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Ms. Purva Prabhu
Georgia Department of Natural Resources
Environmental Protection Division
Air Protection Branch
4244 International Parkway, Suite 120
Atlanta, GA 30354

RE: Application No. 17924, dated January 17, 2008
Plant Washington
Sandersville, Georgia
Project No. 6122-07-0007

Dear Ms. Prabhu:

On behalf of our client Power4Georgians, LLC (P4G) please find attached additional supplemental pages for the above referenced application.

In further review of the application we found that the uncontrolled emissions of fluorides (as HF) from the facility had been based on an incomplete data set from the USGS COALQUAL database. Using the complete data set, our estimate of the uncontrolled emissions estimate for fluorides (as HF) has increased. However, at the same time we have updated the BACT/MACT sections of the application regarding fluorides (as HF), and as a result the proposed controlled emissions of fluorides (as HF) has decreased.

The attached replacement pages provide updated information for all of the references to fluorides (as HF) in the application. The attached replacement pages include the following;

1. **Page 3-2 (Table 3-1)**. This page was included to update the annual fluorides (as HF) emission rate.
2. **Page 4-8 (Table 4-2)**. This page was included to update the proposed fluorides (as HF) BACT emission limit.
3. **Pages 4-116 thru 4-120**. These pages provide additional clarification regarding the HF removal efficiency, corrected information on the fluorine concentration in coal, and updated information regarding BACT listings for other facilities.
4. **Page 6-5 (Table 6-2)**. This page provides an updated emission rate for fluorides (as HF) from the main boiler. No other information on this page has been modified.
5. **Form 4.00**. The fluorides (as HF) emission rate has been updated for the main boiler on the emissions summary form.
6. **Pages 10-11 thru 10-14, 10-53 thru 10-58, and 10-63 thru 10-64**. These pages include updated discussions regarding HF in the Case-By-Case MACT analysis. Pages 10-57 thru 10-58 do not include discussions on HF but have been included so page numbering/discussions on Organic HAPs are consistent.

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7. **Pages A1 thru A-2, A-31, A33 thru A-36, and A38 thru A-40 (Exhibit A).** These pages include updated calculation pages and USGS COALQUAL summary data for fluorine and HF emissions from Exhibit A.
8. **Pages A49 thru A-50 (Table A-7 Exhibit A).** These pages include updated main boiler HF emission calculations in Table A-7.

If you have any questions, please contact me at (770) 421-3335 or Ken Hiltgen at (770) 421-3334.

Sincerely,
MACTEC ENGINEERING AND CONSULTING, INC.

Justin Fickas
Senior Engineer

Ken Hiltgen
Project Manager/Principal

Cc: C. Dean Alford, Allied

Table 3-1 Facilitywide Emissions Summary

	Stack/Source ID	PM	PM_{10}	$PM_{2.5}$	SO_2	NO_x	CO	VOC	Pb	HF	H_2SO_4
		Future Emissions (tpy)	Future Emissions (tpy)	Future Emissions (tpy)	Future Emissions (tpy)	Future Emissions (tpy)	Future Emissions (tpy)	Future Emissions (tpy)	Future Emissions (tpy)	Future Emissions (tpy)	Future Emissions (tpy)
Coal-fired Boiler	S1	654	654	449	1890	1818	3635	109	0.58	7.89	145
Auxiliary Boiler	S45	2.52	2.52	1.23	5.26	10.51	4.20	0.32	9.46E-04	3.35E-06	6.31E-03
Emergency Diesel Generator	-	0.26	0.26	0.26	0.15	4.88	2.06	0.26	-	-	-
Emergency Firewater Pump	-	0.19	0.19	0.19	0.18	2.71	0.58	0.22	-	-	-
Cooling Towers	S2-S35	16.28	7.51	3.29E-02	-	-	-	-	-	-	-
Crusher House Dust Collector	S40	4.51	4.51	0.72	-	-	-	-	-	-	-
Tripper Deck	S41	3.38	3.38	0.54	-	-	-	-	-	-	-
Limestone Preparation Building Silo	S42	0.94	0.94	0.25	-	-	-	-	-	-	-
Fly Ash Mechanical Exhausters (Fly Ash Filter Seperator)	S43	0.45	0.45	0.24	-	-	-	-	-	-	-
Fly Ash Silo	S37	0.28	0.28	0.15	-	-	-	-	-	-	-
Bottom Ash Transfer Point to Bottom Ash Bin	A3	2.69E-02	1.27E-02	1.93E-03	-	-	-	-	-	-	-
Bottom Ash Transfer Point from Bin to Truck	A3	2.69E-02	1.27E-02	1.93E-03	-	-	-	-	-	-	-
Mercury Sorbent Silo	S38	7.04E-02	7.04E-02	7.04E-02	-	-	-	-	-	-	-
SO_3 Sorbent Silo	S36	7.04E-02	7.04E-02	7.04E-02	-	-	-	-	-	-	-
Pre-Treatment Soda Ash Silo	S44	3.52E-02	3.52E-02	3.52E-02	-	-	-	-	-	-	-
Pre-Treatment Hydrated Lime Silo	S39	3.52E-02	3.52E-02	9.50E-03	-	-	-	-	-	-	-
PRB Stackout (Insertable Dust Collector)	S46	0.28	0.28	4.51E-02	-	-	-	-	-	-	-
Illinois No. 6 Stackout (Insertable Dust Collector)	S47	0.28	0.28	4.51E-02	-	-	-	-	-	-	-
Limestone Stackout (Insertable Dust Collector)	S48	0.28	0.28	7.60E-02	-	-	-	-	-	-	-
Solid Material Handling - Ash	A1	1.73	0.33	0.18	-	-	-	-	-	-	-
Solid Material Handling - Gypsum	A2	1.73	0.33	0.18							
Limestone Unloading	A5	1.89E-01	8.95E-02	1.35E-02	-	-	-	-	-	-	-
Limestone Transfer Point	A10	3.45E-02	1.63E-02	2.47E-03	-	-	-	-	-	-	-
Limestone Pile (Wind Erosion)	A10	0.36	9.88E-04	1.48E-04	-	-	-	-	-	-	-
Rail Unloading	A4	2.84E-01	1.34E-01	2.03E-02	-	-	-	-	-	-	-
Inactive PRB Coal Pile	A6	0.07	0.03	4.97E-03	-	-	-	-	-	-	-
Inactive Illinois No. 6 Coal Pile	A7	0.32	0.15	2.27E-02	-	-	-	-	-	-	-
Active PRB Coal Pile (Wind Erosion)	A8	1.95	8.79E-03	1.32E-03	-	-	-	-	-	-	-
Transfer Point for Active PRB Coal Pile	A8	0.07	3.28E-02	4.97E-03							
Active Illinois No. 6 Coal Pile (Wind Erosion)	A9	1.95	8.79E-03	1.32E-03	-	-	-	-	-	-	-
Transfer Point for Active Illinois Basin Coal Pile	A9	0.32	1.50E-01	2.27E-02							
Solid Material Handling Haul Road	P1-P21	0.55	0.55	8.19E-02	-	-	-	-	-	-	-
Fugitive Road Sources Between Coal Piles Unpaved Road	U1-U15	1.31	0.35	3.49E-02							
Storage Tank Emissions	-	-	-	-	-	-	-	0.06	-	-	-
Project Totals		695	678	454	1,896	1,836	3,642	110	0.58	7.89	145
PSD Significance Level		25	15	10	40	40	100	40	0.6	3	7
Significant Emissions Increase (Yes or No)		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**

Prepared by: BSA 4/10/09
Checked by: JDF 4/10/09

Table 4-2 BACT Analysis Summary Table

Source	Pollutant	Control Technology	Emission Limit (lb/MMBtu)	Proposed Compliance Test Method
Supercritical Pulverized Coal (SCPC) Boiler	Particulate Matter (PM/PM_{10})	Fabric Filter Baghouse	Total PM_{10} – 0.018 lb/MMBtu (3-hr. Avg.)	PM_{10} – USEPA Method 201A/202 or USEPA CTM-039/40
			Filterable PM – 0.012 lb/MMBtu (24-hr. Block Avg.)	CEMS
	Nitrogen Oxides (NO_x)	LNB/OFA/SCR	0.05 lb/MMBtu – 30-day Rolling Avg.	CEMS
	Carbon Monoxide (CO)	Combustion Controls	0.10 lb/MMBtu – 30-day Rolling Avg. 0.30 lb/MMBtu 1-hr. Avg.	CEMS
	Volatile Organic Compounds (VOC)	Combustion Controls	0.0030 lb/MMBtu – 3 hr. Avg.	USEPA Method 25A Minus USEPA Method 18 (Methane Removal)
	Sulfur Dioxide (SO_2)	Wet Flue Gas Desulfurization (WFGD)	0.052 lb/MMBtu 12-month rolling average 0.069 lb/MMBtu 30-day rolling average 959 lb/hr 3-hr. average Minimum 97.5% Removal	CEMS
	Fluorides (as HF)	Wet Flue Gas Desulfurization (WFGD)	2.17×10^{-4} lb/MMBtu	USEPA Method 13A or USEPA Method 26A
	Sulfuric Acid Mist (H_2SO_4)	Sorbent Injection and Wet Flue Gas Desulfurization (WFGD)	0.004 lb/MMBtu 3-hr. Avg.	USEPA CTM-013 (Controlled Condensate Method 8A)
	Mercury (Hg)	Multi-control: Sorbent Injection In Conjunction With SCR/FF/WFGD	1.68×10^{-6} lb/MMBtu 15×10^{-6} lb/MW-hr 12-month rolling average	CEMS

Step 3 – Rank Remaining Technically Feasible Control Options

Control Effectiveness

The feasible control technologies found during Step 2 of this analysis include wet scrubbers, sorbent injection, and spray dryer absorbers (dry scrubbers). Technical publications, the USEPA RBLC, and vendor information were reviewed to determine the control efficiencies of each of these identified technically feasible HF reduction technologies. There are not many instances where the performance of control technologies for HF emissions control has been evaluated, and data regarding the effectiveness of differing control technologies are limited. A review of data from the RBLC database includes a variety of controls deemed applicable historically for BACT for HF emissions from coal-fired boilers, including use of dry scrubbers, wet scrubbers, and sorbent injection with a fabric filter baghouse. The removal efficiency for HF from the wet scrubber design for Plant Washington is expected to be at least equivalent to that of SO_2 which is 98.5%. This assumptions is conservative since HF is a strong acid and more reactive than SO_2, potentially leading to a higher removal efficiency for HF than SO_2.

Step 4 – Evaluate Remaining Control Technologies

As stated above in Step 3, there are not many instances where the performance of control technologies for HF emissions control has been evaluated, and data regarding the effectiveness of differing control technologies are limited. A review of data from the RBLC database includes a variety of controls deemed applicable historically for BACT for coal-fired boilers.

Therefore, for the above-listed reasons, use of a wet scrubber was chosen as the top option for control of HF emissions. Use of a baghouse system (for PM control) should provide some additional control of HF emissions. Since the use of sorbent injection has been determined as BACT for control of H_2SO_4 emissions, there will be co-benefit control of HF emissions through use of the sorbent injection system.

A wet scrubber was already selected as BACT for control of SO_2 in Section 4.3.5. As discussed in that section no energy, environmental, or economic impacts would preclude the use of a wet scrubber at Plant Washington.

Step 5 – Selection of BACT

BACT for emissions of fluorides (as HF) is determined to be use of a wet scrubber. In order to determined uncontrolled emissions of HF coal analysis data obtained for PRB and Illinois coals from the USGS COALQUAL database were reviewed to determine the average and 90 percent confidence level values for fluorine. The average fluorine concentration value for PRB coal was approximately 121 ppm, and the average fluorine concentration value for the 50/50 coal blend was calculated to be approximately 101 ppm. The 90 percent confidence level value for PRB coal was approximately 553 ppm, and for the 50/50 coal blend the 90 percent confidence level concentration was approximately 338 ppm. The COALQUAL database provided a limited data set for Illinois basin coals. The fluorine concentration in PRB coal was developed assuming that all coals identified in the database originating from Wyoming and Montana were PRB coals. While it is recognized that a portion of the samples identified in the database from Wyoming and Montana are not directly from the Power River Basin (PRB), for conservatism all samples of these coals have been included in case Plant Washington purchases coal from the other areas.

Based on information from experienced power plant design engineers, and available research data regarding control of the acid gas HF, the estimated removal efficiency for HF from the wet scrubber design for Plant Washington is expected to be at least 98.5%. This is a conservative estimate since HF is a strong acid and more reactive than SO_2 which potentially could lead to a higher removal efficiency. Based on an expected minimum removal efficiency of 98.5%, the estimated emissions for fluorides (as HF) are estimated as 8.17×10^{-4} lb/MMBtu for use of 100 percent PRB, and estimated as 4.73×10^{-4} lb/MMBtu for use of the 50/50 coal blend when evaluating emission rates based on the 90% confidence levels for PRB coal and the 50/50 coal blend.

