of lb/hr and ppm_v on a dry basis corrected to 3 percent O_2.

B) PC Boiler exhaust shall be tested prior to control devices and at the PC Boiler Stack to determine total fluoride emissions and control efficiency following EPA Method 13A, 13B, or equivalent methods. Results of the tests shall be reported in units of lb/hr and control efficiency.

C) PC Boiler exhaust shall be tested prior to control devices and at the PC Boiler Stack to determine hydrogen chloride emissions and control efficiency following EPA Method 26 or equivalent methods. Results of the tests shall be reported in units of lb/hr and control efficiency.

D) PC Boiler exhaust shall be tested prior to control devices and at the PC Boiler Stack to determine emissions of metals (antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, and selenium) and control efficiencies using EPA Method 29 or equivalent methods. Results of the tests shall be reported in units of lb/hr and control efficiencies.

E) PC Boiler stack shall be tested to determine sulfuric acid mist (H_2SO_4) emissions following EPA Method 8 or equivalent methods. Results of the tests shall be reported in units of lb/hr. Sulfur dioxide (SO_2) emission rates shall be determined during the H_2SO_4 tests and reported.

11. ~~Prior to any performance testing or monitor certification testing required by this permit, a test~~ protocol shall be submitted to the Division for approval, at least 30 days prior to testing. Results of the tests shall be submitted to this office within 45 days of completing.

12. Opacity shall be limited as follows:

A) Visible emissions from the PC boiler (PC-001) shall be limited to 20% opacity (6-minute average) except for one 6-minute period per hour of not more than 27 percent opacity in accordance with NSPS, Subpart Da, 40 CFR 60.42a(b).

B) Opacity shall be limited to less than 20% from all coal processing and conveying equipment (including breakers and crushers), coal storage systems, and coal transfer and loading systems in accordance with NSPS, Subpart Y, 40 CFR 60.252(c) as determined by 40 CFR Part 60, Appendix A, Method 9.

C) Opacity from any other source of emissions at this facility shall be limited to 20% opacity in accordance with WAQSR, Chapter 3, Section 2(a) as determined by 40 CFR Part 60, Appendix A, Method 9.

13. Black Hills Corporation (BHC) shall use the following in-stack continuous emission monitoring (CEM) equipment on the PC Boiler stack to demonstrate continuous compliance with the emission limits set forth in this permit:

A) BHC shall install, calibrate, operate, and maintain a monitoring system, and record the output of the system, for measuring NO_x emissions discharged to the atmosphere in units lb/MW-hr, lb/MMBtu and lb/hr. The NO_x monitoring system shall consist of the following:

i) A continuous emission NO_x monitor located in the PC boiler stack

ii) A continuous flow monitoring system for measuring the flow of exhaust gases discharged into the atmosphere.

iii) A watt meter to measure gross electrical output in megawatt-hours on a continuous basis.

iv) An in-stack oxygen or carbon dioxide monitor for measuring oxygen or carbon dioxide content of the flue gas at the location NO_x emissions are monitored.

B) Black Hills Corporation shall install, calibrate, operate, and maintain a SO_2 monitoring system, and record the output of the system, for measuring emissions discharged to the atmosphere in units of lb/MMBtu, lb/hr and measuring the control efficiency of the SO_2 control device. The SO_2 monitoring system shall consist of the following:

i) Continuous emission SO_2 monitors located at the inlet and outlet to the SO_2 control device.

ii) A continuous flow monitoring system for measuring the flow of exhaust gases discharged into the atmosphere.

iii) An in-stack oxygen or carbon dioxide monitor for measuring oxygen or carbon dioxide content of the flue gas at the location of each SO_2 monitor.

C) Black Hills Corporation shall install, calibrate, operate, and maintain a monitoring system, and record the output of the system, for measuring the opacity of the emissions discharged to the atmosphere.

D) Each continuous monitor system listed in this condition shall comply with the following:

i) NSPS Subpart Da, Standards of Performance for Electric Utility Steam Generating Units (40 CFR 60.47a).

ii) Monitoring requirements of WAQSR, Chapter 5, Section 2(j) including the following:

a) 40 CFR 60, Appendix B, Performance Specification 1 for opacity, Performance Specification 2 for NO_x and SO_2, and Performance Specification 3 for O_2 or CO_2. The monitoring systems must demonstrate linearity in accordance with Division requirements and be certified in both concentration (ppm) and units of the standard (lb/MMBtu, lb/MW-hr and lb/hr).

b) Quality Assurance requirements of 40 CFR 60, Appendix F.

c) Black Hills Corporation shall develop and submit for the Division's approval a Quality Assurance plan for the monitoring systems listed in this condition.

14. Following the initial performance tests, compliance with the limits set forth in this permit shall be determined with data from the continuous monitoring systems required by Condition 13 of this permit as follows:

A) Exceedances of the limits shall be defined as follows:

i) Any 30-day rolling average of NO_x emissions which exceeds the lb/MW-hr output-based standard or lb/MMBtu limit calculated in accordance 40 CFR Part 60, Subpart Da, 60.46a, 60.47a, and 60.48a. Any 30-day rolling average ~~which exceeds the lb/hr NO_x limit as calculated following the methodology in~~ Subpart Da for the lb/MMBtu emission limit.

ii) Any calculated 3-hour block average of SO_2 emissions as measured by the PC Boiler stack SO_2 outlet CEM which exceeds the lb/MMBtu or lb/hr limit established in this permit. The 3-hour average emission rate shall be determined at the end of each 3-hour operating block, and calculated as the arithmetic average of the previous three operating hours SO_2 stack emission rates.

iii) Any 30-day rolling average which exceeds the lb/MMBtu SO_2 limit and the percent reduction requirements calculated in accordance 40 CFR Part 60, Subpart Da, 60.46a, 60.47a, and 60.48a. Any 30-day rolling average which exceeds the lb/hr SO_2 limit as calculated following the methodology in Subpart Da for the lb/MMBtu emission limit.

iv) Any 6-minute average opacity, except for one 6-minute period per hour of not more than 27 percent opacity, in excess of 20 percent in accordance with NSPS, Subpart Da, 40 CFR 60.42a(b).

B) Black Hills Corporation will comply with all reporting and record keeping requirements as specified in WAQSR, Chapter 5, Section 2(g) and 40 CFR Part 60, Subpart Da. Reporting and record keeping requirements for the 30-day rolling lb/hr NO_x and SO_2 and 3-hour fixed SO_2 emission rates shall follow the same requirements as the NSPS lb/MMBtu standards.

15. Black Hills Corporation shall comply with all applicable requirements of 40 CFR 60 Subpart Da and Subpart Y.

16. Black Hills Corporation shall install, operate, and maintain a loading spout designed to minimize fugitive dust from loading FGD waste. The loading spout shall have an outer sleeve for dust withdrawal or equivalent and shall be connected to the FGD Waste Loadout Silo baghouses (RDC-002A, RDC-002B) to minimize fugitive dust.

17. To minimize transport emissions, lime and FGD waste shall be entirely enclosed in the haul trucks. Unpaved haul roads will be treated with suitable chemical dust suppressants in addition to water to control fugitive dust emissions. All treated roads will be maintained on a continuous basis to the extent that the surface treatment remains viable as a control measure.

18. Black Hills Corporation shall comply with acid rain program regulations in WAQSR, Chapter 11, Section 2.

19. That Black Hills Corporation shall continue to operate in accordance with the requirements of 40 CFR Parts 50 and 58 an approved ambient SO_2 monitoring program. The monitor shall be ~~operated through September of 2002 and shall resume upon startup of WYGEN 2.~~ Data generated shall be submitted in an approved format on a quarterly basis, within 60 days following the end of the quarter. A quality assurance plan for the monitoring network, as required by 40 CFR Part 58, shall be submitted for approval within 30 days of startup of WYGEN 2.

20. Records required by any applicable regulation or permit condition shall be maintained for a minimum period of five (5) years and shall be readily accessible to Division representatives.

It must be noted that this approval does not relieve you of your obligation to comply with all applicable county, state, and federal standards, regulations or ordinances. Special attention must be given to Chapter 6, Section 2 of the Wyoming Air Quality Standards and Regulations, which details the requirements for compliance with conditions 3, 5, 6 and 7. Any appeal of this permit as a final action of the Department must be made to the Environmental Quality Council within sixty (60) days of permit issuance per Section 16, Chapter I, General Rules of Practice and Procedure, Department of Environmental Quality.

If we may be of further assistance to you, please feel free to contact this office.

Sincerely,

Dan Olson
Administrator
Air Quality Division

Dennis Hemmer
Director
Dept. of Environmental Quality

cc: Mike Warren

DO/bd

WYGEN 2 Emission Summary

Source #	Potential Emissions (tpy)							
	NOx	SO_2	PM/PM_{10}	CO	VOC	NH_3	H_2SO_4	HAPs
PC-001	1578	2254	270	3381	225	97.4	104	110
CDC-001			8					
CDC-002			2.5					
CDC-003			2.5					
CDC-004			11					
LDC-001A			0.5					
LDC-001B			0.5					
RDC-001			1					
RDC-002A/B*			2					
TOTAL	1578	2254	298	3381	225	97.4	104	110

* Only one of these units (RDC-002A or RDC-002B) will be in service at any one time.

IN THE MATTER OF A PERMIT APPLICATION (AP-C92) FROM BLACK HILLS CORPORATION TO CONSTRUCT A 500 MW PULVERIZED COAL FIRED ELECTRIC GENERATING FACILITY TO BE KNOWN AS WYGEN 2

DECISION

I. INTRODUCTION:

The Air Quality Division received a permit application from Black Hills Corporation (BHC) to construct a 500 megawatt (MW) pulverized coal (PC) fired electric generating facility to be known as WYGEN 2 located at 13151 Highway 51 approximately five (5) miles east of Gillette in Campbell County, Wyoming. The proposed facility consists of one PC boiler burning coal from the nearby Wyodak coal mine with associated coal and lime handling and flue gas desulfurization waste product handling. The maximum design heat input to the facility will be 5,145.7 MMBtu/hr.

The Division completed its analysis of the application and advertised its proposed decision to issue a permit in the Gillette News-Record on May 2, 2002 giving opportunity for public comment and a public hearing on the matter. The Division received three comment letters on the proposed permit during the public comment period: 1) a May 31, 2002 letter from the National Park Service (NPS); 2) a June 3, 2002 letter from EPA; and 3) a June 3, 2002 letter from the Rocky Mountain Office of Environmental Defense, the Wyoming Outdoor Council, and the Land and Water Fund of the Rockies (ED, et al.). A public hearing was requested and was held on July 2, 2002 at 10:00 a.m. at the Lakeway Learning Center, Aspen Room, 525 W Lakeway, Gillette, Wyoming. Oral testimony was taken at the hearing and additional written comments were received as follows: 1) a June 28, 2002 letter from Dr. Sam L. Mortimer; 2) a July 1, 2002 letter from BHC; 3) a July 1, 2002 letter from the Office of Campbell County Commissioners; 4) a July 2, 2002 letter from the Campbell County Chamber of Commerce; 5) a July 2, 2002 letter from ED, et al.; and 6) written testimony from the National Park Service presented at the hearing.

II. ANALYSIS OF PUBLIC COMMENTS:

A. **SULFUR DIOXIDE BACT ANALYSIS** - NPS, EPA and ED, et al. commented that BACT for SO_2 should be lower than the proposed 0.15 lb/MMBtu emission level. In response to these comments, the Division requested BHC to supplement the BACT analysis with an evaluation of controls necessary to achieve 0.10 and 0.12 lb/MMBtu including coal blending. BHC responded that coal blending is not necessary to reach an emission level of 0.10 lb/MMBtu using the proposed lime spray dryer/absorber. However, BHC stated that this would set the emission limit at exactly the level of the best existing vendor guarantee for a similar plant and proposed an emission limit of 0.12 lb/MMBtu to allow for an additional margin of safety.