A summary of recent HF BACT evaluations conducted for similar projects is in Table 4-21. The lowest proposed emission rates are for the Thoroughbred Generating Station and the Maidsville Station indicated BACT emission limits less than those proposed for Plant Washington. Neither of these plants are operational so these emission levels have not yet been demonstrated. The design coal data for these facilities are not available for review. Emissions of HF are directly related to the concentration of fluorine in the coals to be combusted at a facility. Those facilities may have planned to use coals with lower estimated fluorine content than those coals proposed

for Plant Washington. Also, the heating value of the coal planned for use at the facility (Btu/lb) can also influence the emission factor chosen. For a coal of equal ppm concentration, higher emissions on a lb/MMBTU basis would be expected from a coal with a lower heating value when being used in a boiler firing at a consistent heat rate. These facilities may have also derived the facility emission limits based on AP-42, Table 1-1-15. Table 1.1-15 provides a single general emission factor for all types of boilers for both controlled and uncontrolled emissions as 0.15 lb HF/ton coal combusted. This factor can only be taken as a rough approximation of emissions and corresponds to 0.009 lb/MMBTU for PRB coal. Assuming this factor is uncontrolled and accounting for 98.5% removal with the scrubber results in an emission level of 0.00013 lb/MMBTU roughly equivalent to the emission level proposed by Thoroughbred Generating Station. Use of actual coal analysis data in the assessment is believed to be more accurate than utilizing AP-42 data for estimation of facility uncontrolled emissions.

The next lowest listing in Table 4-21 is for the Consumers Energy Karn-Weadock facility which is also not yet constructed. The facility indicated the selected BACT control technology is sorbent injection system (with a fabric filter baghouse) and a wet scrubber. The Case-By-Case MACT application for the facility (December 2008) indicated that the combination of controls would have an effective HF removal of approximately 98.3%. Plant Washington, utilizing the same proposed control strategies, has indicated a minimum removal efficiency for HF of 98.5%. Therefore, differences between this site and Plant Washington are due only to the differences in the estimated fluorine concentrations present in coals to be used at the facility.

The next lowest listing in Table 4-21 is for Wisconsin Public Service Corporation, Weston Unit 4. This unit is operational and according to a recent compliance test for fluorides (as HF) did show compliance with its permitted emission limit of 2.17×10^{-4} lb/MMBtu while utilizing PRB coal, with a control strategy of a dry scrubber and fabric filter baghouse. **Due to the recent compliance demonstration for fluorides (as HF) by Weston Unit 4 for a comparable unit and comparable fuel, BACT for Plant Washington for fluorides (as HF) is proposed as use of a wet scrubber with an emissions limit of 2.17×10^{-4} lb/MMBtu on a 3-hr average (stack test).** This emission limit is believed to be the maximum achievable levels for emissions of HF from Plant Washington when factoring in the ppm concentration data for coals planned for use at the Plant Washington facility, as well as the removal efficiencies believed achievable for emissions of HF. Compliance with the proposed 3-hour average limits will be demonstrated

through stack testing using USEPA Methods 13A and/or 26A, with ongoing compliance determined through use of surrogate monitoring of the operating pH of the wet scrubber.

Table 4-21 RBLC and Draft Permit Listings for Hydrogen Fluoride Emissions from Pulverized Coal-fired Boilers

Facility Name	Facility State	Permit Number	Permit Date	Process Name	Fuel	Thruput (MW)	Control Description	Emission Limit		Operational Facility
MAIDSVILLE	WV	R14-0024	3/2/2004	BOILER, PC	PULVERIZED COAL	600	DRY SORBENT INJECTION W/ FABRIC FILTER BAGHOUSE	0.00001	lb/MMBtu	NO
THOROUGHBRED GENERATING STATION	KY	V-02-001	10/11/2002	BOILER, COAL, (2)	COAL	750	PROPER BOILER DESIGN AND CONTROL TECHNOLOGY, WFGD, AND WESP	0.000159	lb/MMBtu	NO
CONSUMERS ENERGY KARN-WEADOCK	MI	DRAFT 341-07	2/26/2009	SUPERCRITICAL PULVERIZED COAL ELECTRIC STEAM BOILER	PRB OR BLEND	930	WET FGD AND SORBENT INJECTION	0.00017	lb/MMBtu	NO
WPS WESTON PLANT	WI	04-RV-248	10/19/2004	SUPERCRITICAL PULVERIZED COAL ELECTRIC STEAM BOILER	PRB COAL	500	DRY FGD AND BAGHOUSE	0.000217	lb/MMbtu	YES
TOQUOP ENERGY, LLC	NV	AP4911-1146	DRAFT	750 MW PC BOILER	COAL	750	WET SCRUBBER	0.00024	lb/MMbtu	NO
DESERT ROCK ENERGY FACILITY	NM	DRAFT	7/1/2006	(2) 750 MW SCPC BOILERS	COAL	750	LIMESTONE WET FGD, HYDRATED LIME INJECTION	0.00024	lb/MMbtu	NO
SANTEE COOPER CROSS GENERATING STATION	SC	0420-0030-CI	2/5/2004	BOILER, NO. 3 AND NO. 4	BITUMINOUS COAL	660	FLUE GAS DESULFURIZATION (WET SCRUBBING)	0.0003	lb/MMBtu	YES - BOILER #3
SANTEE COOPER PEE DEE GENERATING STATION	SC	1040-0113-CA	12/16/2008	BOILER NO. 1 AND NO. 2	BITUMINOUS COAL	660	FLUE GAS DESULFURIZATION (WET SCRUBBING)	0.000341	lb/MMBtu	NO
WHELAN ENERGY CENTER	NE	58048	3/30/2004	BOILER, UNIT 2 UTILITY	SUBBITUMINOUS COAL	220	SPRAY DRYER ABSORBER & PM CONTROL EQUIPMENT	0.0004	lb/MMBtu	NO
ELY ENERGY CENTER	NV	AP4911-2241	DRAFT	(2) 750 MW PC BOILERS	COAL	750	WET SCRUBBER	0.0004	lb/MMbtu	NO
OPPD NEBRASKA CITY STATION	NE	58343C01	3/9/2005	BOILER	COAL	660	FLUE GAS DESULFURIZATION AND FABRIC FILTER	0.0004	lb/MMbtu	NO
PLUM POINT ENERGY	AR	1995-AOP-R1	8/20/2003	PC BOILERS (2)	COAL	665	DRY FGD AND BAGHOUSE	0.00044	lb/MMbtu	NO
COMANCHE STATION	CO	04UNITPB1015	7/5/2005	PC BOILER - UNIT 3	SUB-BITUMINOUS COAL	750	LIME SPRAY DRYER FOLLOWED BY A BAGHOUSE	0.0005	lb/MMBtu	NO
GASCOYNE GENERATING STATION	ND	PTC 05005	6/3/2005	BOILER, COAL-FIRED	LIGNITE	220	LIMESTONE INJECTION AND SPRAY DRYER.	0.0005	lb/MMBtu	NO
INTERMOUNTAIN POWER GENERATING STATION - UNIT #3	UT	DAQE-AN0327010-04	10/15/2004	PULVERIZED COAL FIRED ELECTRIC GENERATING UNIT	BITUMINOUS OR BLEND	950		0.0005	lb/MMBtu	NO
TS POWER PLANT	NV	AP4911-1349	5/5/2005	200 MW PC COAL BOILER	POWDER RIVER BASIN COAL	200	DRY SPRAY SCRUBBER & FABRIC FILTER DUST COLLECTION	0.000576	lb/MMBtu	YES
JK SPRUCE ELECTRIC GENERATING UNIT 2	TX	70492	1/19/2006	PULVERIZED COAL FIRED ELECTRIC STEAM BOILER	COAL	750	WET FGD	0.0008	lb/MMbtu	NO
MIDAMERICAN ENERGY COMPANY	IA	PROJECT 02-528	6/17/2003	CBEC 4 BOILER	PRB COAL	750	LIME SPRAY DRYER FLUE GAS DESULFURIZATION	0.0009	lb/MMBtu	YES

Table 6-2 Toxic Emission Summary

Pollutant	Main Boiler (lb/hr)	Main Boiler (g/s)	Auxiliary Boiler (lb/hr)	Auxiliary Boiler (g/s)	Main Boiler 1-Hr MGLC (mg/m^3)	Auxiliary Boiler 1-Hr MGLC (mg/m^3)	Total 1-Hr MGLC (mg/m^3)	Annual MGLC (mg/m^3)[2]	AAC Annual (mg/m^3)	% of allowable AAC[1]	24-Hr MGLC (mg/m^3)[1]	AAC 24-hour (mg/m^3)	% of allowable AAC[1]	15-Min MGLC (mg/m^3)	Short (15-min) Term Limit (mg/m^3)	% of allowable Short Term Limit
Dimethyl Phthalate	8.00E-04	1.01E-04		-	7.04E-08		7.04E-08	5.63E-09		-	2.82E-08	0.01	0.0002%	9.29E-08		-
Manganese Dioxide	3.54E-01	4.46E-02		-	3.11E-05		3.11E-05	2.49E-06		-	1.24E-05	0.24	0.005%	4.11E-05		-
Polychlorinated Biphenyls	1.14E-04	1.44E-05		-	1.00E-08		1.00E-08	8.02E-10		-	4.01E-09	0.07	0.00001%	1.32E-08		-
Polycyclic Organic Matter	5.16E-02	6.50E-03		-	4.54E-06		4.54E-06	3.63E-07		-	1.81E-06		-	5.99E-06		-
Propylene Dichloride	9.97E-03	1.26E-03		-	8.77E-07		8.77E-07	7.01E-08	4.00E-03	0.002%	3.51E-07		-	1.16E-06	50.80	0.000002%
Sodium Cyanide	6.71E-01	8.46E-02		-	5.90E-05		5.90E-05	4.72E-06	-		2.36E-05	0.012	0.1984%	7.79E-05	0.50	0.02%
Toluene-2,4-Diamine	1.14E-04	1.44E-05		-	1.00E-08		1.00E-08	8.04E-10		-	4.02E-09	5.52E-03	0.0001%	1.33E-08		-
Vinyl Chloride	5.92E-03	7.46E-04		-	5.21E-07		5.21E-07	4.17E-08	1.14E-04	0.04%	2.08E-07		-	6.88E-07	1.28	0.0001%
Dioxins (Total)	8.03E-08	1.01E-08	2.11E-09	2.66E-10	7.07E-12	1.60E-12	8.67E-12	6.94E-13		-	3.47E-12	1.52E-06	0.0002%	1.14E-11		-
Metals																
Antimony	1.46E-02	1.83E-03		-	1.28E-06		1.28E-06	1.02E-07	-	-	5.12E-07	1.19E-03	0.04%	1.69E-06	-	-
Arsenic	3.13E-01	3.94E-02	9.60E-04	1.21E-04	2.75E-05	7.29E-07	2.82E-05	1.00E-07	2.33E-07	970.46% / 43.00%	1.13E-05	-	-	3.73E-05	2.00E-04	18.63%
Beryllium	2.85E-02	3.59E-03	7.20E-04	9.08E-05	2.50E-06	5.47E-07	3.05E-06	2.44E-07	4.17E-06	5.86%	1.22E-06	-	-	4.03E-06	5.00E-04	0.81%
Cadmium	5.35E-02	6.74E-03	7.20E-04	9.08E-05	4.71E-06	5.47E-07	5.25E-06	4.20E-07	5.56E-06	7.56%	2.10E-06	-	-	6.93E-06	3.00E-02	0.02%
Chromium, total	1.57E-01	1.97E-02	7.20E-04	9.08E-05	1.38E-05	5.47E-07	1.43E-05	1.15E-06	-	-	5.73E-06	2.38E-03	0.24%	1.89E-05	-	-
Chromium, hexavalent	3.86E-02	4.86E-03		-	3.39E-06		3.39E-06	1.00E-08	8.33E-08	3252.54% / 12.00%	1.36E-06	-	-	4.48E-06	0.01	0.04%
Cobalt	4.88E-02	6.15E-03		-	4.29E-06		4.29E-06	3.43E-07	-	-	1.72E-06	2.38E-04	0.72%	5.67E-06	-	-
Copper	7.80E-03	9.83E-04	1.44E-03	1.82E-04	6.86E-07	1.09E-06	1.78E-06	1.42E-07	-	-	7.12E-07	2.38E-04	0.30%	2.35E-06	-	-
Lead	5.31E-01	6.69E-02	2.16E-03	2.72E-04	4.67E-05	1.64E-06	4.84E-05	3.87E-06	-	-	1.93E-05	1.19E-04	16.25%	6.38E-05	-	-
Mercury	1.39E-02	1.75E-03	7.20E-04	9.08E-05	1.22E-06	5.47E-07	1.77E-06	1.42E-07	3.00E-04	0.05%	7.08E-07	-	-	2.34E-06	0.01	0.02%
Magnesium	5.37E+00	6.76E-01		-	4.72E-04		4.72E-04	3.78E-05	-	-	1.89E-04	0.02	0.79%	6.23E-04	-	-
Manganese	9.35E-01	1.18E-01	1.44E-03	1.82E-04	8.22E-05	1.09E-06	8.33E-05	6.66E-06	5.00E-05	13.33%	3.33E-05	-	-	1.10E-04	0.50	0.02%
Nickel	1.64E-01	2.07E-02	7.20E-04	9.08E-05	1.45E-05	5.47E-07	1.50E-05	1.20E-06	-	-	6.00E-06	2.38E-03	0.25%	1.98E-05	-	-
Phosphorus	2.61E-01	3.29E-02	2.68E-02	3.39E-03	2.30E-05	2.04E-05	4.34E-05	3.47E-06	-	-	1.74E-05	2.38E-04	7.29%	5.73E-05	-	-
Selenium	6.34E-01	7.99E-02	3.60E-03	4.54E-04	5.58E-05	2.73E-06	5.85E-05	4.68E-06	-	-	2.34E-05	4.76E-04	4.92%	7.73E-05	-	-
Zinc	5.20E-03	6.55E-04	9.60E-04	1.21E-04	4.57E-07	7.29E-07	1.19E-06	9.49E-08	-	-	4.75E-07	4.76E-03	9.97E-03 %	1.57E-06	1.00	0.0002%
Additional Evaluations																
Carbon Monoxide	2.49E+03	3.14E+02	9.60E+00	1.21E+00	2.19E-01	7.29E-03	2.26E-01	1.81E-02	-	-	1.85E-02	0.13	69.15% / 14.12%	2.99E-01	22.90	1.30%
Hydrogen Fluoride, as F	1.80E+00	2.27E-01	2.23E-03	2.82E-04	1.58E-04	1.70E-06	1.60E-04	1.28E-05	-	-	6.40E-05	0.01	1.08%	2.11E-04	1.64E-01	0.13%
Cumulative Impact										**92.91%**			**74.59%**			**21.87%**

1. The model results in the highlighted cells are based on ISCST modeling and not the Screen3 results.The corresponding % of allowable ACC values for each of these concentrations shows the % of AAC when using the Screen3 model (1st) and % of AAC when using the ISCST model (2nd). See Table 6-3 for ISCST modeling results.