A removal efficiency of 96.03% is required to achieve 0.12 lb/MMBtu with the design sulfur content of 1.2%. The Division notes that the same 96.03% removal efficiency will result in 0.10 lb/MMBtu with a coal sulfur content of 1.0%. Therefore, the additional margin of safety that BHC desires can be achieved by controlling the sulfur content of coal to no more than 1.0% through selective mining or coal blending. The total cost effectiveness to achieve 0.10 lb/MMBtu is $569/ton as shown in the following table:

SO_2 Control Cost Effectiveness

	Baseline 2.13 lb/MMBtu	SDA* 0.15 lb/MMBtu	SDA* 0.12 lb/MMBtu	SDA* 0.10 lb/MMBtu
Annual Emissions	48,147 tpy	3,382 tpy	2,705 tpy	2,250 tpy
Emissions Reduction	Baseline	44,765 tpy	45,442 tpy	45,897 tpy
Total Annualized Cost	Baseline	$21,080,000	$23,299,000	$26,128,000
Total Cost Effectiveness	Baseline	$471/ton	$513/ton	$569/ton
Incremental Reduction	–	Baseline	677 tpy	1,132 tpy
Incremental Annualized Cost	–	Baseline	$2,219,000	$5,048,000
Incremental Cost Effectiveness **	–	Baseline	$3,278/ton	$4,459/ton

* Spray Dryer/Absorber
** Incremental costs for all cases are compared to 0.15 lb/MMBtu

<u>**SULFUR DIOXIDE BACT CONCLUSION**</u> - The information provided by Black Hills Corporation indicates that 0.10 lb/MMBtu, 30-day average is technically feasible and economically reasonable. BHC also proposed a new short term limit of 0.15 lb/MMBtu, 3-hour average to replace the previously proposed short term limit of 0.17 lb/MMBtu 2-hour average. BHC stated that a longer averaging time is necessary to achieve an emission limit less than 0.17 lb/MMBtu because a 2-hour average does not allow sufficient time for the scrubber to respond to slight variations in coal supply and prohibits routine maintenance such as spray nozzle replacement or repair while the scrubber is on line. A 3-hour average is consistent with regulatory limits in the Wyoming Air Quality Standards and Regulations, Chapter 3.

The Division concludes that 0.10 lb/MMBtu, 30-day average and 0.15 lb/MMBtu, 3-hour average represent BACT for SO_2. The previously proposed minimum removal efficiency of 90% is no longer necessary because the removal efficiency required to meet 0.10 lb/MMBtu is greater than 90% when burning coal with 0.4% or greater sulfur content.

<u>**SPECIFIC COMMENTS ON SULFUR DIOXIDE CONTROL**</u> - Three methods for achieving lower emissions were discussed as follows:

1. <u>**Circulating Dry Scrubbers**</u> - NPS commented that BHC should consider a circulating dry scrubber (CDS) for SO_2 control.

Response - The Division requested BHC to supplement the BACT analysis with an evaluation of this technology. BHC responded that CDS technology is in practice today in the United States at only two coal fired power plants; BHC's Neil Simpson 2 and Roanoke Valley's LG&E plant in North Carolina. Both systems were started in 1995 and both have experienced corrosion problems and high rates of lime consumption. BHC estimates that lime consumption for a CDS would be double that of a lime spray dryer/absorber and power consumption would be 33% greater resulting in an increased cost of approximately $24,000,000 over a 15 year period. BHC stated that a lime spray dryer/absorber can meet the emission limits in question and that they consider CDS a technically inferior option. The Division can find no compelling reason to further review CDS technology.

2. **Wet Scrubbers** - NPS commented that BHC should further explore the feasibility of wet scrubbing.

Response - As discussed in the analysis, some of the drawbacks to wet scrubbers include visible moisture plumes, formation of H_2SO_4 from the reaction of SO_3 with moisture in the flue gas, increased PM_{10} emissions and opacity, and 20 to 30 percent more water consumption than the proposed lime spray dryer/absorber. Additionally, the proposed lime spray dryer/absorber can achieve removal efficiencies comparable to a wet scrubber with low sulfur coal. The Division can find no compelling reason to further explore wet scrubbing.

3. **Coal Sulfur Content** - EPA and ED, et al. commented that 1.2% sulfur content is higher than most Powder River Basin Coal.

Response - BHC used 1.2% as the design basis for all of their facilities using Wyodak coal including this facility. This value is toward the upper end of Wyodak coal sulfur content and was used to ensure that emission limits can be met under worst case operating scenarios. The previous five year average of actual sulfur contents reported for four facilities using Wyodak coal (BHC - Neil Simpson I, BHC - Neil Simpson II, BHC - Osage, and Pacificorp - Wyodak) was 0.6%. The Division expects actual sulfur contents for this facility to be similar to previously reported values for other facilities using Wyodak coal.

4. **Fuel Cleaning or Treatment** - ED, et al. pointed out that the definition of BACT includes fuel cleaning or treatment.

Response - As previously discussed, the Division requested BHC to evaluate coal blending and BHC responded that coal blending is not necessary to reach an emission level of 0.10 lb/MMBtu using the proposed lime spray dryer/absorber. Although BHC argued that an emission limit of 0.12 lb/MMBtu is necessary to allow for an additional margin of safety, the Division contends that this margin of safety can be achieved by controlling the sulfur content of coal to no more than 1.0% through selective mining or coal blending.

B. **INNOVATIVE FUEL COMBUSTION TECHNIQUES** - NPS and ED, et al. commented that innovative fuel combustion techniques such as circulating fluidized bed (CFB) boilers and integrated gasification combined cycle (IGCC) boilers should be considered in the analysis.

Response - Page B.13 of the draft 1990 *New Source Review Workshop Manual* states, "Historically, EPA has not considered the BACT requirements as a means to redefine the source when considering available control alternatives. For example, applicants proposing to construct a coal-fired electric generator, have not been required by EPA as part of a BACT analysis to consider building a natural gas-fired electric turbine although the turbine may be inherently less polluting per unit product (in this case electricity)." The July 20, 1992 Order Denying Review for Hawaiian Commercial & Sugar Company (PSD appeal No. 92-1) states, "EPA's PSD permit conditions regulations do not mandate that the permitting authority redefine the source in order to reduce emissions." The Division does not consider the BACT process a means to redefine the source.

C. **PM BACT ANALYSIS** - NPS and ED, et al. commented that the Northhampton Generating Station in Pennsylvania has a PM limit of 0.010 lb/MMBtu using fabric filters and they would like the Division to investigate a 0.010 lb/MMBtu limit.

Response - Northhampton Generating Station is a circulating fluidized bed (CFB) boiler and different levels of PM emissions may result from PC boilers and CFB boilers controlled with fabric filters. Particle size distributions tend to be smaller for PC boilers as compared to CFB boilers making emissions more difficult to control.

The proposed emission limit of 0.012 lb/MMBtu is lower than any permitted limit the Division has found for a pulverized coal (PC) electric utility boiler. The Division followed the top down BACT process and can find no compelling reason to revisit the PM BACT analysis.

D. **MACT ANALYSIS** - ED, et al. commented on the case-by-case MACT determination. The comment appears to address two main points as follows:

1. **Powdered Activated Carbon Injection** - ED, et al. refers to a 3% reduction in mercury emissions through the use of the proposed multi-pollutant controls (good combustion controls, selective catalytic reduction (SCR), a semi-dry lime spray dryer/absorber, and a fabric filter) and suggests that powdered activated carbon injection (PAC) can achieve at least 90% reduction in mercury emissions in combination with the proposed controls.

   Response - The Division found several instances where PAC has been evaluated for coal fired utility boilers on a bench scale or pilot scale and one instance of a full scale field evaluation but no coal fired utility boilers utilizing PAC in practice. Black Hills Corporation provided additional information on control of mercury emissions in their July 1, 2002 response to the Division and confirmed that PAC is not being used on any coal fired utility boilers in practice. Based on the Division's review, it is not evident that the addition of PAC would result in any additional mercury removal compared to the multi-pollutant controls currently proposed. Note that the National Park Service letter stated that the proposed combination of SCR and a fabric filter should achieve a very high degree (>94%) of mercury control. Black Hills Corporation used 3% as a conservative number to avoid understating potential emissions because there is a large degree of uncertainty in the control of mercury emissions. Potential emissions of mercury are 0.065 lb/hr (0.28 tpy) based on the conservative 3% control. (See the attached HAP Emissions Table. This table is included because there was an error in column alignment in the original table.) Actual emissions are expected to be much lower with the proposed multi-pollutant controls.

2. **Emission Limits for HAPs** - ED, et al. states that design, equipment, work practice, or operational standards are not allowed under WAQSR Chapter 6, Section 6(h)(iii)(C) and Section 112(h)(2) of the Clean Air Act because it is practical to measure HAPs and, therefore, the Division must impose limits for all HAPs to be emitted by WYGEN 2.

Response - The Division agrees that it is practical to measure most HAPs. However, as concluded in the original analysis, the Division contends that the low NOx burner with selective catalytic reduction (SCR) at 0.07 lb NOx per MMBtu, two spray dryer absorbers at 0.10 lb SO_2 per MMBtu, and two baghouses with an emission limit of 0.012 lb particulate per MMBtu represent application of MACT. The use of low NOx burners and selective catalytic reduction (SCR) has been shown to increase the carbon content of fly ash which increases adsorption of HAPs onto the fly ash particles. Acid gases, such as HCl and HF, react with lime in the spray dryer/absorber to form solid particles. Organic HAPs and volatilized metals can adsorb onto particles such as fly ash and lime from the spray dryer/absorber. These HAP containing particles can then be collected downstream in the fabric filter. Non-volatilized metals and volatilized metals that condense can be directly collected in the fabric filter. SCR also partially oxidizes some of the mercury into various compounds which aids in collection downstream in the fabric filter.

There is a degree of uncertainty in determining the HAP emissions from the proposed facility. With the application of BACT to the criteria pollutants and the multi pollutant control systems utilized at the WYGEN 2 facility application of additional HAP emission limitations will not affect the actual emissions. Establishment of emission standards without good scientific basis for the limits is misleading to the public. If establishment of HAP limits from coal fired power plants was an uncomplicated issue, EPA would have been able to establish the standard by the time table required. Ensuring compliance with the particulate, NOx and SO_2 emission limits established through the permit will effectively limit HAP emissions to levels consistent with the MACT principles.

Black Hills Corporation proposed a limit for hydrogen fluoride (HF) in their July 1, 2002 letter. The Division considers surrogate emission limits to be the appropriate method. As discussed in the analysis, hydrogen fluoride reacts with lime (the reagent for the spray dryer/absorber) to form calcium fluoride. Calcium fluoride is a stable solid and is removed with the fabric filter. Black Hills Corporation estimated that the lime spray dryer/absorber and fabric filter will remove approximately 96% of hydrogen fluoride emissions. These control devices will be operated to control SO_2 and PM_{10} emissions, respectively, and the emission limits for SO_2 and PM_{10} act as surrogates for control of HF.