Sample1-hr MGLC Calculations for Acenaphthene

Main Boiler Emission	3.14E-05	g/s
Auxiliary Boiler Emission	4.56E-06	g/s
Main Boiler Screen 3 Modeling result	6.98E-04	mg/m^3
Auxiliary Boiler Screen 3 Modeling result	6.02E-03	mg/m^3

1-Hr MGLC Calculations

3.14E-5 g/s * 6.98E-04 mg/m3 + 4.56E-6 g/s * 6.02E-03 mg/m3 = 4.94E-08 mg/m3

Completed by : PBS 4/10/2009
Checked by :JDF 4/10/2009

Facility Name: Plant Washington **Date of Application:** April 10, 2009 – Supplemental Data

FORM 4.00 – EMISSION INFORMATION

Emission Unit ID	Air Pollution Control Device ID	Stack ID	Pollutant Emitted	Emission Rates				
				Hourly Actual Emissions (lb/hr)	Hourly Potential Emissions (lb/hr)	Actual Annual Emission (tpy)	Potential Annual Emission (tpy)	Method of Determination
MAIN	C01,02, 03	S01	PM	149	149	654	654	BACT
MAIN	C01,02, 03	S01	PM_{10}	149	149	654	654	BACT
MAIN	C01,02, 03	S01	SO_2	432	432	1890	1890	BACT
MAIN	C01,02, 03	S01	H_2SO_4	33	33	145	145	BACT
MAIN	C01,02, 03	S01	HF	1.80	1.80	7.89	7.89	BACT
MAIN	C01,02, 03	S01	Pb	0.13	0.13	0.58	0.58	PSD Avoidance
MAIN	C01,02, 03	S01	NO_X	415	415	1818	1818	BACT
MAIN	C01,02, 03	S01	VOC	25	25	109.1	109.1	BACT
MAIN	C01,02, 03	S01	CO	830	830	3635	3635	BACT
MAIN	C01,02,03	S01	Hg	0.014	0.014	0.06	0.06	BACT
AUX	--	S45	PM	5.76	5.76	2.52	2.52	BACT
AUX	--	S45	PM_{10}	5.76	5.76	2.52	2.52	BACT
AUX	--	S45	SO_2	12	12	5.26	5.26	BACT
AUX	--	S45	H_2SO_4	0.014	0.014	6.31E-03	6.31E-03	BACT
AUX	--	S45	Pb	2.16E-03	2.16E-03	9.46E-04	9.46E-04	BACT
AUX	--	S45	NO_X	24	24	10.51	10.51	BACT
AUX	--	S45	Hg	7.19E-04	7.19E-04	3.15E-04	3.15E-04	BACT

However, the COALQUAL database information also contains information on the air dry loss (%) from the coal sample air drying procedure, thereby making it possible to estimate the residual moisture present in coal samples analyzed for the COALQUAL database. The residual moisture values were then calculated, when data was available, for PRB and Illinois Basin coals in the COALQUAL database. An average ratio of the residual moisture to total moisture was then developed. This ratio was then used to determine the proper moisture correction to apply to USGS COALQUAL database trace element value during estimation of uncontrolled and controlled emission estimates. Therefore, moisture corrections to COALQUAL database information made in Exhibit A are not from a "dry" basis to an as received "wet" basis, but are instead from a "semi-dry" to a "wet" basis. Calculations indicating the derivation of the moisture correction values utilized can be found in Exhibit A.

Permit Limit Assessment

Specific emissions limits were derived for several HAPs as part of this Case-By-Case MACT evaluation for the main facility boiler, based on uncontrolled emissions estimated from project specifications (including coal quality data from the COALQUAL database found in Exhibit A of this report), and the MACT floor control efficiencies determined in Section 10.4 of this report.

The concentration of the HAP in the coal was calculated differently between cases where a short-term limit for a HAP would be common (compliance demonstration during a 3-hr. stack test), or in cases where a pollutant would be continuously monitored and the result would be reported as a 12-month rolling average rather than a peak 3-hr limit. For the short term the upper bound of 90 percent confidence level concentration value (in parts per million, ppm) was determined to account for variability in the coal that could be received at the Plant Washington facility. The 90 percent confidence level is equal to the average ppm concentration derived from the USGS COALQUAL database plus the standard deviation of the sample set multiplied by the one-tail "t statistic" corresponding to the 90% confidence level. The proposed MACT emission limits for the acid gas HCl are based on the 90 percent confidence level assessment. The proposed MACT emission limit for the acid gas HF is based on an assessment of recently demonstrated achievable emission emission rates.

For pollutants which will have emission limits established on a 12-month rolling average, the 95% Upper Confidence Level (UCL) ppm concentration derived from the USGS COALQUAL database for PRB and Illinois coals will be used. The 95% UCL is derived from the average ppm concentration derived from the USGS COALQUAL database, plus the one-tail t statistic corresponding to 95% confidence multiplied

by the standard deviation of the sample set, and divided by the square root of the number of samples present in the sample set. The proposed MACT emission limit for mercury is based on a 95% UCL derived value.

Table 10-2 summarizes data obtained form the USGS COALQUAL database used to estimate uncontrolled emissions of mercury, non-mercury metals, and the acid gases HF and HCl in this analysis. Since the auxiliary boiler at the facility will not use any add-on pollution control equipment except engineering combustion controls, controlled emissions for the auxiliary boiler have not been determined. HAP emission estimates listed in Table 10-4 for the auxiliary boiler are based on uncontrolled emissions.

Proposed MACT emission limits for the main facility boiler and auxiliary boiler are summarized in Table 10-3. Facility wide total and individual HAP emissions estimates for the facility are included in Table 10-4. Demonstration calculations for the values in Table 10-3 and Table 10-4 can be found in Exhibit A.

Table 10-2 Coal Quality Analysis Data

Elements	PRB Coal Average	Standard Deviation	90% Confidence Level PRB	Illinois #6 Coal Average	Standard Deviation	90% Confidence Level Illinois #6 Coal	PRB-Illinois # 6 Coal 50-50 Blend Average	90% Confidence Level 50-50 Blend
Antimony (Sb) Emission Factor	0.67 ppm	0.90 ppm	1.82 ppm	0.89 ppm	0.97 ppm	2.14 ppm	0.78 ppm	1.98 ppm
Arsenic (As) Emission Factor	7.10 ppm	25.82 ppm	40.15 ppm	7.50 ppm	10.47 ppm	20.90 ppm	7.30 ppm	30.52 ppm
Beryllium (Be) Emission Factor	0.95 ppm	1.01 ppm	2.24 ppm	2.59 ppm	2.26 ppm	5.49 ppm	1.77 ppm	3.87 ppm
Cadmium (Cd) Emission Factor	0.14 ppm	0.19 ppm	0.38 ppm	3.41 ppm	8.40 ppm	14.16 ppm	1.77 ppm	7.27 ppm
Chlorine (Cl) Emission Factor	97.52 ppm	97.62 ppm	222.48 ppm	2700 ppm*	---	4000 ppm	1398.76 ppm	2111.24 ppm
Chromium (Cr) Emission Factor	7.19 ppm	7.16 ppm	16.35 ppm	16.63 ppm	7.47 ppm	26.19 ppm	11.91 ppm	21.27 ppm
Cobalt (Co) Emission Factor	2.17 ppm	2.36 ppm	5.18 ppm	3.45 ppm	1.39 ppm	5.23 ppm	2.81 ppm	5.21 ppm
Fluorine (F) Emission Factor	121.13 ppm	337.48 ppm	553.10 ppm	80.38 ppm	33.95 ppm	123.83 ppm	100.75 ppm	338.47 ppm
Manganese (Mn) Emission Factor	47.80 ppm	56.45 ppm	120.05 ppm	56.75 ppm	32.74 ppm	98.66 ppm	52.27 ppm	109.36 ppm
Mercury (Hg) Emission Factor	0.10 ppm	0.11 ppm	0.25 ppm	0.09 ppm	0.05 ppm	0.15 ppm	0.10 ppm	0.20 ppm
Nickel (Ni) Emission Factor	6.04 ppm	7.43 ppm	15.56 ppm	15.65 ppm	10.53 ppm	29.12 ppm	10.85 ppm	22.34 ppm
Lead (Pb) Emission Factor	4.63 ppm	4.79 ppm	10.77 ppm	36.92 ppm	75.50 ppm	133.56 ppm	20.78 ppm	72.16 ppm
Selenium (Se) Emission Factor	1.09 ppm	0.94 ppm	2.30 ppm	2.28 ppm	1.10 ppm	3.69 ppm	1.68 ppm	2.99 ppm

*Concentrations listed above are from the USGS COALQUAL database with one exception. Chlorine concentration values for Illinois #6 coals listed above are based on coal design basis information.

Note: Concentration values provided in the COALQUAL database shown above are not on a "dry" basis but on a semi-dry basis, with residual moisture remaining after air drying prior to sample analysis.

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Checked by: JDF 4/10/09

Table 10-3 Case-By-Case MACT Evaluation Summary for the Main Facility Boiler and Auxiliary Boiler

Pollutant	Control Technology	Control Efficiency	Proposed MACT Emission Limit	
Main Boiler				
Mercury	Multi-pollutant controls; SCR, fabric filter baghouse, wet scrubber, with activated carbon injection	84%	1.68×10^{-6} lb/MMBtu 15×10^{-6} lb/MW-hr Annual average	
Non-Mercury Metal HAPs	Fabric filter baghouse	99%	Surrogate CEM Monitoring Facility PM filterable emissions limit 0.012 lb/MMBtu 24-hr average	
Organic HAPs	Engineering combustion controls (Good Combustion Practices)	---	Surrogate CEM monitoring Facility BACT CO emission limit 0.10 lb/MMBtu 30-day rolling average (100 ppm)	
HF	Wet scrubber and fabric filter baghouse	---	2.17×10^{-4} lb/MMBtu 3-hr. avg.	
HCl	Wet scrubber and fabric filter baghouse	> 98.5%	3.22×10^{-4} lb/MMBtu (PRB) 3-hr. avg.	2.89×10^{-3} lb/MMBtu (50/50 Coal Blend) 3-hr. avg.
Auxiliary Boiler				
Inorganic HAPs	Engineering combustion controls and fuel selection	N/A	Work practice standard (fuel specification) including low sulfur/low ash fuel	
Organic HAP	Engineering combustion controls	N/A	Surrogate CEM Facility BACT CO emission limit 0.04 lb/MMBtu 24-hr. average	
HCl	Fuel selection and fuel specifications	N/A	Work practice standard (fuel specification) including low sulfur/low ash fuel	

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Table 10-4 Total Facility HAP Emissions Estimate

Source	Pollutant[1]	Emissions (ton/yr)
Main Boiler	Non-Mercury Metal HAPs	2.65
	Acid Gases	11.65
	Mercury	0.06
	Organic HAPs and Others	30.3
Auxiliary Boiler	Total HAPs	0.057
Total Facility Wide HAP Emission Estimate		44.7

[1] Pollutant emission calculations shown in Exhibit A. Emissions of antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, manganese, and nickel represent non-mercury metal HAPs, and HF and HCl represent acid gas HAPs. Total ton/yr emissions of non-mercury metal HAPs and Acid Gas HAPs based on average ppm concentration values as derived from the USGS COALQUAL database. Organic HAP calculations for PRB coal shown in Exhibit A. Organics HAPs and Others value includes phosphorous and several metal compounds (i.e. arsenic trioxide).