There is precedent for using surrogate emission limits as MACT limits. For example, an August 21, 2001 EPA document, *Hazardous Air Pollutant (HAP) Emission Control Technology for New Stationary Combustion Turbines*, states that "Carbon monoxide is a good surrogate for formaldehyde and other HAPs. Therefore, assuring that the oxidation catalyst system is achieving 90-plus percent reduction of CO assures that the same catalyst system is effective in reducing formaldehyde and other HAP emissions." This document is located at http://www.epa.gov/ttn/atw/combust/turbine/turbpg.html under *Information for Case by Case MACT*.

The Division does, however, find it beneficial to verify that the collection mechanisms described above work as expected and to determine actual control efficiencies where possible. The proposed permit conditions already contain requirements to test for HCl and total fluorides before and after the control devices (SCR, spray dryer/absorber, and fabric filter) in order to determine control efficiencies. The Division will add requirements to test for metals (antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, and selenium) before and after the control devices using EPA Method 29.

E. <u>VISIBILITY ANALYSIS</u> - The NPS, and ED, et al. provided comments on several issues associated with the visibility modeling analyses conducted by the Black Hills Corporation (applicant). The main technical comments focused on the recommendation that additional visibility analyses should be conducted as suggested by the Federal Land Manager's WorkGroup (FLAG) Phase I Report guidance document. Specifically,

1. Additional visibility analyses should be conducted using the CALPUFF model in a refined mode.
2. Demonstrate no adverse impact to visibility at Badlands and Wind Cave.

~~REVISIONS TO VISIBILITY ANALYSIS - The Division has conducted the requested~~ additional visibility analyses using the recommended methods and procedures provided in the comments received on the applicant's visibility analysis. The Division's revised visibility analyses consisted of evaluating model predicted impacts on visibility while running CALPUFF in a screening mode, in a refined mode, utilizing seasonal RH adjustment factors, (i.e. seasonal *f*(RH) values), and hourly RH data from CALMET. The Division conducted the screening level and refined level visibility analyses based on available guidance, and has provided the results of the proposed source's impact on visibility at designated Class I/II areas as required by Wyoming Air Quality Standards and Regulations, Chapter 6, Section 4, (b)(i)(B)(I) and 40 CFR Part 51.166 (o)(1).

The Division conducted the requested additional visibility analyses using the following pollutant emission rates:

SO_2: Emission rates of 0.17, 0.15, 0.12, and 0.10 lb/MMBtu were used in the visibility modeling analyses as a means to show the relative reduction in light extinction or visibility, by decreasing the SO_2 emission rate while keeping all other pollutant emission rates (NOx, PM_{10}, and H_2SO_4) constant.

NOx: A constant emission rate of 0.07 lb/MMBtu was used in all visibility analyses.

PM_{10}: A constant emission rate of 0.012 lb/MMBtu was used in all visibility analyses.

H_2SO_4: A constant emission rate of 23.3 lb/hr was used in all visibility analyses.

In August 2001, the Division funded a CALMET wind field generation project for Northeast Wyoming, and a new CALMET modeling database for 1996 was developed for a region encompassing the state of Wyoming and portions of surrounding states. The Wyoming CALMET database consists of hourly upper-air meteorological data obtained from the MM5 meteorological model, surface meteorological observations from 240 sites, and precipitation observations from 249 sites. By providing the MM5 data to CALMET, and specifying IPROG=14 in the Group 5 inputs, the MM5 data were used as a 3-D initial guess wind field. The data used in the CALMET database underwent a series of quality assurance and quality control (QA/QC) checks by the contractor that developed it, and the CALMET database was provided to the Division in November.

During the Division's review of the permit application for the proposed WYGEN 2 power generating facility (proposed source), the Division requested that the applicant utilize the newly developed and untested three-dimensional 1996 CALMET database to construct a wind field that would be used in the CALPUFF modeling system, which is the modeling system specified in the current guidance on conducting visibility analysis. The applicant attempted to use the CALMET wind field, but was unable to run all months of the annual CALMET and CALPUFF simulations, and could not turn on the chemistry and dry deposition algorithms for all months of the simulations. Since the applicant was unable to utilize the chemistry and dry deposition options in CALPUFF, the visibility analyses could not be conducted using CALPUFF in a refined mode. Nor, could the applicant enable all regulatory options that are specified in CALPUFF.

Therefore, the applicant only used the CALPUFF model in a screening mode using the five years of Casper NWS meteorological data for assessing impacts to visibility based on the initial screening methodologies that were agreed upon by the Division and the NPS. The results of the applicant's visibility analysis using the 90 degree receptor arc method, as approved by the NPS, predicted no days with impacts greater than a 10% change in light extinction at the Badlands and Wind Cave National Parks. The NPS threshold level of concern for determining adverse impacts to visibility is a10% change in light extinction, when compared against natural background conditions.

It was later determined that the CALMET wind field contained invalid surface pressure data at several surface stations located in the Powder River Basin, and also contained suspect RH data at many of the 240 surface stations that were used in constructing the CALMET wind field. The Division was able to identify and remove the invalid pressure data values, which allowed the Division to run the entire CALPUFF simulation with the dry deposition and chemistry options turned on.

Relative Humidity Considerations

In order to evaluate the newly modified CALMET wind field, the Division conducted a CALPUFF refined level visibility analysis using the proposed BHC WYGEN 2 coal-fired boiler as a test case, and using the hourly RH data in the CALMET surf.dat file. The analysis showed that on some days, very large changes in light extinction were being calculated by the CALPUFF model. The high visibility impacts were traced back to high surface RH measurements at some of the surface monitoring sites used in the development of the 1996 CALMET wind field.

Although the observed surface RH data were subjected to quality assurance and quality control (QA/QC) techniques that consisted of range checks (0-100%) and checks for fast hourly variations, there were an abundance of RH values to check as the 1996 CALMET database utilized 240 surface meteorological sites. Based on additional reviews of the CALMET database, it was apparent that all suspect RH data had not been identified and eliminated from the database, and that additional QA/QC procedures for evaluating the quality of the RH data were necessary and are discussed below:

The RH data are used in a CALPUFF visibility modeling analysis in two ways:

1. The RH data are used in the CALPUFF chemical transformation module that forms sulfate and nitrate.

2. The RH data are used in the relative humidity adjustment factor [*f*(RH)] calculation that is applied to sulfate (SO_4) and nitrate (NO_3) concentrations by CALPOST. The change in light extinction due to the modeled emissions from the proposed source is linearly proportional to the calculated value of *f*(RH), as shown in Equation (1).

$$(b_{ext'source}): b_{ext}(SO_4+NO_3) = 3 \times f(RH) \times \{[SO_4] + [NO_3]\} \qquad (1)$$

The relative humidity adjustment factor *f*(RH) is particularly important because at high RH levels, small changes in RH can make large changes in the light extinction calculations due to the effect of high RH values used in calculating the growth rates of secondary particles. For example, an increase in RH of 5% and 8% from a 70% level will increase the *f*(RH) value by a factor of approximately 0.3 and 0.6, respectively. However, an increase in RH of 5% and 8% from a 90% RH level will increase the *f*(RH) value by a factor of approximately 2 and 4, respectively.

As one of the QA/QC checks of the RH data, the model calculated relative humidity adjustment factor *f*(RH) values were plotted across the domain. It was noted that the average of the top 10 24-hour average *f*(RH) values was 18.1 at some sites, which indicated that at these sites the top 10 days all had 24 hours of hourly RH measurements of 98%-100%, which seemed highly unlikely in many portions of the CALMET domain, particularly in Northeast Wyoming. In some cases, these high *f*(RH) values were located next to surface meteorological monitoring sites with much lower average *f*(RH) values.

Although some spatial variations in RH observations are expected due to the influence of topography and available water sources, several of these sites appeared to clearly be in error, or at least had highly localized influences. It was noted that most of the sites that had the extremely high or unrealistic *f*(RH) values were the Remote Automated Weather Station (RAWS) and Automated Weather Data Network (AWDN) sites. Therefore, a proposed short-term solution to the CALMET/CALPUFF surface RH issue was to set the RH records to missing for just the RAWS and AWDN sites, and conduct additional evaluations of the RH data.

Revised Visibility Analyses

The Division ran and evaluated five (5) visibility analyses and several corresponding sensitivity analyses using the proposed source. The analyses utilized seasonal RH adjustment factors, or equivalently seasonal *f*(RH) factors, and also used the hourly RH data from the CALMET surf.dat file to calculate the corresponding hourly *f*(RH) values.

Below is a description of five (5) visibility analyses conducted by the Division using the variable SO_2 emission rates and the constant pollutant emission rates for the other three (3) pollutants provided above. The short-term SO_2 emission rates were decreased from 0.17 lb/MMBtu down to 0.15, 0.12, and 0.10 lb/MMBtu in the Division's modeling analyses, however, to be conservative, no adjustment was made to the H_2SO_4 emission rate as a result of the decreased SO_2 emission rate being modeled. These visibility analyses followed the guidance provided in the IWAQM Phase II Summary Report for both screening level and refined level visibility analyses, and also followed many of the recommendations in the FLAG Phase I Report. The number of receptors used in the first visibility analysis, or Simulation #1 were modified from the IWAQM Phase II guidance, as approved by the NPS.

SIMULATION #1 This visibility analysis was run using CALPUFF in a screening mode, and is referred to as either a "CALPUFF Lite" analysis, or a CALPUFF screening level analysis.

Receptors: This analysis was based on the applicant's visibility analysis which utilized partial rings of receptors, or receptor arcs. The receptor arcs were approximately 90 degrees wide, and located on either side of the Class I/II areas, with the receptors spaced every one degree within the receptor arc, as per the EPA guidance document, Long-Range-Transport Screening Technique Using CALPUFF that was provided to the applicant by the NPS.

Meteorological Data: The meteorological data used in the analysis consisted of five years of surface observations (1986-1990) for Casper, Wyoming, which was the closest NWS site that collected all of the meteorological parameters required to run CALPUFF in a screening mode for assessing visibility.

Model Options Used: The chemical transformation, and wet and dry deposition options were enabled. Method 6 was selected in CALPOST for the light extinction calculations. Regulatory options and defaults were used where applicable.

Visibility Data: Seasonal RH adjustment factors and seasonal natural visibility background extinction values for hygroscopic and non-hygroscopic components were taken from the FLAG Phase I Report to calculate background light extinction for three Class I areas: Badlands National Park (BL), Wind Cave National Park (WC), and the Northern Cheyenne Indian Reservation (NC), and at a Class II wilderness area: the Cloud Peak Wilderness Area (CP).

Results: The results of this analysis indicate that there were two days with impacts greater than 10% change in light extinction from the proposed source at CP for all modeled SO_2 emission rates. The visibility analysis predicts one day with impacts greater than a 10% change in light extinction at NC at the 0.17 and 0.15 lb/MMBtu SO_2 emissions rates, and no days above 10% when modeling the 0.12 and 0.10 lb/MMBtu SO_2 emission rates. The results of this analysis are provided in Table 1 (Attachment B).

<u>SIMULATION #2</u> A second visibility analysis was run using CALPUFF in a refined mode, which uses a fully developed three-dimensional wind field, and is also referred to as a "CALPUFF refined" level analysis.

Receptors: Simulations #2, #3, and #4 (CALPUFF refined analyses) were based on receptors located within the Class I/II areas and along the boundaries, with receptors spaced evenly at one kilometer intervals. The receptors used in the analysis for each Class I/II are identified below:

Badlands NP	Northern Cheyenne	Wind Cave NP	Cloud Peak
(Rec 1-249)	(Rec 250-711)	(Rec 712-750)	(Rec 751)

Meteorological Data: The meteorological data used consisted of the 1996 CALMET database described above, with the RAWS and AWDN RH data set to missing, (i.e., MM5 meteorological data, surface meteorological observations from 240 sites, and precipitation observations from 249 sites were used in Simulations #2 - #5).