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Total facility HAP emissions estimates indicated in Table 10-4 are based on use of PRB coal alone. Use of PRB coal alone, versus a blend of PRB and bituminous coals, is a worst case scenario for emissions of most HAPs due to the lower Higher Heating Value (HHV – Btu/lb) for PRB coal, requiring combustion of more coal than use of a blend of PRB and bituminous coals. The only significant exception is estimated annual emissions of HCl. Facility HCl emissions are dependent on the amount of chlorine present in the coal upon combustion. PRB coals typically contain a low chlorine content, where bituminous coals contain a high chlorine content. PRB coal design data has indicated an average PRB coal chlorine concentration of 100 ppm, while design data for Illinois #6 (bituminous) coals has indicated an average chlorine content of 2700 ppm. Therefore, use of a blend of PRB and bituminous coals would lead to higher estimated emissions of HCl than those values indicated in Table 10-4.

10.4 CASE-BY-CASE MACT ANALYSIS FOR THE MAIN BOILER

40 CFR 63.43(e)(2)(x); 40 CFR 63.43(e)(2)(xii); 40 CFR 63.43(e)(1), 40 CFR 63.43(e)(2)(xi), 40 CFR 63.43e(2)(xiii)

The proposed Plant Washington facility will use a supercritical pulverized coal-fired boiler with a heat input capacity of 8,300 MMBtu/hr. The main boiler's fuel design basis is use of 100 percent sub-bituminous coals (PRB), or up to a 50/50 blend of sub-bituminous and bituminous coals (PRB/Illinois #6).

10.4.3.2 Evaluation of Information for the MACT Floor

It is technically feasible to use SO_2 controls, and specifically a wet scrubber, for control of the HAP acid gases HF and HCl. The pollution control scheme at Plant Washington will include a wet scrubber for control of emissions. Use of SO_2 control devices, including wet scrubbers, have been identified, evaluated, and proposed by other sources. While other technologies may be technically feasible, research information indicates that use of PM controls are the Best Demonstrated Technology (BDT) for control of non-mercury metal HAP emissions.

Two facilities, the Walter Scott Jr. Energy Center (Unit 4) and the Santee Cooper Cross Generating Station (Unit 3) have recently conducted compliance testing with 112(g) limits for HF and HCl. The Walter Scott Jr. Energy Center (Unit 4) is a facility utilizing SCR, dry scrubber, and fabric filter baghouse while utilizing PRB coal. The Santee Cooper Cross Generating Station, Unit 3, is a facility utilizing SCR, an ESP, and a wet scrubber while utilizing bituminous coal. The Wisconsin Public Service Corporation – Weston Unit 4 is a facility utilizing a dry scrubber and fabric filter baghouse, utilizing PRB coal. A summary of the stack testing results for HF and HCl from these facilities is provided in Table 10-15.

Table 10-15 Coal Fired Utility Units Emissions Testing Summary for Acid Gases HCl and HF

Facility	Pollutant	Emission Test Result	Emission Limit
Walter Scott Jr. Energy Center Unit 4	HF	2.9×10^{-5} lb/MMBtu	9.0×10^{-4} lb/MMBtu
	HCl	5.77×10^{-5} lb/MMBtu	2.9×10^{-3} lb/MMBtu
Santee Cooper Cross Generating Station Unit 3	HF	4.15×10^{-5} lb/MMBtu	3.0×10^{-4} lb/MMBtu
	HCl	2.77×10^{-4} lb/MMBtu	2.4×10^{-3} lb/MMBtu
Wisconsin Public Service Corporation Weston Unit 4	HF	3.1×10^{-5} lb/MMBtu	2.17×10^{-4} lb/MMBtu
	HCl	0.34 lb/hr (7.03×10^{-5} lb/MMBtu)	10.94 lb/hr (2.11×10^{-3} lb/MMBtu)

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Testing at the Walter Scott Jr. Energy Center, Unit 4 utilized USEPA Method 13A for fluoride emissions (as HF), and USEPA Method 26A for HCl. Testing at the Santee Cooper Cross facility, Unit 3, utilized USEPA Method 26A for HF and HCl emissions. Testing at Weston Unit 4 utilized USEPA Method 13B for fluorides (as HF), and USEPA Method 26A for HCl. Although testing results for the facilities listed above indicated emissions well below permitted limits, caution should be used in utilizing the above data since the tests were single tests of short duration (3 one hour test runs). Therefore, the above indicated values would not be representative of long term performance.

Table 10-16 provides data for coal fired utility unit 112(g) determinations for acid gases. Section 4.3 provides BACT determination data for HF from the USEPA RBLC database.

Table 10-16 Coal Fired Utility Units 112(g) Determinations for Acid Gases HCl and HF

Facility	Acid Gas Control Strategy	HCl/HF Reduction	Emission Limit[2]
Thoroughbred Generating Station	WFGD and WESP	98%	HF: 1.59×10^{-4} lb/MMBtu HCl: no limit
Consumers Energy Karn-Weadock	WFGD and sorbent injection	~ 98.3% Based on Estimated Fluorine and Chlorine Coal Concentrations	HF: 1.70×10^{-4} lb/MMBtu HCl: 2.4×10^{-3} lb/MMBtu
Roundup Power Project	Dry scrubber and fabric filter	90%	HF: 3.2×10^{-4} lb/MMBtu
Midamerican Energy Company – Walter Scott Jr. Energy Center CBEC4 Boiler[1]	Dry scrubber and fabric filter	96%	HF: 9×10^{-4} lb/MMBtu HCl: 2.9×10^{-3} lb/MMBtu
Santee Cooper Cross Generating Station [1]	WFGD	95%	HF: 3×10^{-4} lb/MMBtu HCl: 2.4×10^{-3} lb/MMBtu
LS Power Longleaf	Dry Scrubber and Fabric Filter	Note Indicated 98% to 99% Estimated Based on Uncontrolled and Controlled Rates	HF: 2.0×10^{-4} lb/MMBtu HCl: 6.0×10^{-3} lb/MMBtu PRB coal 2.4×10^{-3} lb/MMBtu CAPP coal
Tuscon Electric Power Company Springerville Generating Station [1]	Dry scrubber and fabric filter	Not Indicated	HF: 4.4×10^{-4} lb/MMBtu HCl: no limit
Cliffside Station Unit 6	Dry scrubber and fabric filter	Not Indicated	Surrogate Limit For HF and HCl SO_2 0.12 lb/MMBtu 30-Day Rolling Avg.
Santee Cooper Pee Dee Generating Station	Wet Scrubber	Not Indicated	HF: 3.4×10^{-4} lb/MMBtu HCl: 2.72 x 10-3 lb/MMBtu Identified Limits For Initial Compliance – Continued Compliance Through Surrogate Monitoring SO2 0.12 lb/MMBtu 30-Day Rolling Avg.
Consumers Energy Karn/Weadock Generating Station	Wet Scrubber	97%	HF: 3.0×10^{-4} lb/MMBtu HCl: 4.0×10^{-3} lb/MMBtu
John W. Turk Jr.	Dry scrubber and fabric filter	Not Indicated	HF: 2.0×10^{-4} lb/MMBtu HCl: 6.0×10^{-4} lb/MMBtu

[1] Indicated facilities have conducted compliance demonstrations for the indicated limits.
[2] Emission limits based on a stack test (3-hr. average) unless otherwise noted.

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10.4.3.3 Determination of the MACT Floor

Based on a thorough review of the data available, use of a wet scrubber for control of the acid gases HF and HCl with a removal efficiency of 98.5% is determined to be representative of the best controlled similar source, and the MACT floor for the control of the acid gases HF and HCl.

10.4.3.4 Beyond the Floor Analysis

Available literature has indicated that use of a wet electrostatic precipitator (WESP) has historically been used to control acid mists in the metals industry, so there have been a few instances of a WESP being installed on a power plant for this purpose. EPRI pilot studies of WESP operation have indicated that 35% and 45% of the HCl and HF was removed, respectively.

The cost of a full scale WESP unit was evaluated in Section 4.3 of this application, and it was found that a WESP unit is not economically feasible for the facility due to the high capital cost (approximately $290 million) for a unit of the size necessary for Plant Washington. Considering the high costs and relatively low removal efficiencies, a WESP unit is considered ineffective for this application and a wet scrubber has been found to be the best demonstrated technology for control of HF and HCl emissions.

10.4.3.5 MACT Determination for HF and HCl Emissions

Based on a thorough review of the available information in accordance with 40 CFR 63.43, use of a wet scrubber (WFGD system) for HCl and HF is determined as the MACT floor. Based on information from experienced power plant design engineers, and available research data regarding control of the acid gases HCl, the estimated removal efficiency for HF and HCl from the wet scrubber design for Plant Washington would be at least 98.5%. Coal cleaning will also be conducted for the Illinois #6 coals planned for use at the facility. This control strategy is determined to be MACT for reducing emissions of the acid gases HCl and HF.

Emissions calculations, shown in Exhibit A and described in Section 10.3 of this report, indicate the methodologies used to calculate the uncontrolled and controlled HCl and HF emissions for the facility's main boiler. For this analysis, the uncontrolled emissions of HCl and HF were estimated from analysis data obtained from fluorine and chlorine concentrations from the USGS COALQUAL database and coal design basis data, included in Exhibit A of this report. A summary of the analysis data is in Exhibit A of this report.

Recent source testing data, as described above and in Section 4.3.6, has demonstrated compliance with an emission limit of 2.17 x 10^{-4} lb/MMBtu for HF while utilizing PRB coal. Therefore, a MACT emission limit for HF is proposed as 2.17 x 10^{-4} lb/MMBtu.

Also, based on an expected minimum removal efficiency of 98.5%, the estimated emissions of HCl are estimated as 3.22 x 10^{-4} lb/MMbtu for use of 100 percent PRB, and estimated as 2.89 x 10^{-3} lb/MMBtu for use of the 50/50 coal blend when evaluating emission rates based on the 90% confidence levels for chlorine for PRB coal and the 50/50 coal blend. Therefore, a MACT emission limit for HCl is proposed as 3.22 x 10^{-4} lb/MMBtu for use of PRB coal, and 2.89 x 10^{-3} lb/MMBtu for use of the 50/50 coal blend.

The proposed MACT emission limits for the acid gases of concern are indicated in Table 10-17.

Table 10-17 Proposed MACT Emission Limits for Acid Gases HF and HCl

Pollutant	Uncontrolled Emission (lb/MMBtu) PRB Coal	Uncontrolled Emission (lb/MMBtu) 50/50 Coal Blend	Estimated Control Efficiency	Proposed MACT Emission Limit (lb/MMBtu) PRB Coal[1]	Proposed MACT Emission Limit (lb/MMBtu) 50/50 Coal Blend[1]
HF	5.45 x 10^{-2}	3.15 x 10^{-2}	---	2.17 x 10^{-4}	
HCl	2.15 x 10^{-2}	1.93 x 10^{-1}	> 98.5%	3.22 x 10^{-4}	2.89 x 10^{-3}

[1] Please note that uncontrolled emission estimates are based on the 90% confidence level values derived from fluorine and chlorine concentration values from the COALQUAL database, with the exception of chlorine concentrations for Illinois #6 coals. Chlorine concentrations of Illinois #6 coals, used in derivation of the uncontrolled emissions for the 50/50 blend for HCl, are based on project design data. Calculations demonstrating derivation of these values can be found in Appendix A.

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Compliance with the emission limits will be determined through stack testing (three hour average) using USEPA Methods 13A and/or 26A. Continuous compliance can be determined using SO_2 as a surrogate monitoring compound for compliance with the applicable HF and HCl emission limits, and pH monitoring of the facility wet scrubber.

10.4.4 Organic HAPs MACT Determination For The Main Boiler

Volatile organic compounds (VOC), Carbon Monoxide (CO), and organic HAP emissions result from incomplete combustion of fuel. Because organic HAPs are emitted as VOC from the main facility boiler, and VOC emissions result from incomplete combustion of the fuel, carbon monoxide (CO) emissions can be used as a surrogate for the MACT analysis. CO is a more effective surrogate than VOC emissions

since VOC emissions will be monitored on a continuous basis, where VOC emissions would be monitored during a stack test (3-hr. average). CO and organic HAPs can be controlled in a combustion system by providing adequate fuel residence time in the combustion chamber and maintaining a high temperature and sufficient oxygen in the combustion zone to ensure complete combustion. Low levels of CO, VOC, and organic HAP emissions are expected from properly operated pulverized coal fired boilers.

Establishing a MACT Floor

10.4.4.1 Identification of Best Demonstrated Technology (BDT)

The review of available information identified the following control technologies for organic HAPs, which correlate to VOC and CO emission controls.

Combustion Controls

By optimizing the combustion process, VOC and CO emissions would be reduced. This process would also reduce organic HAP emissions from the main boiler. CO, VOC, and organic HAP formation will be limited through a properly designed combustion chamber with adequate controls to regulate the combustion process. Important factors in proper combustion include proper fuel residence time, proper air to fuel ratios in the combustion chamber, and consistent proper temperatures in the combustion chamber. Proper operation and maintenance of fuel feed systems, fans, system dampers, and other equipment will assist in reducing CO, VOC, and organic HAP emissions. For additional information please refer to the CO and VOC BACT analyses in Section 4.3.3 and 4.3.4.