Model Options Used: The MESOPUFF II chemical transformation, and wet deposition options were enabled. Dry deposition was turned off in Simulations #2, #3, and #4, and turned on in Simulation #5 to determine the sensitivity of the dry deposition option on the modeled change in light extinction. Method 2 was selected in CALPOST for the light extinction calculations. Except for enabling the dry deposition option, all regulatory options and default switches were used in these three visibility simulations.

Visibility Data: Hourly relative humidity data from the surf.dat file used by CALPOST were utilized in Simulation #2 and #3. As stated previously, the removal of the RAWS and AWDN data are considered a temporary solution and the Division is still in the process of performing additional QA/QC checks on the hourly RH database. Seasonal natural visibility background extinction values for hygroscopic and non-hygroscopic components were taken from the FLAG Phase I Report.

Results: This visibility analysis predicts that there were several days with modeled impacts greater than a 10% change in light extinction at all three Class I areas for all of the modeled SO_2 emission rates. However, there were no days with impacts greater than a 10% change in light extinction at the Cloud Peak Wilderness Area. Recognizing the sensitivity of the visibility calculations to the RH data, as evidenced by the results from Simulation #1 and Simulation #2, the Division proceeded to conduct the next three visibility simulations, which are denoted as Simulations #3 - #5. The results of this analysis are provided in Table 2 (Attachment B).

<u>SIMULATION #3</u> This visibility analysis is identical to Simulation #2, except the maximum relative humidity value (RHMAX) was no longer capped at the regulatory default value of 98%, and was instead capped at 95%. The RHMAX parameter is one of the regulatory options specified in CALPOST.

Results: A check on the locations of surface meteorological stations that are sited near BL and WC reveals that there are one or more National Climatic Data Center (NCDC) sites located near these two National Parks. Reducing the RHMAX value to 95% only affects the results for BL and WC, and has little effect of reducing the total number of days above 5% or 10%. The results of this analysis are provided in Table 3 (Attachment B).

<u>SIMULATION #4</u> This visibility analysis is identical to Simulation #2, except that seasonal relative humidity adjustment factors *f*(RH) and seasonal natural visibility background extinction values for hygroscopic and non-hygroscopic components were taken from the FLAG Phase I Report. Method 6 was selected in CALPOST for the light extinction calculations.

Results: Using the seasonal *f*(RH) values for BL and WC, the modeled change ~~in light extinction was approximately 220% lower at Badlands, and 150% lower at WC~~ on the maximum impact days for all modeled SO_2 emission rates, as compared to the results of Simulation #2. Based on comparisons of historical mean monthly relative humidity measurements at several National Weather Service (NWS) monitoring stations in the northeast portion of the CALMET domain to the FLAG seasonal RH data values, which were calculated from the FLAG seasonal *f*(RH) values, the Division considers the seasonal *f*(RH) values for BL and WC to be representative of the mesoscale relative humidity fields, because the seasonal data are not unduly influenced by local effects or site specific measurement artifacts.

The results of this visibility analysis indicate that there were no days with impacts greater than a 10% change in light extinction at any of the Class I/II areas for each of the modeled SO_2 emission rates. The results of this analysis are provided in Table 4 (Attachment B).

SIMULATION #5 This visibility analysis is identical to Simulation #4, except that the dry deposition option was enabled.

Results: Turning on the dry deposition option, allowed for all regulatory options to be used, or equivalently, the variable MREG was set equal to a value of (1). The results of this visibility analysis indicate that the additional depletion of mass from the puffs reaching the Class I/II areas due to enabling the dry deposition option produces an overall corresponding change in light extinction of about 0.5%, with no effect on the number of days above the calculated change in light extinction of 5%. The visibility analysis indicates that the effects of dry deposition for this test case have a minimal effect on the visibility calculations for any modeled SO_2 emission rate. The results of this analysis are provided in Table 5 (Attachment B).

CONCLUSION:

Due to the complex nature of the multiple meteorological and transport models that are recommended for use in Long Range Transport modeling analyses, it is difficult to evaluate model performance using a single test case. Additionally, at this time, there are no established objective and reliable techniques for performing QA/QC checks on the RH data to eliminate any spurious observations. It is important to remember that the RH data are intended to drive the CALPUFF chemistry in the elevated plumes that may reach Class I areas which are typically located at higher elevations, and away from the surface meteorological monitoring sites. This important concept dictates that ground based localized hourly RH data may not be completely representative for calculating the relative humidity adjustment factor *f*(RH) values used in the visibility assessment.

Based on the results of the five (5) visibility analyses, it is apparent that additional QA/QC procedures for evaluating the hourly surface RH data in the 1996 CALMET database are needed in order to obtain RH data that are representative of the mesoscale region. Additionally, QA/QC procedures are needed to ensure that RH data are of sufficient quality to allow New Source Review applicants to conduct scientifically technical and defensible visibility analyses when using these complex modeling systems. The meteorological variables such as wind speed and direction, stability, and temperature are interpolated by CALMET for each grid cell in the three-dimensional CALMET domain, with the resulting wind field based on this homogeneous treatment of the raw hourly meteorological data by the diagnostic wind field module in CALMET. This homogenization, or blending of the various meteorological data together throughout the wind field effectively averages or smooths the meteorological data throughout the CALMET domain to achieve a dynamically balanced average ensemble representation of the wind field. However, the RH data are not treated in the same manner, and there is no interpolation of the RH data across each grid cell in the CALMET domain. As such, the RH data are not smoothed or blended into the homogeneous wind field.

Additionally, the algorithms used in the CALPOST model to assign RH data for use in the light extinction calculations are applied using the "nearest neighbor" concept if there are missing RH data for a given surface site. The nearest neighbor approach adds to the problem of localized RH data being used by CALPOST where it is not representative, and the assignment of RH data by CALPOST becomes somewhat random when a large number of surface stations are included in the CALMET surf.dat file, as in the case of the 1996 CALMET database.

Under the current guidance for conducting visibility analyses there are no methods available to CALMET to interpolate RH data contained in the surf.dat file. Since there are an abundance of RH data contained at the 240 surface stations in the Division's 1996 CALMET database, it is reasonable to utilize procedures for gridding and smoothing the hourly f(RH) fields. The interpolated RH data values would be more consistent with the climatic summaries and the *f*(RH) monthly average values specified in the FLAG Phase I Report. Considering that the RH data have the potential of dominating a CALPUFF refined visibility analysis based on how the RH data are currently handled by CALMET, a methodology to represent an ensemble average of the RH data is warranted.

The guidance in the FLAG Phase I Report suggests using quarterly RH values and empirically derived *f*(RH) adjustment factors for screening level analyses. The *f*(RH) factors in the FLAG Phase I Report are based on ten (10) years of monthly averaged historic National Weather Service (NWS) data that were spatially interpolated and gridded, and further interpolated to the specific Class I areas. The protocols used by the NWS to collect the meteorological data and the quality assurance methods also used by the NWS to screen these data yield some of the highest quality meteorological data available for use in air quality modeling analyses. Based on the above rationale, the Division considers the use of monthly or seasonal average RH and *f*(RH) values to be more representative when applying the CALPUFF modeling system in a visibility analysis. Additionally, the approach used in establishing *f*(RH) values for use in the demonstration of reasonable progress for the Regional Haze Rule (RHR) was based on spatially interpolated daily and monthly RH and *f*(RH) fields. These RH fields were compared with historical climatic data to provide a check of the monthly averaged *f*(RH) fields. Based on this concept, the methodology used in Simulation #4 and Simulation #5 are more consistent with the direction pursued for the demonstration of reasonable progress for the RHR.

It is evident from the results of the five (5) visibility simulations that there are several disparities between the screening level and refined level methodologies used to predicted changes in light extinction. Specifically, the model predicted changes in visibility impacts associated with decreasing SO_2 emissions from 0.17 lb/MMBtu (875 lb/hr) to 0.10 lb/MMBtu (515 lb/hr) vary considerably. The results of the refined level visibility analysis using the hourly RH data from the surf.dat file predicted several days with modeled impacts greater than a 10% change in light extinction from the proposed source at all three Class I areas for all modeled SO_2 emission rates. In contrast, the results of Simulation #4 and Simulation #5 using the seasonal RH data demonstrated that the maximum change in light extinction was below 10% on all days at all Class I/II areas.

In conclusion, the applicant has followed the approved Class I protocol by using the CALPUFF screening methodology for assessing visibility impacts from the proposed new source; the results of the applicant's visibility analysis show that there are no model predicted days with impacts greater than a 10% change in light extinction. In response to the public comments received, the Division conducted several additional visibility analyses using the CALPUFF model in a refined mode, and has assessed the visibility impacts from the proposed source using the recommended methodologies that were provided by the NPS. In the interest of full disclosure, the Division has presented the results of those revised visibility analyses in this document, and the results show that different methods of incorporating RH data into the CALPUFF/CALPOST analyses produce much different changes in the calculated light extinction from the proposed source. The results of these analyses, all of which are reasonable approaches in utilizing a complex modeling system as a tool to inform the decision making process, point out the difficulty in relying solely on the results of such calculations. We are certain the Federal Land Managers enjoy this same dilemma.

The Division is still in the process of conducting additional QA/QC reviews of the RH data in the 1996 CALMET database, and will conduct additional sensitivity analyses once the validity of the RH data have been determined through additional QA/QC methods. In the meantime, we believe the refined analyses conducted by the Division, utilizing generally accepted modeling options and seasonal f(RH) values, represent the basis on which we must evaluate whether there is or is not a predicted impact at or above the NPS threshold level of concern for visibility at Badlands and Wind Cave National Parks.

SPECIFIC COMMENTS ON VISIBILITY ANALYSIS - Additional comments pertaining to the visibility analyses were also received, and specific responses are provided to each comment below.

1. **Request for Short-Term Nitrogen Oxide and Sulfuric Acid Emission Limits**
   The NPS commented that a NOx emission limit based on a 30-day rolling average was not adequate to regulate short-term emissions that affect visibility. The NPS also requested a sulfuric acid (H_2SO_4) limit to be established in the air quality permit, as the emissions of this pollutant can also contribute to visibility impairment.

   Response - The top-down BACT process was followed and the proposed control devices and emission limits meet the requirements of BACT. NOx emissions will be controlled with low NOx burners and SCR and H_2SO_4 will be controlled with the semi-dry lime spray dryer/absorber. NOx and H_2SO_4 emissions will be well controlled and there is no regulatory basis for setting short term emission limits, specific to visibility protection, as there are no established standards for visibility.

   The 30 day rolling average NOx limit of 0.07 lb/MMBtu is more stringent than any existing limit the Division can find for an operating PC boiler. Using a shorter term limit would require a higher emission limit. Additionally, setting a short term emission limit would not change actual short term emission rates.

The semi-dry lime spray dryer/absorber proposed for SO_2 control removes SO_2 that could be oxidized to SO_3 and also removes SO_3 and H_2SO_4 in the flue gas by reacting condensed acid with the alkaline reagent. The SO_2 emission limits are therefore a surrogate for H_2SO_4 and compliance with the SO_2 limits will ensure that the spray dryer/absorber is properly maintained and operated. Additionally, the Division will add an initial testing requirement for H_2SO_4 to quantify short term emission rates.

2. <u>Inclusion of Sulfuric Acid Emissions in Visibility Analyses</u> - The NPS commented that they could find no evidence that H_2SO_4 emissions were modeled, nor was any limit for H_2SO_4 emissions proposed in the Division's permit application analysis.