Add-On Controls

No effective add-on controls currently exist for CO or VOC emissions from a coal-fired utility boiler. Afterburners, and other control devices such as catalytic oxidation or flares used for destruction of organic compounds, have not been demonstrated in pulverized coal boiler units. Any such control devices would cause negative secondary environmental impacts, such as higher NO_x emissions. Good combustion controls are widely recognized as the effective control for CO, VOC, and organic HAPs emissions for pulverized coal fired boilers. For additional information please refer to the CO and VOC BACT analyses in Section 4.3.3 and 4.3.4.

10.4.4.2 Evaluation of Information for the MACT Floor and Determination of the MACT Floor

Plant Washington will use combustion controls and proper boiler design to control organic HAP emissions, emitted as VOC emissions, from the main boiler. A review of available information, including 112(g) determinations conducted for other sources, and review of BACT determinations and information from the RACT/BACT/LAER Clearinghouse, indicated good combustion practices (GCP, or good combustion controls) and proper boiler design is representative of the best controlled similar sources for organic HAP emissions, and is determined to be the MACT floor. Information is not readily available regarding the control efficiency of organic HAPs (and VOC emissions) using GCP and proper boiler design, as the controls prevent the formation of the pollutants, making an estimate of uncontrolled emissions difficult to accurately determine. As a result, an estimate of uncontrolled organic HAP emissions (as VOC), and the removal efficiency using the proposed controls cannot be determined.

The following Table 10-18 is a listing of 112(g) determinations for organic HAPs for similar sources. Recent BACT determinations for a surrogate monitoring pollutant for organic HAPs, CO, can be found in the BACT analysis for CO emissions for the main boiler in Section 4.3.3.

Table 10-19 Case By Case MACT Evaluation Summary for The Main Boiler

Pollutant	Control Technology	Control Efficiency	Proposed MACT Emission Limit (lb/MMBtu) PRB Coal	Proposed MACT Emission Limit (lb/MMBtu) 50/50 Coal Blend
Mercury	Multi-pollutant controls; SCR, fabric filter baghouse, wet scrubber, with activated carbon injection	84%	1.68×10^{-6} lb/MMBtu 15×10^{-6} lb/MW-hr Annual average	
Non-Mercury Metal HAPs	Fabric filter baghouse	99%	Surrogate CEM Monitoring Facility PM filterable emissions limit 0.012 lb/MMBtu 24-hr average	
Organic HAPs	Engineering combustion controls (Good Combustion Practices)	---	Surrogate CEM monitoring Facility BACT CO emission limit 0.10 lb/MMBtu 30-day rolling average (100 ppm)	
HF	Wet scrubber	---	2.17×10^{-4} 3-hr. avg.	
HCl	Wet scrubber	> 98.5%	3.22×10^{-4} 3-hr avg.	2.89×10^{-3} 3-hr. avg.

Prepared by: PBS 4/10/09
Checked by: JDF 4/10/09

The compliance strategy for the emissions limits proposed for the main boiler is described in the following section.

10.4.5.1 Main Boiler Summary

Mercury Emissions

The control strategy for Hg emissions includes multi-pollutant controls using sorbent injection (activated carbon injection) with a fabric filter baghouse, a wet scrubber, and a SCR for Hg oxidation.

Compliance with the limits indicated in Table 10-19 will be achieved using a Hg CEM system.

Non-Mercury Metal Emissions

The control strategy for non-mercury metal emissions includes a fabric filter baghouse.

The proposed compliance determination for the limits in Table 10-19 would include the facility filterable PM limit as a surrogate of 0.012 lb/MMBtu, which would be achieved using CEM on a 24-hour block average. Compliance with the proposed limitations is also chosen as a surrogate for emissions of radionuclides, which are emitted in particulate form from coal combustion sources and are a priority HAP

of concern identified in the *Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units – Final RTC – USEPA (1998).*

Organic HAPs

The control strategy for organic HAPs involves engineering combustion controls (good combustion practices).

Compliance with MACT for organic HAPs will be determined through surrogate compliance with a CO CEM system with an emission limit of 0.10 lb/MMBtu CO on a 30-day rolling average basis. Compliance with this limit is also chosen as a surrogate for emissions of dioxins, acrolein, and formaldehyde which are emitted as organic HAPs from coal combustion sources and are priority HAPs of concern identified in the *Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units – Final Report To Congress – USEPA (1998).*

Acid Gas Emissions – HF and HCl

The control strategy for the acid gases HF and HCl involves use of a wet scrubber.

Compliance with the emission limits for HF and HCl will be through stack testing using USEPA Methods 13A and/or 26A. Ongoing compliance will be determined by using SO_2 as a surrogate monitoring compound with the applicable HF and HCl emission limits, and pH monitoring of the facility scrubber

10.5 CASE-BY-CASE MACT ANALYSIS FOR THE AUXILIARY BOILER

40 CFR 63.43(e)(2)(x); 40 CFR 63.43(e)(2)(xii); 40 CFR 63.43(e)(1), 40 CFR 63.43(e)(2)(xi), 40 CFR 63.43e(2)(xiii)

The proposed Plant Washington facility includes a 240 MMBtu/hr fuel-oil fired auxiliary boiler. This auxiliary boiler will only be used during startup and shutdown operations of the main facility boiler. A regulation to consider in conducting a Case-By-Case MACT evaluation for the auxiliary boiler would be the *National Emission Standards for Industrial/Commercial/Institutional Boilers and Process Heaters* source category. MACT standards for this source category, specifically 40 CFR Part 63 Subpart DDDDD, were adopted in September 2004. In 2007, the U.S. Court of Appeals for the D.C. Circuit issued a decision remanding and vacating Subpart DDDDD. The court remanded the rule based on the

1 **Coal Fired Boiler - Stack S1**

Basis	Value	Units	Reference
Gross Power Rating - Full Load	930	MW	Plant Washington Specification
Maximum Heat Input - Full Load	8300	MMBtu/hr	Plant Washington Specification
Fuel Oil Burner Rating	1300	MMBtu/hr	Plant Washington Specification
Maximum Expected Hours of Operation	8760	hr/yr	Plant Washington Specification
PM Emission Factor - Coal	0.018	lb/MMBtu	BACT
PM_{10} Emission Factor - Coal	0.018	lb/MMBtu	BACT
PM_{10} Emission Factor Filterable- Coal	0.012	lb/MMBtu	BACT
$PM_{2.5}$ Percentage-Filterable	53.00%		AP 42, Section 1.1 - Particulate Matter Size Distribution
Condensable $PM_{2.5}$ Emission Factor	0.006	lb/MMBtu	Engineering Estimate
SO_2 Emission Factor - Coal	959	lb/hr	BACT (3 hour averaging period) - Section 4.3.5
SO_2 Emission Factor - Coal	0.052	lb/MMBtu	BACT (annual averaging period)
NO_X Emission Factor - Coal	0.05	lb/MMBtu	BACT (30-Day Rolling averaging period)
CO Emission Factor - Coal	0.10	lb/MMBtu	BACT (30-Day Rolling averaging period)
CO Emission Factor - Coal	0.30	lb/MMBtu	BACT (1-hour averaging period)
VOC Coal Emission Factor - Coal	0.003	lb/MMBtu	BACT
H_2SO_4 Emission Factor - Coal	0.004	lb/MMBtu	BACT
Pb Emission Factor - Coal	1.60E-05	lb/MMBtu	BACT-PSD Avoidance Limit
Hg Emission Factor - Coal	1.68E-06	lb/MMBtu	BACT
HF Emission Factor - Coal	2.17E-04	lb/MMBtu	BACT
Exhaust Flow Rate	1,927,690	dscfm	Vendor Specification
Ammonia Slip Concentration	10	ppm	Vendor Guarantee

PM Emissions - Full Load

8300 MMBtu/hr * 0.018 lb/MMBtu / 2,000 lb/ton * 8,760 hr/yr = 654 ton/yr

PM_{10} Emissions - Full Load

8300 MMBtu/hr * 0.018 lb/MMBtu / 2,000 lb/ton * 8,760 hr/yr = 654 ton/yr

PM_{10} (Filterable) Emissions - Full Load

8300 MMBtu/hr * 0.012 lb/MMBtu / 2,000 lb/ton * 8,760 hr/yr = 436 ton/yr

$PM_{2.5}$ (Filterable) Emissions

436 ton/yr * 53.00% = 231 ton/yr

$PM_{2.5}$ (Condensable) Emissions

8300 MMBtu/hr * 0.006 lb/MMBtu / 2,000 lb/ton * 8,760 hr/yr = 218 ton/yr

$PM_{2.5}$ (Filterable + Condensable) Emissions

231 ton/yr + 218 ton/yr = 449 ton/yr

SO_2 Emissions - Full Load (3 hr and 24 hr averaging periods)

959 lb/hr * 8760 hr/yr / 2,000 lb/ton = 4,200 ton/yr

SO_2 Emissions - Full Load (annual averaging periods)

8300 MMBtu/hr * 0.052 lb/MMBtu / 2,000 lb/ton * 8,760 hr/yr = 1,890 ton/yr

NO_X Emissions - Full Load

8300 MMBtu/hr * 0.05 lb/MMBtu / 2,000 lb/ton * 8,760 hr/yr = 1,818 ton/yr

CO Emissions - Full Load (Annual)

8300 MMBtu/hr * 0.10 lb/MMBtu / 2,000 lb/ton * 8,760 hr/yr = 3635.40 ton/yr

CO Emissions - Full Load (1 hr averaging period)

8300 MMBtu/hr * 0.30 lb/MMBtu = 2,490 lb/hr

Completed by: BSA 4/10/2009
Checked by: JDF 4/10/2009

VOC Emissions - Full Load

8300 MMBtu/hr	*	0.003 lb/MMBtu	/	2,000 lb/ton	*	8,760 hr/yr	=	109.1 ton/yr			

H_2SO_4 Emissions - Full Load

8300 MMBtu/hr	*	0.004 lb/MMBtu	/	2,000 lb/ton	*	8,760 hr/yr	=	145.4 ton/yr			

HF Emissions - Full Load

8300 MMBtu/hr	*	2.17E-04 lb/MMBtu	/	2,000 lb/ton	*	8,760 hr/yr	=	7.89 ton/yr			

Pb Emissions - Full Load

8300 MMBtu/hr	*	1.60E-05 lb/MMBtu	/	2,000 lb/ton	*	8,760 hr/yr	=	0.58 ton/yr			

Hg Emissions - Full Load

8300 MMBtu/hr	*	1.68E-06 lb/MMBtu	/	2,000 lb/ton	*	8,760 hr/yr	=	0.06 ton/yr			

Ammonia Emissions - Full Load

1,927,690 dscfm	*	10 ppm	/	385 dscf/lb-mole	*	17 lb/lb-mole	*	60 min/hr	=	51.07 lb/hr	
51.07 lb/hr	/	2,000 lb/ton	*	8,760 hr/yr	=	223.7 ton/yr					

2 Auxiliary Boiler - Stack S45

Basis	Value	Units	Reference
Boiler Rating	240	MMBtu/hr	Plant Washington Specification
Maximum Hours of Operation	876	hr/yr	Plant Washington Specification
PM Emission Factor - Fuel Oil	0.024	lb/MMBtu	BACT
PM_{10} Emission Factor - Fuel Oil	0.024	lb/MMBtu	BACT
PM_{10} Emission Factor Filterable - Fuel Oil	0.014	lb/MMBtu	BACT
$PM_{2.5}$ Percentage Filterable - Fuel Oil	12.0%	of PM_{10}	AP-42, Table 1.3-6
Condensable $PM_{2.5}$ Emission Factor	0.010	lb/MMBtu	Engineering Estimate
SO_2 Emission Factor - Fuel Oil	0.05	lb/MMBtu	BACT
NO_X Emission Factor - Fuel	0.10	lb/MMBtu	BACT
CO Emission Factor - Fuel Oil	0.04	lb/MMBtu	BACT
VOC Coal Emission Factor - Fuel Oil	0.003	lb/MMBtu	BACT
H_2SO_4 Emission Factor - Fuel Oil	6.00E-05	lb/MMBtu	BACT
HF Emission Factor - Fuel Oil	3.19E-08	lb/MMBtu	AP-42 Table 1.3-9
Pb Emission Factor - Fuel Oil	9.00E-06	lb/MMBtu	AP-42, Table 1.3-10
Hg Emission Factor - Fuel Oil	3.00E-06	lb/MMBtu	AP-42, Table 1.3-10