<u>Response</u> - The CALPUFF modeling input files sent to the NPS on 5/10/02 using the CALPUFF screening methodology, as well as the CALPUFF modeling input files sent to the NPS on 5/28/02 using the CALPUFF refined methodology include an H_2SO_4 emission rate of 23.3 lb/hr (2.94 gram/sec). The H_2SO_4 emissions were included for determining impacts to Air Quality Related Values (AQRVs), including impacts to visibility and acid deposition at several Class I areas, and one Class II area (Cloud Peak Wilderness Area). Additionally, the H_2SO_4 emission rate of 2.94 gram/sec is provided on page 38 of the Division's permit application analysis.

3. <u>Cumulative Visibility Analysis</u> - The NPS commented that a cumulative visibility analysis should be conducted.

<u>Response</u> - PSD Regulations do not require a cumulative visibility analysis to be performed for the proposed new source or modification. Only the visibility impacts from the proposed new source or modification must be assessed as required under current Federal regulations, and the Wyoming Air Quality Standards and Regulations (WAQSR). Specifically, under WAQSR Chapter 6, Section 4, (b)(i)(B)(I) and 40 CFR Part 51.166 (o)(1), it states that "the owner or operator shall provide an analysis of the impairment to visibility, soils and vegetation that would occur as a result of the facility or modification and general commercial, residential, industrial, and other growth associated with the facility or modification". The applicant has complied with the regulations cited above by assessing visibility impacts from the proposed source.

4. <u>Establishment of a Visibility Monitoring Program</u> - ED, et al. commented that WYDEQ should require BHC to conduct an approved visibility monitoring program for relevant Class I areas.

<u>Response</u> - At the present time IMPROVE aerosol monitors exist at the Badlands and Wind Cave National Parks to monitor pollutants affecting visibility. Additionally, during 2001, the State of Wyoming funded and established additional IMPROVE protocol visibility monitoring sites at the Cloud

Peak Wilderness Area and in the Thunder Basin Grasslands, northeast of Gillette. As of June, 2002 the aerosol monitors at the Wyoming sites have been incorporated into the IMPROVE program. Monitoring exists at the Class I areas in question.

The Division is keenly aware of the need for monitoring data to assess existing visibility conditions in the northeastern portion of Wyoming. To that extent the Division has instituted the additional visibility monitoring beyond that necessary for the RHR. The monitoring data will give a better understanding of the frequency, magnitude, and extent of visibility impact as compared to that predicted by modeling.

F. <u>**DEPOSITION ANALYSIS**</u> - The NPS, and ED, et al. provided comments on the deposition modeling analyses that were submitted by the applicant. The comments addressed comparing impacts to the NPS Deposition Analysis Threshold, performing a cumulative deposition analysis, and a demonstration of no adverse impacts to deposition.

1. <u>**Total Nitrogen and Sulfur Deposition Above NPS's Deposition Analysis Thresholds**</u> - The NPS commented that the CALPUFF screening level deposition analysis produced nitrogen and sulfur deposition values greater than the Deposition Analysis Thresholds (DATs) that have been established by the NPS. A cumulative deposition analysis was not conducted as suggested by the FLAG Phase I Report guidance document.

<u>Response</u> - On May 17, 2001, a Class I modeling protocol was sent to the NPS. Section 3.2.6.2 of that modeling protocol stipulated that the applicant would evaluate the change in acid neutralizing capacity (ΔANC) at Florence Lake, in the Cloud Peak Wilderness Area, which is a Class II area managed by the United States Forest Service (USFS). The protocol also stipulated that the "Fox Equation" would be used to calculate the ΔANC at Florence Lake, and specifically referenced the guidance document, <u>A Suggested Methodology for an Acid Deposition Screening Technique Applicable Within 200 km of Isolated Sources,</u> as the source of data to compare impacts from deposition. The NPS did not provide comments on the Class I modeling protocol, and did not suggest that the applicant use the proposed DATs in the conference call on 5/24/01. The applicant has followed the approved Class I modeling protocol in comparing the deposition impacts from the proposed source, and the Division accepts the applicant's analysis as demonstrating no significant impacts to deposition using the proposed methods.

2. <u>**Cumulative Deposition Analysis**</u> - The NPS commented that a cumulative deposition analysis was not conducted for the Wind Cave National Park and the Badlands National Park.

<u>Response</u> - PSD Regulations do not require a cumulative deposition analysis to be performed. Only the impacts from the proposed new source are required under WAQSR Chapter 6, Section 4, (b)(i)(B)(I) and 40 CFR Part 51.166 (o)(1).

3. **Demonstration of No Adverse Impacts to Deposition** - ED, et al. commented that BHC's modeling analyses for impacts on visibility and other Air Quality Related Values (AQRVs) at the Class I areas does not sufficiently demonstrate there will be no adverse impact from WYGEN 2.

Response - As per the applicant's Class I area modeling protocol, an analysis was submitted which evaluated the percent change in acid neutralizing capacity (ΔANC) at Florence Lake in the Cloud Peak Wilderness Area, located approximately 143 kilometers west of the proposed source. The results of the applicant's deposition analysis using CALPUFF in a screening mode indicated that the maximum calculated ΔANC for Florence Lake was 0.86%, which is well below the 10% significance criteria for water bodies with baseline ANC's greater than 25 μeq/L. Therefore, considering the fact that the deposition analysis has demonstrated that total nitrogen and sulfur deposition from the proposed new source are well below the significance criteria as established by the United States Department of Agriculture - Forest Service (USDA/FS), a refined deposition analysis was not warranted, or required by the Division.

Additionally, the NPS has indicated in their July 2, 2002 comments that the values obtained from rerunning the applicant's deposition analysis indicated that the model predicted sulfur deposition values would not likely cause an adverse impact to park ecosystems in either Badlands or Wind Cave National Parks.

G. **CLASS I AREA MODELING ANALYSES** - The NPS, EPA, and ED, et al. provided comments on the Class I increment analyses including the usage of the proposed EPA Class I significant impact levels (SILs), and a request for additional sources to be included in the Class I increment analyses. Also, the NPS requested additional modeling files and related information.

SPECIFIC COMMENTS ON CLASS I AREA MODELING ANALYSES -

1. **Use of Proposed Class I Significance levels** - ED, et al. commented that the BHC unlawfully relied upon significant impact levels (SILs) for Class I areas to exempt WYGEN 2 from a cumulative modeling analysis for the NO_2 and PM_{10} increments at the nearby Class I areas.

Response - PSD guidance contained in the Federal Register/Vol. 61, No. 142/ Tuesday, July 23, 1996/Proposed Rules provides guidance on using the proposed significant impact levels (SILs) for Class I increments. In the 1996 Proposed Rules, the EPA proposed significant impact levels for Class I increments that would exclude proposed sources with de minimis ambient impacts from the requirement to conduct comprehensive Class I increment consumption analyses for each applicable criteria pollutant. The recommended EPA SILs for Class I Areas are provided below:

Pollutant	Averaging Period	Levels Recommended by the EPA ($\mu g/m^3$)
SO_2	3-hour	1.0
	24-hour	0.2
	Annual	0.1
PM_{10}	24-hour	0.3
	Annual	0.2
NO_2	Annual	0.1

The proposed Class I SILs were intended to be used as a screening tool to avoid costly modeling analyses of potentially insignificant sources, and the Division supports the use of the proposed Class I SILs for assessing if a source has a significant impact at a Class I area. The NPS did not provide any comments on the applicant's Class I modeling protocol which specified using the Class I SILs, and during the Division's review of the permit application for the proposed new source, the NPS has given no indication that the use of the Class I SILs was inappropriate. Therefore, the Division relied on the Class I SILs to exempt the applicant from completing cumulative Class I increment consumption analyses.

The applicant used an EPA approved Long Range Transport model: the CALPUFF modeling system, version 5.5 (Level 010730_1) to evaluate the model predicted ambient air quality impacts of the proposed WYGEN 2 facility at three (3) Class I areas: Wind Cave National Park, Badlands National Park, and the Northern Cheyenne Indian Reservation. The CALPUFF analysis was run in a refined mode using a fully developed three-dimensional wind field.

The applicant was able to demonstrate that the CALPUFF model predicted impacts from PM_{10} and NOx emissions from the proposed new source were at least 1-2 orders of magnitude below the proposed Class I SILs for these two pollutants. Therefore, based on the modeled insignificant impacts, the Division did not require the applicant to conduct cumulative Class I NOx and PM_{10} increment consumption analyses for any Class I areas. The model predicted SO_2 impact from the proposed new source was greater than the 3-hour and 24-hour Class I SILs for SO_2. As a result, the Division required the applicant to conduct a cumulative SO_2 Class I increment consumption analysis for the three (3) designated Class I areas: Badlands National Park, Wind Cave National Park, and the Northern Cheyenne Indian Reservation.

---

2. **<u>Inclusion of Additional Sources in Class I Increment Consumption Analyses</u>** - EPA and ED, et al. commented that the Colstrip Power Plant (MT), Ben French Power Plant (SD), and the South Dakota Cement Plant (SD) should also be included in the Class I increment consumption analysis.

<u>Response</u> - On July 2, 2002, the applicant submitted an additional Class I increment consumption analysis that included Unit #3 and Unit #4 at Colstrip Power Plant. It was verified by the applicant and the Division that the sources at the Ben French Power Plant and the South Dakota Cement Plant facilities, and Colstrip Unit #1 and Unit #2 were all constructed prior to the major source baseline date for SO_2, and have not been modified. Therefore these sources were not included in the increment analyses.

3. **<u>Demonstration of No Exceedance of the PSD Class I Increments</u>** - ED, et al. commented that the modeling analysis provided by the Black Hills Corporation (BHC) fails to demonstrate WYGEN 2 would not cause or contribute to a violation of the PSD Class I increments for SO_2.

<u>Response</u> - Based on comments received during the public comment period, the applicant conducted an additional cumulative Class I SO_2 increment consumption analysis and included the Colstrip power plant (Unit #3 & Unit #4). The two sources at the Colstrip facility were modeled using the allowable 3-hour and 24-hour emission rates to compare with the Class I 3-hour and 24-hour increments, respectively.

The applicant attempted to utilize a newly developed CALMET wind field created for the Division, but was unable to run all months of the annual CALMET simulation, and could not turn on the chemistry and dry deposition algorithms in the model simulations. Since the Class I SO_2 increment analysis could be run without chemistry and dry deposition turned on in the CALPUFF simulations, it was decided by the Division that a Class I SO_2 increment analysis could be completed by the applicant using this wind field. On July 2, 2002, the applicant submitted a revised cumulative Class I increment consumption analysis using a 3-hour short-term SO_2 emission rate of 0.15 lb/MMBtu.

During the Division's review of this permit application, it was determined that the surface data file (surf.dat) used by the applicant in the CALPUFF modeling simulations contained invalid surface pressure data. The Division discovered invalid hourly surface pressure data at several surface stations in the Powder River Basin were affecting the chemistry and dry deposition options. A new surface meteorological data file was generated after removing the invalid pressure data, and the Division reran the applicant's modeling simulations using the revised surface meteorological data file. Based on the Division's Class I increment consumption analysis, the highest second highest (HSH) 3-hour SO_2 impact was 27.3 $\mu g/m^3$ from all SO_2 sources represented in the Class I increment analysis, indicating a single modeled exceedance of the 3-hour SO_2 Class I increment level of 25 $\mu g/m^3$ at the Northern Cheyenne Indian Reservation.

A separate analysis conducted by the Division revealed that the SO_2 emissions from the Colstrip Unit #3 and Unit #4, located 24 kilometers north of the NCIR, contributed to 99.9% of the modeled 3-hr SO_2 exceedance; the maximum 3-hour SO_2 impact from the proposed new source at the receptor with the modeled exceedance (Rec #655) was 0.07 $\mu g/m^3$, which is well below the Class I 3-hour SIL of 1.0 $\mu g/m^3$ for SO_2.

The Division recognizes that the modeled exceedance is entirely due to an existing facility, and that the proposed new source does not significantly impact the location of the modeled exceedance. The results of the Class I increment analyses are provided in Attachment C. A plot showing the receptor locations, distances from the proposed source to the Class I areas, and the maximum 3-hr impact at the NCIR are also provided in Attachment D.

The Class I increment analysis also demonstrated that the highest second highest (HSH) 24-hour impacts from all SO_2 sources considered in the Class I increment analysis were below the 24-hour Class I SO_2 increment of 5 $\mu g/m^3$ at all three (3) Class I areas considered in this analysis. All of the air quality modeling analyses have been performed correctly, and in accordance with the PSD regulations, and available EPA guidance on PSD modeling analyses. The Division acknowledges that the applicant has conducted the necessary Class I increment modeling analyses and has demonstrated that the proposed source does not exceed the Class I increments, or contribute significantly to any Class I increment exceedances.

4. <u>**Request for Modeling Files**</u> - The NPS commented that the Division should provide all necessary modeling files to the NPS and resolve all technical issues prior to proceeding with the issuance of the construction permit for the proposed WYGEN 2 facility.

<u>**Response**</u> - ***Modeling Files*** - With the transmittal of this decision, the Division is making available all of the files used in the Division's five (5) visibility analyses, including the revised surface data file (surf.dat), which can be used in conjunction with the following modeling files that have been sent to the NPS:

a) CALPUFF input files for visibility and deposition analyses using the a screening level methodology and five years of meteorological data.

b) MM5 data, CALMET and CALPUFF input files used in the refined level CALPUFF visibility and Class I increment analyses.

<u>**Response**</u> - ***Technical Issues*** - The Division reviewed and verified the source parameters, default settings, and modeling inputs used in the revised Class I increment and visibility modeling analyses, and the revised modeling analyses have addressed the comments on technical issues received during the public comment period, and the public hearing.

The Division's initial review of the applicant's modeling analyses were put out for public notice. Comments were received during the public comment period which addressed the technical merit of the initial modeling analyses, and those comments on technical issues were incorporated into the revised modeling analyses for visibility and Class I increment consumption using CALPUFF in a refined mode. The results of the revised modeling analyses are provided in Attachment B, Attachment C, and Attachment D, and are being used in the Division's final decision.

H. **CLASS II AREA MODELING ANALYSES** - The NPS, EPA, and ED, et al. provided comments on the Class II modeling analyses which included clarification of the sources used in the Class II increment consumption and Wyoming Ambient Air Quality Standards (WAAQS) analyses, the length of meteorological data used in the near-field modeling analyses, and clarification that the PSD Class II SO_2 increments were not going to be exceeded as a result of the additional emissions from the proposed source.

1. **Length of Meteorological Data Used in Near-Field Analyses** - ED, et al. commented that the near-field modeling analyses were only based on one (1) year of meteorological data from "1990-2000", which is not sufficient to determine whether there will be violations of the PSD increments.

   Response - This comment contains a typographical error, and should have correctly referenced the year of meteorological data used in the ISCST3 near-field modeling analyses as 1999-2000.

   40 CFR Part 51, Appendix W: Guideline on Air Quality Models, Section 9.3.1.2 states that if the source is large, (e.g., a 500 MW power plant), the use of 5 years of NWS meteorological data or at least one year of site-specific data is required." The Pacificorp company has an existing on-site meteorological data monitoring program at the Wyodak complex, which is where the proposed new source will be located. The meteorological data collected at Pacificorp's on-site meteorological monitoring station are considered to be representative in a spatial and temporal sense, of the meteorological and dispersion conditions for this geographical area. The applicant utilized the on-site meteorological data in their near-field modeling analyses, and the use of this on-site meteorological data is consistent with EPA guidance and PSD regulations.

   Initially, the applicant used one year of surface meteorological data collected by Hampshire Energy in 1981 for a proposed facility near the Wyodak complex. A comparison of the model predicted impacts using the 1981 and 1999-2000 meteorological data sets indicated that the ISCST3 model predicted impacts were similar in magnitude, and were also similar in a spatial and temporal sense for the short-term and annual averaging periods. This comparison also revealed that the model predicted impacts of the proposed new source using both sets of data adequately demonstrated compliance with all applicable ambient air quality standards and PSD increments.

   Therefore, the Division acknowledges that both sets of meteorological data are representative of the wind flow patterns and meteorology that occur in this geographical area, that the applicant has followed the correct guidance, and has successfully demonstrated in the modeling analyses that there will be no violations of the PSD increment levels for SO_2.

2. **Clarification of Sulfur Dioxide Emissions Sources in Near-Field Analyses** - EPA, NPS, and ED, et al. commented that the Division's permit application analysis did not clearly state which sources and emission rates were represented

in the air quality dispersion modeling analyses for the Wyoming Ambient Air Quality Standards (WAAQS) and Prevention of Significant Deterioration (PSD) Class II Increment Consumption analyses for sulfur dioxide (SO_2). Additionally, the respondents requested that more information should be provided to document why the SO_2 emissions from the WYODAK Unit 1 and the Neil Simpson Unit 1 sources do not consume SO_2 increment.

Response - In he Division's permit application analysis (NSR-AP-C92), the Emissions and Stack Parameters section states that "Both the WAAQS and increment modeling analyses included several interactive (nearby) sources of SO_2, which are provided in Table 3a." Table 3a clearly shows that the sources: WYODAK Unit 1 and Neil Simpson 1 do not consume SO_2 increment.

The Pacificorp WYODAK Unit 1 and the Black Hills Corporation Neil Simpson Unit 1 power generating facilities were constructed in 1972, and 1969, respectively, prior to the major source baseline date for SO_2 of January 6, 1975, and have not been modified. Therefore, these two facilities were not included in the modeling analyses to assess increment consumption in the Class II areas.

3. **Inclusion of Additional Sources in Class II Increment Consumption Analyses** - EPA and ED, et al. commented that the sources of SO_2 that consume increment due to modifications occurring after the minor source baseline date was triggered should be included in the increment consumption analyses.

Response - Based on the applicant's significant impact analysis using the 1999 on-site meteorological data from Pacificorp's Wyodak monitoring site, it was determined that the impact from the proposed source was above the Class II Significant Impact Levels for SO_2 for the 3-hour and 24-hour averaging periods; the 3-hour and 24-hour SO_2 radii of impact (ROI) were approximately 2 km and 10 km, respectively. PSD guidance provided in the New Source Review Workshop Manual (Draft October 1990) recommends that a distance of 50 km be added onto the ROIs to define the maximum distance out to which the interacting source inventory would be compiled and used in the WAAQS and PSD Class II increment analyses; the maximum distance would therefore be 60 kilometers in this case.

Since the Black Hills Corporation - Osage Power Plant, and the Wyoming Refining Company - Newcastle Refinery are located 86 kilometers, and 106 kilometers away from the proposed WYGEN 2 facility, respectively, any SO_2 increment consuming sources at these two facilities would be beyond the recommended distance of (ROI+50 kilometers), based on the PSD guidance document cited above.

4. **Demonstration of No Exceedance of the PSD Class II Increments** - ED, et al. commented that the modeling analysis provided by the Black Hills Corporation (BHC) fails to demonstrate WYGEN 2 would not cause or contribute to a violation of the PSD Class I and Class II increments for SO_2.

Table 6 in the Division's analysis identifies the highest second highest (HSH) SO_2 concentration predicted in the WAAQS analysis to be 124.2 μg/m^3, which is well below Wyoming's 24-hour ambient SO_2 standard of 260 μg/m^3. Additionally, Table 10 in the Division's analysis identifies that the HSH 24-hour SO_2 concentration in the PSD Class II increment consumption analysis to be 80.5 μg/m^3, which is below the 24-hour Class II increment level of 91 μg/m^3 for SO_2, and thereby demonstrates there were no modeled exceedances of the PSD Class II increments for SO_2.

I. **<u>PERMIT PROCESS</u>** - NPS and ED, et al. commented that WYDEQ did not comply with 40 CFR 51.307 and WAQSR Chapter 6, Section 2 and, as a result, diminished the ability of the Federal Land Manager to carry out their "affirmative responsibility" to protect the air quality related values of surrounding Class I areas.

<u>Response</u> - We disagree. The WAQSR requirements for permit review are found at Chapter 6, Section 2(g). The Division must notify the applicant within 30 days as to whether the application is complete. For complex major sources, this "completeness" process may be quite lengthy and include communication with the applicant by telephone, email, and formal correspondence. Following a determination of completeness, the Division is required to reach a decision and publish that decision in a notice to the public within 60 days of the completeness determination. The public notification is for a period of 30 days and includes the opportunity to request a public hearing. We assume that the FLMs dealing with Wyoming permitting issues are cognizant of these regulatory requirements.

Per the requirements of 40 CFR 50.307 and the WAQSR, the Division began the process of notifying the Federal Land Managers of the potential for a new major source in advance of receipt of a formal application. On May 17, 2001, a Class I Modeling Protocol for the proposed WYGEN2 facility was sent to the NPS and USFS, followed by a conference call with all parties on May 24, 2001. The Division received a formal application on July 30, 2001 and on August 1, 2001, notified the NPS and the USFS that an application had been received and included a complete copy of the application and analysis submitted. In our view, this action satisfies the requirements of both Federal and State regulations for notification to the Federal Land Manager and initiates subsequent processes for the State and the FLM.

For the State, the process is a preliminary review of the application to determine if issues such as BACT, increment and visibility modeling, and the like have been addressed adequately. If not, a dialog is opened with the applicant to provide additional information until enough information is available for the application to be deemed complete. This process continued until the applicant was informed by letter dated February 25, 2002, that the application was complete. We assume that during this seven month period the FLM was exercising its affirmative responsibility to take a particular interest in applications such as this, and to provide comments to the permitting agency if desiring those comments to be considered in the completeness determination or in the proposed decision. We received no formal comment in that regard until the public notice period.

Recognizing that the completeness review process has a somewhat open-ended time line in these cases, we acknowledge that, although not required by regulation, formal notification to the appropriate FLM when a completeness determination is made by the State would be helpful to the process as an indication to the FLM of when the 60 day review cycle prior to public notice begins. A letter, dated April 26, 2002, was sent to the applicant, EPA Region VIII, the NPS, and the USFS enclosing notification of our intention to grant a permit for the WYGEN2 project with a public comment period beginning May 2, 2002, also reaffirming the opportunity for interested parties to request a public hearing on the matter. A public hearing, at the request of the NPS, was held on July 2, 2002.

J. **<u>PUBLIC AVAILABILITY OF APPLICATION DOCUMENTS</u>** - ED, et al. characterizes the permit process as fundamentally unfair to interested members of the public.

<u>Response</u> - The comment stems from frustration on the part of the commentor that a copy of the WYGEN2 permit application was not made and sent to them at their request. On several occasions ED, et al. staff were informed of WDEQ policy in this regard. WDEQ files are public files, open for inspection at any time during State office hours, with facilities available for making copies at a nominal charge per page. For large volumes of copying, arrangements can be made with an outside copying service. As ED, et al. was previously advised, we simply do not have the resources to serve as a copying center for the multitude of requests we receive daily for information from the public files. We adhere to this policy consistently so that we do not unfairly advantage structured environmental organizations or industrial corporations over the requests of ordinary citizens.