PM Emissions
Fuel Oil

240 MMBtu/hr	*	0.024 lb/MMBtu	/	2,000 lb/ton	*	876 hr / yr	=	2.52 ton/yr			

PM_{10} Emissions
Fuel Oil

240 MMBtu/hr	*	0.024 lb/MMBtu	/	2,000 lb/ton	*	876 hr / yr	=	2.52 ton/yr			

PM_{10} (Filterable) Emissions - Full Load
Fuel Oil

240 MMBtu/hr	*	0.014 lb/MMBtu	/	2,000 lb/ton	*	876 hr/yr	=	1.472 ton/yr			

$PM_{2.5}$ (Filterable) Emissions
Fuel Oil

1.472 ton/yr	*	12.00%	=	0.177 ton/yr							

Table A-3: USGS COALQUAL Summary Data for PRB and Illinois No. 6

Elements	PRB Coal Average	Standard Deviation	90% Confidence Level PRB	Illinois #6 Coal Average	Standard Deviation	90% Confidence Level Illinois #6 Coal	PRB-Illinois # 6 Coal 50-50 Blend Average	90% Confidence Level 50-50 Blend
Antimony (Sb) Emission Factor	0.67 ppm	0.90 ppm	1.82 ppm	0.89 ppm	0.97 ppm	2.14 ppm	0.78 ppm	1.98 ppm
Arsenic (As) Emission Factor	7.10 ppm	25.82 ppm	40.15 ppm	7.50 ppm	10.47 ppm	20.90 ppm	7.30 ppm	30.52 ppm
Beryllium (Be) Emission Factor	0.95 ppm	1.01 ppm	2.24 ppm	2.59 ppm	2.26 ppm	5.49 ppm	1.77 ppm	3.87 ppm
Cadmium (Cd) Emission Factor	0.14 ppm	0.19 ppm	0.38 ppm	3.41 ppm	8.40 ppm	14.16 ppm	1.77 ppm	7.27 ppm
Chlorine (Cl) Emission Factor	97.52 ppm	97.62 ppm	222.48 ppm	2700 ppm*	---	4000 ppm	1398.76 ppm	2111.24 ppm
Chromium (Cr) Emission Factor	7.19 ppm	7.16 ppm	16.35 ppm	16.63 ppm	7.47 ppm	26.19 ppm	11.91 ppm	21.27 ppm
Cobalt (Co) Emission Factor	2.17 ppm	2.36 ppm	5.18 ppm	3.45 ppm	1.39 ppm	5.23 ppm	2.81 ppm	5.21 ppm
Fluorine (F) Emission Factor	121.13 ppm	337.48 ppm	553.10 ppm	80.38 ppm	33.95 ppm	123.83 ppm	100.75 ppm	338.47 ppm
Manganese (Mn) Emission Factor	47.80 ppm	56.45 ppm	120.05 ppm	56.75 ppm	32.74 ppm	98.66 ppm	52.27 ppm	109.36 ppm
Mercury (Hg) Emission Factor	0.10 ppm	0.11 ppm	0.25 ppm	0.09 ppm	0.05 ppm	0.15 ppm	0.10 ppm	0.20 ppm
Nickel (Ni) Emission Factor	6.04 ppm	7.43 ppm	15.56 ppm	15.65 ppm	10.53 ppm	29.12 ppm	10.85 ppm	22.34 ppm
Lead (Pb) Emission Factor	4.63 ppm	4.79 ppm	10.77 ppm	36.92 ppm	75.50 ppm	133.56 ppm	20.78 ppm	72.16 ppm
Selenium (Se) Emission Factor	1.09 ppm	0.94 ppm	2.30 ppm	2.28 ppm	1.10 ppm	3.69 ppm	1.68 ppm	2.99 ppm

*Note: Fluorine and Chlorine ppm values used to determine uncontrolled emissions of HF and HCl. Raw coal quality analysis data can be found in Exhibit A. Chlorine concentration values indicated for Illinois #6 coals based on coal design basis data and not USGS COALQUAL data.

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Checked by: JDF 4/10/2009

16 PRB Coal Case-By-Case MACT 90% Confidence Level Emission Rate Calculations - Main Boiler (Stack S1)

Basis	Value	Units	
Exhaust Flow Rate	1,927,690	dscf/min	Project Specification
Maximum Heat Input - Full Load	8300	MMBtu/hr	Project Specification
Antimony (Sb) Emission Factor	1.82	ppm	90% Confidence level from Coal Analysis Data
Arsenic (As) Emission Factor	40.15	ppm	90% Confidence level from Coal Analysis Data
Beryllium (Be) Emission Factor	2.24	ppm	90% Confidence level from Coal Analysis Data
Cadmium (Cd) Emission Factor	0.38	ppm	90% Confidence level from Coal Analysis Data
Chromium (Cr) Emission Factor	16.35	ppm	90% Confidence level from Coal Analysis Data
Cobalt (Co) Emission Factor	5.18	ppm	90% Confidence level from Coal Analysis Data
Manganese (Mn) Emission Factor	120.05	ppm	90% Confidence level from Coal Analysis Data
Nickel (Ni) Emission Factor	15.56	ppm	90% Confidence level from Coal Analysis Data
Lead (Pb) Emission Factor	10.77	ppm	90% Confidence level from Coal Analysis Data
Selenium (Se) Emission Factor	2.30	ppm	90% Confidence level from Coal Analysis Data
Fluorine Fuel Content	0.0553	lb F per 100 lb coal	90% Confidence level from Coal Analysis Data
Chlorine Fuel Content	0.0222	lb Cl per 100 lb coal	90% Confidence level from Coal Analysis Data
MACT Floor Metals Control Efficiency	99	%	
MACT Floor Acid Gas (HCl, HF) Control Efficiency	98.5	%	
Moisture Correction Factor	0.7973		From Table A-4
Coal Heating Value	8500	Btu/lb	
lb HCl per lb Cl	1.03	lb	
lb HF per lb F	1.05	lb	
kg per ton	907.18	kg/ton	
mg per lb	453592.37	mg/lb	
Coal Flow Rate For PRB	488	ton/hr	

Antimony (Sb) Emissions

Estimated Uncontrolled Emissions

$$\frac{1.82\ \text{mg}}{\text{kg}} * \frac{907.18\ \text{kg}}{\text{ton}} * \frac{1\ \text{lb}}{453592.37\ \text{mg}} * \frac{488\ \text{ton}}{\text{hr}} * 0.7973 * \frac{1\ \text{hr}}{8300\ \text{MMBtu}} = \boxed{\textbf{1.71E-04 lb/MMBtu}}$$

Estimated Controlled Emissions

1.71E-04 lb/MMBtu * 99 % Removal = **1.71E-06 lb/MMBtu**

Arsenic (As) Emissions

Estimated Uncontrolled Emissions

$$\frac{40.15\ \text{mg}}{\text{kg}} * \frac{907.18\ \text{kg}}{\text{ton}} * \frac{1\ \text{lb}}{453592.37\ \text{mg}} * \frac{488\ \text{ton}}{\text{hr}} * 0.7973 * \frac{1\ \text{hr}}{8300\ \text{MMBtu}} = \boxed{\textbf{3.77E-03 lb/MMBtu}}$$

Estimated Controlled Emissions

3.77E-03 lb/MMBtu * 99 % Removal = **3.77E-05 lb/MMBtu**

Completed by : BSA 4/10/2009
Checked by: JDF 4/10/2009

Beryllium (Be) Emissions

Estimated Uncontrolled Emissions

2.24 mg / kg	*	907.18 kg / ton	*	1 lb / 453592.37 mg	*	488 ton / hr	*	0.7973	*	1 hr / 8300 MMBtu	=	**2.11E-04 lb/MMBtu**

Estimated Controlled Emissions

2.11E-04 lb/MMBtu	*	99 % Removal	=	**2.11E-06 lb/MMBtu**

Cadmium (Cd) Emissions

Estimated Uncontrolled Emissions

0.38 mg / kg	*	907.18 kg / ton	*	1 lb / 453592.37 mg	*	488 ton / hr	*	0.7973	*	1 hr / 8300 MMBtu	=	**3.53E-05 lb/MMBtu**

Estimated Controlled Emissions

3.53E-05 lb/MMBtu	*	99 % Removal	=	**3.53E-07 lb/MMBtu**

Chromium (Cr) Emissions

Estimated Uncontrolled Emissions

16.35 mg / kg	*	907.18 kg / ton	*	1 lb / 453592.37 mg	*	488 ton / hr	*	0.7973	*	1 hr / 8300 MMBtu	=	**1.53E-03 lb/MMBtu**

Estimated Controlled Emissions

1.53E-03 lb/MMBtu	*	99 % Removal	=	**1.53E-05 lb/MMBtu**

Cobalt (Co) Emissions

Estimated Uncontrolled Emissions

5.18 mg / kg	*	907.18 kg / ton	*	1 lb / 453592.37 mg	*	488 ton / hr	*	0.7973	*	1 hr / 8300 MMBtu	=	**4.86E-04 lb/MMBtu**

Estimated Controlled Emissions

4.86E-04 lb/MMBtu	*	99 % Removal	=	**4.86E-06 lb/MMBtu**

Manganese (Mn) Emissions

Estimated Uncontrolled Emissions

120.05 mg / kg	*	907.18 kg / ton	*	1 lb / 453592.37 mg	*	488 ton / hr	*	0.7973	*	1 hr / 8300 MMBtu	=	**1.13E-02 lb/MMBtu**

Estimated Controlled Emissions

1.13E-02 lb/MMBtu	*	99 % Removal	=	**1.13E-04 lb/MMBtu**

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Nickel (Ni) Emissions

Estimated Uncontrolled Emissions

$$\frac{15.56\ \text{mg}}{\text{kg}} * \frac{907.18\ \text{kg}}{\text{ton}} * \frac{1\ \text{lb}}{453592.37\ \text{mg}} * \frac{488\ \text{ton}}{\text{hr}} * 0.7973 * \frac{1\ \text{hr}}{8300\ \text{MMBtu}} = \boxed{\textbf{1.46E-03 lb/MMBtu}}$$

Estimated Controlled Emissions

1.46E-03 lb/MMBtu * 99 % Removal = **1.46E-05 lb/MMBtu**

Lead (Pb) Emissions

Estimated Uncontrolled Emissions

$$\frac{10.77\ \text{mg}}{\text{kg}} * \frac{907.18\ \text{kg}}{\text{ton}} * \frac{1\ \text{lb}}{453592.37\ \text{mg}} * \frac{488\ \text{ton}}{\text{hr}} * 0.7973 * \frac{1\ \text{hr}}{8300\ \text{MMBtu}} = \boxed{\textbf{1.01E-03 lb/MMBtu}}$$

Estimated Controlled Emissions

1.01E-03 lb/MMBtu * 99 % Removal = **1.01E-05 lb/MMBtu**

Selenium (Se) Emissions

Estimated Uncontrolled Emissions

$$\frac{2.30\ \text{mg}}{\text{kg}} * \frac{907.18\ \text{kg}}{\text{ton}} * \frac{1\ \text{lb}}{453592.37\ \text{mg}} * \frac{488\ \text{ton}}{\text{hr}} * 0.7973 * \frac{1\ \text{hr}}{8300\ \text{MMBtu}} = \boxed{\textbf{2.15E-04 lb/MMBtu}}$$

Estimated Controlled Emissions

2.15E-04 lb/MMBtu * 99 % Removal = **2.15E-06 lb/MMBtu**

Hydrogen Chloride (HCl) Emissions

Estimated Uncontrolled Emissions

$$\frac{0.02\ \text{lb Cl}}{100\ \text{lb coal}} * \frac{1\ \text{lb}}{8500\ \text{Btu}} * \frac{1 \times 10^{6}\ \text{Btu}}{\text{MMBtu}} * \frac{1.03\ \text{lb HCl}}{\text{lb Cl}} * 0.7973 = \boxed{\textbf{2.15E-02 lb/MMBtu}}$$

Estimated Controlled Emissions

2.15E-02 lb/MMBtu * 98.5 % Removal = **3.22E-04 lb/MMBtu**

Completed by : BSA 4/10/2009
Checked by: JDF 4/10/2009

Hydrogen Fluoride (HF) Emissions

Estimated Uncontrolled Emissions

$$\frac{0.0553 \text{ lb F}}{100 \text{ lb coal}} * \frac{1 \text{ lb}}{8500 \text{ Btu}} * \frac{1 \times 10^6 \text{ Btu}}{\text{MMBtu}} * \frac{1.05 \text{ lb HF}}{\text{lb F}} * 0.7973 = \boxed{\textbf{5.45E-02 lb/MMBtu}}$$

Estimated Controlled Emissions

5.45E-02 lb/MMBtu * 98.5 % Removal = **8.17E-04 lb/MMBtu**

Note: MACT/BACT Emission Limit for fluorides (as HF) has been established as 2.17E-04 lb/MMBtu.