III. DECISION:

On the basis of comments received prior to and at the public hearing, an analysis of those comments, and representations made by Black Hills Corporation in the application, the Department of Environmental Quality has determined that the permit application filed by Black Hills Corporation complies with all applicable Wyoming Air Quality Standards and Regulations and that a permit will be issued to Black Hills Corporation allowing construction of WYGEN 2 as described in the application. All of the conditions proposed in the Division's analysis will be included in the permit with the following changes and additions:

1. ~~The SO_2 limits in Condition 8 were changed to 0.10 lb/MMBtu (30-day rolling) and 0.15~~ lb/MMBtu (3-hr block). The lb/hr and tpy limits were adjusted accordingly.

2. The requirement for 90% SO_2 removal efficiency in Condition 8 was revised to the NSPS Subpart Da requirement of 70% SO_2 removal efficiency.

3. All references to the 2 hour SO_2 emission limit were changed to a 3 hour limit.

4. An initial requirement to test for metals (antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, and selenium) before and after the control devices using EPA Method 29 was added to Condition 10.

5. An initial requirement to test for H_2SO_4 using EPA Method 8 was added to Condition 10.

Dated this 26 day of September, 2002

Dan Olson,
Administrator
Wyoming Air Quality Division

Dennis Hemmer
Director
Wyoming Department of Environmental Quality

Attachment A

HAP Emissions

Pollutant	Emission Factor (lb/ton)	Uncontrolled Emission Rate (lb/hr)[a]	Controlled Emission Rate (lb/hr)[a]	Control Efficiency (%)	Potential Emissions (tpy)[a]
2,4-Dinitrotoluene[d]	2.80E-07		9.06E-05		3.97E-04
2-Chloroacetophenone[d]	7.00E-06		2.27E-03		9.92E-03
Acetaldehyde[d]	5.70E-04		1.84E-01		8.08E-01
Acetophenone[d]	1.50E-05		4.85E-03		2.13E-02
Acrolein[d]	2.90E-04		9.38E-02		4.11E-01
Antimony[h]	-	2.59E-01	2.59E-02	9.090909e+20	1.13E-01
Arsenic[h]	-	1.94E+00	1.94E-01		8.50E-01
Benzene[b]	1.30E-03		4.21E-01		1.84E+00
Benzyl Chloride[d]	7.00E-04		2.27E-01		9.92E-01
Beryllium[h]	-	3.88E-01	3.88E-02		1.70E-01
Biphenyl[c]	1.70E-06		5.50E-04		2.41E-03
Bis(2-ethylhexyl)phthalate[d]	7.30E-05		2.36E-02		1.03E-01
Bromoform[d]	3.90E-05		1.26E-02		5.53E-02
Cadmium[f]	5.10E-05	1.65E-01	1.65E-02		7.23E-02
Carbon Disulfide[d]	1.30E-04		4.21E-02		1.84E-01
Chlorine	-		-		-
Chlorobenzene[d]	2.20E-05		7.12E-03		3.12E-02
Chloroform[d]	5.90E-05		1.91E-02		8.36E-02
Chromium[h]	-	7.77E+00	7.77E-01		3.40E+00
Cobalt[h]	-	1.29E+00	1.29E-01		5.67E-01
Cumene[d]	5.30E-06		1.72E-03		7.51E-03
Cyanide[d]	2.50E-03		8.09E-01		3.54E+00
Dimethyl Sulfate[d]	4.80E-05		1.55E-02		6.80E-02
Ethyl Chloride[d]	4.20E-05		1.36E-02		5.95E-02
Ethylbenzene[d]	9.40E-05		3.04E-02		1.33E-01
Ethylene Dibromide[d]	1.20E-06		3.88E-04		1.70E-03
Ethylene Dichloride[d]	4.00E-05		1.29E-02		5.67E-02
Fluorine	-		-		-
Formaldehyde[d]	2.40E-04		7.77E-02		3.40E-01
Hexane[d]	6.70E-05		2.17E-02		9.50E-02
Hydrogen Chloride[e,g,i]	1.20E+00	3.88E+02	1.55E+01		6.80E+01
Hydrogen Fluoride[e,g,j]	1.50E-01	4.85E+01	1.94E+00		8.50E+00
Isophorone[d]	5.80E-04		1.88E-01		8.22E-01
Lead[k]	-		1.30E-01		5.69E-01
Manganese[h]	-		1.81E+00		7.94E+00
Mercury[h]	-	6.47E-02	6.28E-02		2.75E-01
Methyl Bromide[d]	1.60E-04		5.18E-02		2.27E-01
Methyl Chloride[d]	5.30E-04		1.72E-01		7.51E-01
Methyl Ethyl Ketone[d]	3.90E-04		1.26E-01		5.53E-01
Methyl Hydrazine[d]	1.70E-04		5.50E-02		2.41E-01
Methyl Methacrylate[d]	2.00E-05		6.47E-03		2.83E-02
Methyl Tert Butyl Ether[d]	3.50E-05		1.13E-02		4.96E-02
Methylene Chloride[d]	2.90E-04		9.38E-02		4.11E-01
Naphthalene[c]	1.30E-05		4.21E-03		1.84E-02
Nickel[h]	-	9.71E+00	9.71E-01		4.25E+00
Phenol[d]	1.60E-05		5.18E-03		2.27E-02
Polychlorinated Dibenzofurans[b]	2.01E-07		6.50E-05		2.85E-04
Polychlorinated Dibenzo-p-dioxins[b]	4.28E-08		1.39E-05		6.07E-05
Propionaldehyde[d]	3.80E-04		1.23E-01		5.39E-01
Selenium[f]	1.30E-03		4.21E-01		1.84E+00
Styrene[d]	2.50E-05	1.75E-02	8.09E-03		3.54E-02
Tetrachloroethylene[d]	4.30E-05		1.39E-02		6.09E-02
Toluene[d]	2.40E-04		7.77E-02		3.40E-01
Vinyl Acetate[d]	7.60E-06		2.46E-03		1.08E-02
Xylenes (o and m)[d]	3.70E-05		1.20E-02		5.24E-02
				Total	110

[a]Emissions based on a coal burn rate of 323.6 tons/hr.
[b]Emission Rate from AP-42 Table 1.1-12. Assumes emission control from spray dryers and fabric filters.
[c]Emission Rate from AP-42 Table 1.1-13. Assumes emission control from spray dryers and fabric filters.
[d]Emission Rate from AP-42 Table 1.1-14. Assumes emission control from spray dryers and fabric filters.
[e]Emission Rate from AP-42 Table 1.1-15. Assumes emission control from spray dryers and fabric filters.
[f]Emission Rate from AP-42 Table 1.1-18. Assumes emission control from spray dryers and fabric filters.
[g]Assumed 96% control efficiency.
[h]1991 Wyodak coal analysis. Assumed 90% control efficiency. Mercury assumed 3% control efficiency.
[i]Assumed 100% of Chlorine is converted to Hydrogen Chloride.
[j]Assumed 100% of Fluorine is converted to Hydrogen Fluoride.
[k]Assumed 95% control efficiency. Lead emission was based on an emission factor published by the USEPA in a document entitled, *Toxic Air Pollutant Emission Factors-A Compilation for Selected Air Toxic Compounds and Sources.*

Attachment B

Table 1
Results of WDEQ/AQD's Visibility Analyses for
Black Hills Corporation - WYGEN 2 Electrical Power Generating Facility

Simulation #1: Calpuff "Lite" ANALYSIS -- USING 90 DEGREE RECEPTOR ARCS & FLAG SEASONAL *f* (RH) VALUES

Constant Emission Rates: NO_x = 0.07 LB/MMBTU, PM_{10} = 0.012 LB/MMBTU, SO_4 = 23.3 LB/HR

SO_2 = 0.17 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	UTM COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	*f*(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1986	338	55	643.914	5026.145	1.27	16.36	17.63	7.76	3.1	0.806	0.442	0.021	6	0
CP	1989	351	212	393.656	4782.703	2.591	16.24	18.831	15.96	2.9	1.638	0.916	0.037	29	2
NC	1988	6	254	326.207	4862.903	1.799	16.24	18.039	11.08	2.9	0.970	0.794	0.035	27	1
WC	1986	37	78	633.763	4938.903	1.604	16.24	17.844	9.88	2.9	1.022	0.562	0.02	21	0

SO_2 = 0.15 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	UTM COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	*f*(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1986	338	55	643.914	5026.145	1.187	16.36	17.547	7.25	3.1	0.723	0.442	0.021	4	0
CP	1989	351	212	393.656	4782.703	2.418	16.24	18.658	14.89	2.9	1.465	0.916	0.037	27	2
NC	1988	6	254	326.207	4862.903	1.704	16.24	17.944	10.49	2.9	0.874	0.794	0.035	20	1
WC	1986	37	78	633.763	4938.903	1.494	16.24	17.734	9.20	2.9	0.913	0.562	0.02	17	0

SO_2 = 0.12 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	UTM COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	*f*(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1986	338	55	643.914	5026.145	1.063	16.36	17.423	6.50	3.1	0.599	0.442	0.021	4	0
CP	1989	351	212	393.656	4782.703	2.158	16.24	18.398	13.29	2.9	1.205	0.916	0.037	21	2
NC	1988	6	254	326.207	4862.903	1.561	16.24	17.801	9.61	2.9	0.731	0.794	0.035	15	0
WC	1986	37	78	633.763	4938.903	1.33	16.24	17.57	8.19	2.9	0.748	0.562	0.02	12	0

SO_2 = 0.10 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	UTM COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	*f*(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1986	338	55	643.914	5026.145	0.98	16.36	17.34	5.99	3.1	0.517	0.442	0.021	4	0
CP	1989	351	212	393.656	4782.703	1.985	16.24	18.225	12.22	2.9	1.032	0.916	0.037	16	2
NC	1988	6	254	326.207	4862.903	1.466	16.24	17.706	9.02	2.9	0.636	0.794	0.035	11	0
WC	1986	37	78	633.763	4938.903	1.22	16.24	17.46	7.51	2.9	0.638	0.562	0.02	10	0

Table 2
Results of WDEQ/AQD's Visibility Analyses for Black Hills Corporation - WYGEN 2 Electrical Power Generating Facility

Simulation #2: CALPUFF REFINED ANALYSIS -- RHMAX = 98%

Constant Emission Rates: NO_x = 0.07 LB/MMBTU, PM_{10} = 0.012 LB/MMBTU, SO_4 = 23.3 LB/HR

SO_2 = 0.17 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	133	102	172.352	-31.593	3.952	21.078	25.03	18.75	10.96	2.934	1.003	0.015	13	2
CP	1996	66	751	-167.269	39.58	1.441	16.185	17.625	8.90	2.808	0.925	0.494	0.021	3	0
NC	1996	90	284	-131.309	151.293	2.191	16.811	19.002	13.04	3.851	1.403	0.765	0.024	6	2
WC	1996	133	748	117.371	-36.879	3.493	21.202	24.695	16.48	11.17	2.543	0.934	0.016	16	5

SO_2 = 0.15 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	133	102	172.352	-31.593	3.627	21.078	24.705	17.21	10.96	2.609	1.003	0.015	11	2
CP	1996	66	751	-167.269	39.58	1.343	16.185	17.527	8.30	2.808	0.827	0.494	0.021	2	0
NC	1996	90	284	-131.309	151.293	2.046	16.811	18.856	12.17	3.851	1.257	0.765	0.024	6	1
WC	1996	133	748	117.371	-36.879	3.214	21.202	24.416	15.16	11.17	2.264	0.934	0.016	15	5

SO_2 = 0.12 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	133	102	172.352	-31.593	3.14	21.078	24.218	14.90	10.96	2.122	1.003	0.015	9	2
CP	1996	66	751	-167.269	39.58	1.196	16.185	17.38	7.39	2.808	0.680	0.494	0.021	2	0
NC	1996	90	284	-131.309	151.293	1.826	16.811	18.637	10.86	3.851	1.038	0.765	0.024	5	1
WC	1996	133	748	117.371	-36.879	2.795	21.202	23.996	13.18	11.17	1.845	0.934	0.016	12	3

SO_2 = 0.10 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	133	102	172.352	-31.593	2.815	21.078	23.893	13.36	10.96	1.797	1.003	0.015	9	2
CP	1996	66	751	-167.269	39.58	1.098	16.185	17.282	6.78	2.808	0.582	0.494	0.021	1	0
NC	1996	90	284	-131.309	151.293	1.68	16.811	18.491	10.0	3.851	0.892	0.764	0.024	4	1
WC	1996	133	748	117.371	-36.879	2.515	21.202	23.717	11.86	11.17	1.565	0.934	0.016	11	2

Table 3
Results of WDEQ/AQD's Visibility Analyses for
Black Hills Corporation - WYGEN 2 Electrical Power Generating Facility

Simulation #3: CALPUFF REFINED ANALYSIS -- RHMAX = 95%

Constant Emission Rates: NO_x = 0.07 LB/MMBTU, PM_{10} = 0.012 LB/MMBTU, SO_4 = 23.3 LB/HR

SO_2 = 0.17 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	133	102	172.352	-31.593	3.365	19.099	22.464	17.62	7.665	2.476	0.874	0.015	10	2
CP	1996	66	751	-167.269	39.58	1.441	16.185	17.625	8.90	2.808	0.925	0.494	0.021	3	0
NC	1996	90	284	-131.309	151.293	2.191	16.811	19.002	13.04	3.851	1.403	0.765	0.024	6	1
WC	1996	133	748	117.371	-36.879	2.442	18.809	21.25	12.98	7.182	1.775	0.651	0.016	14	4

SO_2 = 0.15 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	133	102	172.352	-31.593	3.092	19.099	22.19	16.19	7.665	2.203	0.874	0.015	10	2
CP	1996	66	751	-167.269	39.58	1.343	16.185	17.527	8.30	2.808	0.827	0.494	0.021	2	0
NC	1996	90	284	-131.309	151.293	2.046	16.811	18.856	12.17	3.851	1.257	0.765	0.024	6	1
WC	1996	133	748	117.371	-36.879	2.247	18.809	21.056	11.94	7.182	1.580	0.651	0.016	14	3

SO_2 = 0.12 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	133	102	172.352	-31.593	2.682	19.099	21.78	14.04	7.665	1.793	0.874	0.015	8	1
CP	1996	66	751	-167.269	39.58	1.196	16.185	17.38	7.39	2.808	0.680	0.494	0.021	1	0
NC	1996	90	284	-131.309	151.293	1.826	16.811	18.637	10.86	3.851	1.038	0.765	0.024	5	1
WC	1996	133	748	117.371	-36.879	1.954	18.809	20.763	10.39	7.182	1.287	0.651	0.016	10	2

SO_2 = 0.10 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	133	102	172.352	-31.593	2.408	19.099	21.507	12.61	7.665	1.520	0.874	0.015	7	1
CP	1996	66	751	-167.269	39.58	1.098	16.185	17.282	6.78	2.808	0.582	0.494	0.021	1	0
NC	1996	90	284	-131.309	151.293	1.68	16.811	18.491	10.00	3.851	0.892	0.764	0.024	4	1
WC	1996	332	712	115.454	-50.42	1.654	17.175	18.828	9.63	4.458	0.723	0.898	0.032	10	0

Table 4
Results of WDEQ/AQD's Visibility Analyses for Black Hills Corporation - WYGEN 2 Electrical Power Generating Facility

Simulation #4: CALPUFF REFINED ANALYSIS -- USING FLAG f(RH) SEASONAL VALUES

Constant Emission Rates: NO_x = 0.07 LB/MMBTU, PM_{10} = 0.012 LB/MMBTU, SO_4 = 23.3 LB/HR

SO_2 = 0.17 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	133	102	172.352	-31.593	1.307	16.06	17.367	8.14	2.6	0.949	0.343	0.015	7	0
CP	1996	66	751	-167.269	39.58	1.317	16	17.317	8.23	2.5	0.843	0.452	0.021	1	0
NC	1996	90	284	-131.309	151.293	1.278	16	17.278	7.99	2.5	0.818	0.436	0.024	6	0
WC	1996	31	712	115.454	-50.42	1.592	16.24	17.832	9.80	2.9	0.903	0.662	0.027	10	0

SO_2 = 0.15 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	133	102	172.352	-31.593	1.203	16.06	17.263	7.49	2.6	0.845	0.343	0.015	7	0
CP	1996	66	751	-167.269	39.58	1.227	16	17.227	7.67	2.5	0.753	0.452	0.021	1	0
NC	1996	90	284	-131.309	151.293	1.193	16	17.193	7.46	2.5	0.733	0.436	0.024	5	0
WC	1996	31	712	115.454	-50.42	1.5	16.24	17.74	9.24	2.9	0.811	0.662	0.027	8	0

SO_2 = 0.12 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	133	102	172.352	-31.593	1.046	16.06	17.106	6.51	2.6	0.688	0.343	0.015	4	0
CP	1996	66	751	-167.269	39.58	1.093	16	17.093	6.83	2.5	0.619	0.452	0.021	1	0
NC	1996	90	284	-131.309	151.293	1.065	16	17.065	6.66	2.5	0.605	0.436	0.024	5	0
WC	1996	31	712	115.454	-50.42	1.362	16.24	17.602	8.39	2.9	0.673	0.662	0.027	8	0

SO_2 = 0.10 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	306	1	170.446	-50.934	0.969	16.18	17.149	5.99	2.8	0.376	0.567	0.026	3	0
CP	1996	66	751	-167.269	39.58	1.004	16	17.004	6.27	2.5	0.530	0.452	0.021	1	0
NC	1996	90	284	-131.309	151.293	0.979	16	16.979	6.12	2.5	0.519	0.436	0.024	3	0
WC	1996	31	712	115.454	-50.42	1.27	16.24	17.51	7.82	2.9	0.581	0.662	0.027	7	0

Table 5
Results of WDEQ/AQD's Visibility Analyses for
Black Hills Corporation - WYGEN 2 Electrical Power Generating Facility

Simulation #5: CALPUFF REFINED ANALYSIS - MREG=1 -- USING FLAG f(RH) SEASONAL VALUES

Constant Emission Rates: NO_x = 0.07 LB/MMBTU, PM_{10} = 0.012 LB/MMBTU, SO_4 = 23.3 LB/HR

SO_2 = 0.17 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	133	102	172.352	-31.593	1.221	16.06	17.281	7.60	2.6	0.878	0.329	0.015	7	0
CP	1996	66	751	-167.269	39.58	1.215	16.00	17.215	7.60	2.5	0.766	0.429	0.021	1	0
NC	1996	90	284	-131.309	151.293	1.175	16.00	17.175	7.34	2.5	0.746	0.407	0.023	6	0
WC	1996	31	712	115.454	-50.42	1.572	16.24	17.812	9.68	2.9	0.889	0.657	0.027	10	0

SO_2 = 0.15 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	133	102	172.352	-31.593	1.125	16.06	17.185	7.00	2.6	0.782	0.329	0.015	7	0
CP	1996	66	751	-167.269	39.58	1.135	16.00	17.135	7.09	2.5	0.685	0.429	0.021	1	0
NC	1996	90	284	-131.309	151.293	1.098	16.00	17.098	6.86	2.5	0.668	0.407	0.023	5	0
WC	1996	31	712	115.454	-50.42	1.482	16.24	17.722	9.13	2.9	0.798	0.657	0.027	8	0

SO_2 = 0.12 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	133	102	172.352	-31.593	0.981	16.06	17.041	6.11	2.6	0.637	0.329	0.015	4	0
CP	1996	66	751	-167.269	39.58	1.014	16.00	17.014	6.34	2.5	0.564	0.429	0.021	1	0
NC	1996	90	284	-131.309	151.293	0.982	16.00	16.982	6.14	2.5	0.552	0.407	0.023	5	0
WC	1996	31	712	115.454	-50.42	1.346	16.24	17.586	8.29	2.9	0.663	0.657	0.027	8	0

SO_2 = 0.10 LB/MMBTU

Area	YEAR	DAY	RECEPTOR	Lambert Conformal COORDINATES (km)		Bext(source) (Mm^{-1})	Bext(bkg) (Mm^{-1})	Bext(total) (Mm^{-1})	%CHANGE	f(RH)	Modeled Extinction By Species (Mm^{-1}) bxSO4	bxNO3	bxPMF	Days > 5%	Days > 10%
BL	1996	306	1	170.446	-50.934	0.906	16.18	17.086	5.60	2.8	0.348	0.534	0.025	3	0
CP	1996	66	751	-167.269	39.58	0.933	16.00	16.933	5.83	2.5	0.484	0.429	0.021	1	0
NC	1996	90	284	-131.309	151.293	0.904	16.00	16.904	5.65	2.5	0.475	0.407	0.023	3	0
WC	1996	31	712	115.454	-50.42	1.256	16.24	17.496	7.73	2.9	0.573	0.657	0.027	7	0

Attachment C

Comparison of Highest Second Highest Modeled SO_2 Impacts From WYGEN 2 PC Boiler to PSD Class I Increments

Class I Area	Averaging Period	Rec #	Lambert Conformal (LC-X) (km)	Lambert Conformal (LC-Y) (km)	Predicted Maximum ($\mu g/m^3$)	Percent of PSD Class I Increments
Badlands	3-Hour	83	170.429	-35.462	0.5	2%
	24-Hour	3	164.662	-49.005	0.2	4%
Wind Cave	3-Hour	735	117.374	-40.747	0.9	4%
	24-Hour	735	117.374	-40.747	0.4	8%
Northern Cheyenne	3-Hour	691	--102.417	180.278	0.6	3%
	24-Hour	655	-115.898	178.345	0.2	4%

Comparison of Highest Second Highest Modeled SO_2 Impacts From All Increment Consuming SO_2 Sources to PSD Class I Increments

Class I Area	Averaging Period	Rec #	Lambert Conformal (LC-X) (km)	Lambert Conformal (LC-Y) (km)	Predicted Maximum ($\mu g/m^3$)	Percent of PSD Class I Increments
Badlands	3-Hour	14	166.587	-47.069	1.8	7%
	24-Hour	112	191.62	-31.576	0.5	10%
Wind Cave	3-Hour	735	117.374	-40.747	2.1	8%
	24-Hour	712	115.454	-50.42	0.7	14%
Northern Cheyenne	3-Hour	655	-115.898	178.345	27.3	109%
	24-Hour	486	-108.196	166.751	3.5	70%

Note: The two Colstrip sources, located 24 kilometers north of the NCIR, contributed 99.9% to the modeled 3-hr SO_2 exceedance at receptor #655, the contribution from the proposed WYGEN2 boiler at Rec #655 was 0.07 $\mu g/m^3$.

Attachment D

FIGURE 1

REFINED LEVEL CALPUFF 3-HR SO2 CLASS I INCREMENT ANALYSIS
(USING 0.15 LB/MMBTU SO2 EMISSION RATE FOR BHC WYGEN 2