Completed by : BSA 4/10/2009
Checked by: JDF 4/10/2009

18 50-50 Blend of PRB Coals and Illinois No. 6 Coals 90% Confidence Level Emission Rate Calculations - Main Boiler (Stack S1)

Basis	Value	Units	
Exhaust Flow Rate	1,927,690	dscf/min	Project Specification
Maximum Heat Input - Full Load	8300	MMBtu/hr	Project Specification
Antimony (Sb) Emission Factor	1.98	ppm	90% Confidence level from Coal Analysis Data
Arsenic (As) Emission Factor	30.52	ppm	90% Confidence level from Coal Analysis Data
Beryllium (Be) Emission Factor	3.87	ppm	90% Confidence level from Coal Analysis Data
Cadmium (Cd) Emission Factor	7.27	ppm	90% Confidence level from Coal Analysis Data
Chromium (Cr) Emission Factor	21.27	ppm	90% Confidence level from Coal Analysis Data
Cobalt (Co) Emission Factor	5.21	ppm	90% Confidence level from Coal Analysis Data
Manganese (Mn) Emission Factor	109.36	ppm	90% Confidence level from Coal Analysis Data
Nickel (Ni) Emission Factor	22.34	ppm	90% Confidence level from Coal Analysis Data
Lead (Pb) Emission Factor	72.16	ppm	90% Confidence level from Coal Analysis Data
Selenium (Se) Emission Factor	2.99	ppm	90% Confidence level from Coal Analysis Data
Fluorine Fuel Content	0.0338	lb F per 100 lb coal	90% Confidence level from Coal Analysis Data
Chlorine Fuel Content	0.2111	lb Cl per 100 lb coal	Project Specification
MACT Floor Metals Control Efficiency	99	%	
MACT Floor Acid Gas (HCl, HF) Control Efficienc	98.5	%	
Moisture Correction Factor	0.8825		From Table A-4
Coal Heating Value	9950	Btu/lb	
lb HCl per lb Cl	1.03	lb	
lb HF per lb F	1.05	lb	
kg per ton	907.18	kg/ton	
mg per lb	453592.37	mg/lb	
Coal Flow Rate For 50/50 Blend	417	ton/hr	

Antimony (Sb) Emissions

Estimated Uncontrolled Emissions

$$\frac{1.98\ \text{mg}}{\text{kg}} * \frac{907.18\ \text{kg}}{\text{ton}} * \frac{1\ \text{lb}}{453592.37\ \text{mg}} * \frac{417\ \text{ton}}{\text{hr}} * \frac{1\ \text{hr}}{8300\ \text{MMBtu}} * 0.8825 = \boxed{1.75\text{E-}04\ \text{lb/MMBtu}}$$

Estimated Controlled Emissions

1.75E-04 lb/MMBtu * 99 % Removal = **1.75E-06 lb/MMBtu**

Arsenic (As) Emissions

Estimated Uncontrolled Emissions

$$\frac{30.52\ \text{mg}}{\text{kg}} * \frac{907.18\ \text{kg}}{\text{ton}} * \frac{1\ \text{lb}}{453592.37\ \text{mg}} * \frac{417\ \text{ton}}{\text{hr}} * \frac{1\ \text{hr}}{8300\ \text{MMBtu}} * 0.8825 = \boxed{2.71\text{E-}03\ \text{lb/MMBtu}}$$

Estimated Controlled Emissions

2.71E-03 lb/MMBtu * 99 % Removal = **2.71E-05 lb/MMBtu**

Beryllium (Be) Emissions

Estimated Uncontrolled Emissions

$\frac{3.87\ mg}{kg} * \frac{907.18\ kg}{ton} * \frac{1\ lb}{453592.37\ mg} * \frac{417\ ton}{hr} * \frac{1\ hr}{8300\ MMBtu} * 0.8825 =$ **3.43E-04 lb/MMBtu**

Estimated Controlled Emissions

3.43E-04 lb/MMBtu * 99 % Removal = **3.43E-06 lb/MMBtu**

Cadmium (Cd) Emissions

Estimated Uncontrolled Emissions

$\frac{7.27\ mg}{kg} * \frac{907.18\ kg}{ton} * \frac{1\ lb}{453592.37\ mg} * \frac{417\ ton}{hr} * \frac{1\ hr}{8300\ MMBtu} * 0.8825 =$ **6.45E-04 lb/MMBtu**

Estimated Controlled Emissions

6.45E-04 lb/MMBtu * 99 % Removal = **6.45E-06 lb/MMBtu**

Chromium (Cr) Emissions

Estimated Uncontrolled Emissions

$\frac{21.27\ mg}{kg} * \frac{907.18\ kg}{ton} * \frac{1\ lb}{453592.37\ mg} * \frac{417\ ton}{hr} * \frac{1\ hr}{8300\ MMBtu} * 0.8825 =$ **1.89E-03 lb/MMBtu**

Estimated Controlled Emissions

1.89E-03 lb/MMBtu * 99 % Removal = **1.89E-05 lb/MMBtu**

Cobalt (Co) Emissions

Estimated Uncontrolled Emissions

$\frac{5.21\ mg}{kg} * \frac{907.18\ kg}{ton} * \frac{1\ lb}{453592.37\ mg} * \frac{417\ ton}{hr} * \frac{1\ hr}{8300\ MMBtu} *$ (100% - 88.25%) = **4.62E-04 lb/MMBtu**

Estimated Controlled Emissions

4.62E-04 lb/MMBtu * 99 % Removal = **4.62E-06 lb/MMBtu**

Manganese (Mn) Emissions

Estimated Uncontrolled Emissions

$\frac{109.36\ mg}{kg} * \frac{907.18\ kg}{ton} * \frac{1\ lb}{453592.37\ mg} * \frac{417\ ton}{hr} * \frac{1\ hr}{8300\ MMBtu} * 0.8825 =$ **9.70E-03 lb/MMBtu**

Estimated Controlled Emissions

9.70E-03 lb/MMBtu * 99 % Removal = **9.70E-05 lb/MMBtu**

Nickel (Ni) Emissions

Estimated Uncontrolled Emissions

$\frac{22.34\ mg}{kg} * \frac{907.18\ kg}{ton} * \frac{1\ lb}{453592.37\ mg} * \frac{417\ ton}{hr} * \frac{1\ hr}{8300\ MMBtu} * 0.8825 =$ **1.98E-03 lb/MMBtu**

Estimated Controlled Emissions

1.98E-03 lb/MMBtu * 99 % Removal = **1.98E-05 lb/MMBtu**

Lead (Pb) Emissions

Estimated Uncontrolled Emissions

$\frac{72.16\ mg}{kg} * \frac{907.18\ kg}{ton} * \frac{1\ lb}{453592.37\ mg} * \frac{417\ ton}{hr} * \frac{1\ hr}{8300\ MMBtu} * 0.8825 =$ **6.40E-03 lb/MMBtu**

Estimated Controlled Emissions

6.40E-03 lb/MMBtu * 99 % Removal = **6.40E-05 lb/MMBtu**

Selenium (Se) Emissions

Estimated Uncontrolled Emissions

$\frac{2.99\ mg}{kg} * \frac{907.18\ kg}{ton} * \frac{1\ lb}{453592.37\ mg} * \frac{417\ ton}{hr} * \frac{1\ hr}{8300\ MMBtu} * 0.8825 =$ **2.65E-04 lb/MMBtu**

Estimated Controlled Emissions

2.65E-04 lb/MMBtu * 99 % Removal = **2.65E-06 lb/MMBtu**

Hydrogen Chloride (HCl) Emissions

Estimated Uncontrolled Emissions

$\frac{0.21\ lb\ Cl}{100\ lb\ coal} * \frac{1\ lb}{9950\ Btu} * \frac{1 \times 10^6\ Btu}{MMBtu} * \frac{1.03\ lb\ HCl}{lb\ Cl} * 0.8825 =$ **1.93E-01 lb/MMBtu**

Estimated Controlled Emissions

1.93E-01 lb/MMBtu * 98.5 % Removal = **2.89E-03 lb/MMBtu**

Hydrogen Fluoride (HF) Emissions

Estimated Uncontrolled Emissions

$\frac{0.0338\ lb\ F}{100\ lb\ coal} * \frac{1\ lb}{9950\ Btu} * \frac{1 \times 10^6\ Btu}{MMBtu} * \frac{1.05\ lb\ HF}{lb\ F} * 0.8825 =$ **3.15E-02 lb/MMBtu**

Estimated Controlled Emissions

3.15E-02 lb/MMBtu * 98.5 % Removal = **4.73E-04 lb/MMBtu**

Note: MACT/BACT Emission Limit for fluorides (as HF) has been established as 2.17E-04 lb/MMBtu.

Table A-7: Toxic Emission Calculations: Main Boiler

Basis:

PRB Coal Consumption Rate	488	ton Coal/hr
50-50 Blend Coal Consumption rate	417	ton Coal/hr
Fuel Oil Consumption Rate	9286	gal/hr
Maximum heat input	8.30E-03	Trillion Btu/hr

Compound	Pulverized Coal [1] -AP-42				Fuel Oil [2]-AP-42			Pulverized Coal [3]-Utility report to Congress, NEI Database, TRI Database			Pulverized Coal[4] -MACT Analysis						Worst Case Emissions (lb/hr)	Worst Case Emissions (tpy)[5]
	Emission Factor	Units	Hourly Emissions (lb/hr) (PRB Coal)	Hourly Emissions (lb/hr) 50-50 Blend	Emission Factor	Units	Hourly Emissions (lb/hr)	Emission Factor	Units	Hourly Emissions (lb/hr)	Emission Factor (PRB Coal)	Units	Hourly Emissions (lb/hr) (PRB Coal)	Emission Factor (50-50 Blend Coal)	Units	Hourly Emissions (lb/hr) 50-50 Blend		
Organics																		
Acenaphthene	5.10E-07	lb/ton	2.49E-04	2.13E-04	2.1E-05	lb/1,000 gal	2.0E-04	0.013	lb/trillion btu	1.08E-04							2.49E-04	1.1E-03
Acenaphthylene	2.50E-07	lb/ton	1.22E-04	1.04E-04	2.5E-07	lb/1,000 gal	2.3E-06	0.004	lb/trillion btu	3.32E-05							1.22E-04	5.3E-04
Acetaldehyde	5.70E-04	lb/ton	2.78E-01	2.38E-01				6.75	lb/trillion btu	5.60E-02							2.78E-01	1.2E+00
Acetophenone	1.50E-05	lb/ton	7.32E-03	6.26E-03				0.68	lb/trillion btu	5.64E-03							7.32E-03	3.2E-02
Acrolein	2.90E-04	lb/ton	1.42E-01	1.21E-01				3.25	lb/trillion btu	2.70E-02							1.42E-01	6.2E-01
Anthracene	2.10E-07	lb/ton	1.02E-04	8.76E-05	1.2E-06	lb/1,000 gal	1.1E-05	0.004	lb/trillion btu	3.32E-05							1.02E-04	4.5E-04
Benzene	1.30E-03	lb/ton	6.34E-01	5.42E-01	2.14E-04	lb/1,000 gal	2.0E-03	2.5	lb/trillion btu	2.08E-02							6.34E-01	2.8E+00
Benzo(a)anthracene	8.00E-08	lb/ton	3.90E-05	3.34E-05	4.0E-06	lb/1,000 gal	3.7E-05	0.002	lb/trillion btu	1.66E-05							3.90E-05	1.7E-04
Benzo(a)pyrene	3.80E-08	lb/ton	1.85E-05	1.58E-05				0.001	lb/trillion btu	8.30E-06							1.85E-05	8.1E-05
Benzo(b)fluoranthene			-	-				0.008	lb/trillion btu	6.64E-05							6.64E-05	2.9E-04
Benzo(e)pyrene			-	-				0.001	lb/trillion btu	8.30E-06							8.30E-06	3.6E-05
Benzo(g,h,i)perylene			-	-	2.26E-06	lb/1,000 gal	2.1E-05	0.002	lb/trillion btu	1.66E-05							2.10E-05	9.2E-05
Benzo(g,h,i)pyrene	2.70E-08	lb/ton	1.32E-05	1.13E-05													1.32E-05	5.8E-05
Benzo(b,k)fluoranthene	1.10E-07	lb/ton	5.37E-05	4.59E-05	1.48E-06	lb/1,000 gal	1.4E-05	0.004	lb/trillion btu	3.32E-05							5.37E-05	2.4E-04
Benzo(k)fluoranthene			-	-				0.004	lb/trillion btu	3.32E-05							3.32E-05	1.5E-04
Benzyl chloride	7.00E-04	lb/ton	3.42E-01	2.92E-01				0.006	lb/trillion btu	4.98E-05							3.42E-01	1.5E+00
Biphenyl	1.70E-06	lb/ton	8.30E-04	7.09E-04				0.18	lb/trillion btu	1.49E-03							1.49E-03	6.5E-03
bis(2-Ethylhexyl)phthalate	7.30E-05	lb/ton	3.56E-02	3.04E-02				4.1	lb/trillion btu	3.40E-02							3.56E-02	1.6E-01
Bromoform	3.90E-05	lb/ton	1.90E-02	1.63E-02				6.6	lb/trillion btu	5.48E-02							5.48E-02	2.4E-01
2-Butanone (MEK)	3.90E-04	lb/ton	1.90E-01	1.63E-01													1.90E-01	
Carbon tetrachloride			-	-				3.25	lb/trillion btu	2.70E-02							2.70E-02	1.2E-01
Carbon disulfide	1.30E-04	lb/ton	6.34E-02	5.42E-02				4.3	lb/trillion btu	3.57E-02							6.34E-02	2.8E-01
Chlorobenzene	2.20E-05	lb/ton	1.07E-02	9.17E-03				3.18	lb/trillion btu	2.64E-02							2.64E-02	1.2E-01
Chloroform	5.90E-05	lb/ton	2.88E-02	2.46E-02				3.2	lb/trillion btu	2.66E-02							2.88E-02	1.3E-01
Chloromethane	5.30E-04	lb/ton	2.59E-01	2.21E-01				5.9	lb/trillion btu	4.90E-02							2.59E-01	1.1E+00
2-Chloronaphthalene			-					0.04	lb/trillion btu	3.32E-04							3.32E-04	1.5E-03
2-Chloroacetophenone	7.00E-06	lb/ton	3.42E-03	2.92E-03				0.29	lb/trillion btu	2.41E-03							3.42E-03	1.5E-02
Chrysene	1.00E-07	lb/ton	4.88E-05	4.17E-05	2.4E-06	lb/1,000 gal	2.2E-05	0.003	lb/trillion btu	2.49E-05							4.88E-05	2.1E-04
Cumene	5.30E-06	lb/ton	2.59E-03	2.21E-03				0.29	lb/trillion btu	2.41E-03							2.59E-03	1.1E-02
Cyanide	2.50E-03	lb/ton	1.22E+00	1.04E+00				28.00	lb/trillion btu	2.32E-01							1.22E+00	5.3E+00
Dibenzo(a,h)anthracene			-	-	1.7E-06	lb/1,000 gal	1.6E-05	0.001	lb/trillion btu	8.30E-06							1.55E-05	6.8E-05
Dibutyl phthalate				-				2.8	lb/trillion btu	2.32E-02							2.32E-02	1.0E-01
Dimethyl sulfate	4.80E-05	lb/ton	2.34E-02	2.00E-02													2.34E-02	1.0E-01
2,4-Dinitrotoluene	2.80E-07	lb/ton	1.37E-04	1.17E-04				0.015	lb/trillion btu	1.25E-04							1.37E-04	6.0E-04
Ethylbenzene	9.40E-05	lb/ton	4.59E-02	3.92E-02	6.36E-05	lb/1,000 gal	5.9E-04	0.41	lb/trillion btu	3.40E-03							4.59E-02	2.0E-01
Ethyl Chloride	4.20E-05	lb/ton	2.05E-02	1.75E-02				2.4	lb/trillion btu	1.99E-02							2.05E-02	9.0E-02
Ethylene dichloride	4.00E-05	lb/ton	1.95E-02	1.67E-02				3.1	lb/trillion btu	2.57E-02							2.57E-02	1.1E-01
Ethylene dibromide	1.20E-06	lb/ton	5.86E-04	5.00E-04													5.86E-04	2.6E-03
Fluoranthene	7.10E-07	lb/ton	3.46E-04	2.96E-04	4.8E-06	lb/1,000 gal	4.5E-05	0.016	lb/trillion btu	1.33E-04							3.46E-04	1.5E-03
Fluorene	9.10E-07	lb/ton	4.44E-04	3.79E-04	4.5E-06	lb/1,000 gal	4.2E-05	0.013	lb/trillion btu	1.08E-04							4.44E-04	1.9E-03
Formaldehyde	2.40E-04	lb/ton	1.17E-01	1.00E-01	3.3E-02	lb/1,000 gal	3.1E-01	4.0	lb/trillion btu	3.32E-02							3.06E-01	1.3E+00
Hexane	6.70E-05	lb/ton	3.27E-02	2.79E-02				0.83	lb/trillion btu	6.89E-03							3.27E-02	1.4E-01
Hydrogen chloride	1.20E+00	lb/ton	5.86E+02	5.00E+02				13634.6623	lb/trillion btu	1.13E+02	3.22E-04	lb/MMBtu	2.68E+00	2.89E-03	lb/MMBtu	2.40E+01	2.40E+01	1.1E+02
Hydrogen Fluoride	1.50E-01	lb/ton	7.32E+01	6.26E+01				2260.714975	lb/trillion btu	1.88E+01	2.17E-04	lb/MMBtu	1.80E+00	2.17E-04	lb/MMBtu	1.80E+00	1.80E+00	7.9E+00
Indeno(1,2,3,c,d)pyrene	6.10E-08	lb/ton	2.98E-05	2.54E-05	2.1E-06	lb/1,000 gal	2.0E-05	0.003	lb/trillion btu	2.49E-05							2.98E-05	1.3E-04
Isophorone	5.80E-04	lb/ton	2.83E-01	2.42E-01				24	lb/trillion btu	1.99E-01							2.83E-01	1.2E+00
Methyl Bromide	1.60E-04	lb/ton	7.81E-02	6.67E-02				0.89	lb/trillion btu	7.39E-03							7.81E-02	3.4E-01
Methyl hydrazine	1.70E-04	lb/ton	8.30E-02	7.09E-02													8.30E-02	3.6E-01
MMA	2.00E-05	lb/ton	9.76E-03	8.34E-03				1.1	lb/trillion btu	9.13E-03							9.76E-03	4.3E-02
2-Methylnaphthalene			-	-				0.032	lb/trillion btu	2.66E-04							2.66E-04	1.2E-03
MTBE	3.50E-05	lb/ton	1.71E-02	1.46E-02				1.4	lb/trillion btu	1.16E-02							1.71E-02	7.5E-02
Methylene chloride	2.90E-04	lb/ton	1.42E-01	1.21E-01				13	lb/trillion btu	1.08E-01							1.42E-01	6.2E-01
Naphthalene	1.30E-05	lb/ton	6.34E-03	5.42E-03	1.13E-03	lb/1,000 gal	1.0E-02	0.77	lb/trillion btu	6.39E-03							1.05E-02	4.6E-02
5-Methyl chrysene	2.20E-08	lb/ton	1.07E-05	9.17E-06													1.07E-05	4.7E-05
OCDD					3.10E-09	lb/1,000 gal	2.9E-08										2.88E-08	1.3E-07
Phenanthrene	2.70E-06	lb/ton	1.32E-03	1.13E-03	1.1E-05	lb/1,000 gal	9.8E-05	0.032	lb/trillion btu	2.66E-04							1.32E-03	5.8E-03
Phenol	1.60E-05	lb/ton	7.81E-03	6.67E-03				6.1	lb/trillion btu	5.06E-02							5.06E-02	2.2E-01
Propionaldehyde	3.80E-04	lb/ton	1.85E-01	1.58E-01				10.35	lb/trillion btu	8.59E-02							1.85E-01	8.1E-01
Pyrene	3.30E-07	lb/ton	1.61E-04	1.38E-04	4.3E-06	lb/1,000 gal	3.9E-05	0.012	lb/trillion btu	9.96E-05							1.61E-04	7.1E-04
Styrene	2.50E-05	lb/ton	1.22E-02	1.04E-02				3.1	lb/trillion btu	2.57E-02							2.57E-02	1.1E-01
Tetrachloroethylene	4.30E-05	lb/ton	2.10E-02	1.79E-02				3.1	lb/trillion btu	2.57E-02							2.57E-02	1.1E-01
Toluene	2.40E-04	lb/ton	1.17E-01	1.00E-01	6.20E-03	lb/1,000 gal	5.8E-02	3.6	lb/trillion btu	2.99E-02							1.17E-01	5.1E-01
1,1,1-Trichloroethane	2.00E-05	lb/ton	9.76E-03	8.34E-03	2.36E-04	lb/1,000 gal	2.2E-03										9.76E-03	4.3E-02
1,1,2-Trichloroethane			-	-				4.7	lb/trillion btu	3.90E-02							3.90E-02	1.7E-01
Trichloroethylene			-	-				3.1	lb/trillion btu	2.57E-02							2.57E-02	1.1E-01
Vinyl acetate	7.60E-06	lb/ton	3.71E-03	3.17E-03				0.42	lb/trillion btu	3.49E-03							3.71E-03	1.6E-02

Completed by: PBS 4/10/09
Checked by: JDF 4/10/09

Table A-7: Toxic Emission Calculations: Main Boiler

Basis:

PRB Coal Consumption Rate	488	ton Coal/hr
50-50 Blend Coal Consumption rate	417	ton Coal/hr
Fuel Oil Consumption Rate	9286	gal/hr
Maximum heat Input	8.30E-03	Trillion Btu/hr

Compound	Pulverized Coal [1] -AP-42				Fuel Oil [2]-AP-42			Pulverized Coal [3]-Utility report to Congress, NEI Database, TRI Database			Pulverized Coal[4] -MACT Analysis						Worst Case Emissions (lb/hr)	Worst Case Emissions (tpy)[5]
	Emission Factor	Units	Hourly Emissions (lb/hr) (PRB Coal)	Hourly Emissions (lb/hr) 50-50 Blend	Emission Factor	Units	Hourly Emissions (lb/hr)	Emission Factor	Units	Hourly Emissions (lb/hr)	Emission Factor (PRB Coal)	Units	Hourly Emissions (lb/hr) (PRB Coal)	Emission Factor (50-50 Blend Coal)	Units	Hourly Emissions (lb/hr) 50-50 Blend		
Xylene	3.70E-05	lb/ton	1.81E-02	1.54E-02	1.09E-04	lb/1,000 gal	1.0E-03	4.65	lb/trillion btu	3.86E-02							3.86E-02	1.7E-01
m-xylene	-	-	-	-	-	-	-	1.45	lb/trillion btu	1.20E-02							1.20E-02	5.3E-02
o-xylene	-	-	-	-	1.09E-04	lb/1,000 gal	1.0E-03	0.81	lb/trillion btu	6.72E-03							6.72E-03	2.9E-02
p-xylene	-	-	-	-	-	-	-	1.45	lb/trillion btu	1.20E-02							1.20E-02	5.3E-02
Dioxins (Total)	-	-	-	-	-	-	-	9.68E-06	lb/trillion btu	8.03E-08							8.03E-08	3.5E-07
P-Cresol	-	-	-	-	-	-	-	0.95	lb/trillion btu	7.89E-03							7.89E-03	3.5E-02
Pentachlorophenol	-	-	-	-	-	-	-	0.008	lb/trillion btu	6.64E-05							6.64E-05	2.9E-04
Hexachlorobenzene	-	-	-	-	-	-	-	0.08	lb/trillion btu	6.64E-04							6.64E-04	2.9E-03
Methyl chloroform	-	-	-	-	-	-	-	3.42	lb/trillion btu	2.84E-02							2.84E-02	1.2E-01
Methyl iodine	-	-	-	-	-	-	-	0.4	lb/trillion btu	3.32E-03							3.32E-03	1.5E-02
Methyl isobutyl ketone	-	-	-	-	-	-	-	4.9	lb/trillion btu	4.07E-02							4.07E-02	1.8E-01
1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	1.51E-06	lb/MMBtu	1.25E-02							1.25E-02	5.5E-02
1,3-Butadiene	-	-	-	-	-	-	-	3.71E-07	lb/MMBtu	3.08E-03							3.08E-03	1.3E-02
1,3-Dichloropropene	-	-	-	-	-	-	-	6.61E-07	lb/MMBtu	5.48E-03							5.48E-03	2.4E-02
1,4-Dichlorobenzene	-	-	-	-	-	-	-	1.06E-06	lb/MMBtu	8.76E-03							8.76E-03	3.8E-02
2,4,6-Trichlorophenol	-	-	-	-	-	-	-	8.01E-10	lb/MMBtu	6.64E-06							6.64E-06	2.9E-05
2,4-Dinitrophenol	-	-	-	-	-	-	-	1.08E-08	lb/MMBtu	8.92E-05							8.92E-05	3.9E-04
3-Methylcholanthrene	-	-	-	-	-	-	-	6.62E-11	lb/MMBtu	5.49E-07							5.49E-07	2.4E-06
4-Nitrophenol	-	-	-	-	-	-	-	4.00E-09	lb/MMBtu	3.32E-05							3.32E-05	1.5E-04
7,12-Dimethylbenz[a]Anthracene	-	-	-	-	-	-	-	5.88E-10	lb/MMBtu	4.88E-06							4.88E-06	2.1E-05
Allyl Chloride	-	-	-	-	-	-	-	8.03E-06	lb/MMBtu	6.66E-02							6.66E-02	2.9E-01
Arsenic Trioxide	-	-	-	-	-	-	-	2.98E-05	lb/MMBtu	2.47E-01							2.47E-01	1.1E+00
Cadmium Oxide	-	-	-	-	-	-	-	3.20E-06	lb/MMBtu	2.66E-02							2.66E-02	1.2E-01
Calcium Cyanamide	-	-	-	-	-	-	-	3.39E-06	lb/MMBtu	2.81E-02							2.81E-02	1.2E-01
Chromic Acid (VI)	-	-	-	-	-	-	-	8.32E-06	lb/MMBtu	6.91E-02							6.91E-02	3.0E-01
Chromic Oxide	-	-	-	-	-	-	-	2.44E-05	lb/MMBtu	2.02E-01							2.02E-01	8.9E-01
Dibenzo[a,j]Acridine	-	-	-	-	-	-	-	5.12E-07	lb/MMBtu	4.25E-03							4.25E-03	1.9E-02
Dibenzofuran	-	-	-	-	-	-	-	5.73E-07	lb/MMBtu	4.75E-03							4.75E-03	2.1E-02
Diethyl Sulfate	-	-	-	-	-	-	-	2.33E-06	lb/MMBtu	1.94E-02							1.94E-02	8.5E-02
Dimethyl Phthalate	-	-	-	-	-	-	-	9.64E-08	lb/MMBtu	8.00E-04							8.00E-04	3.5E-03
Manganese Dioxide	-	-	-	-	-	-	-	4.26E-05	lb/MMBtu	3.54E-01							3.54E-01	1.5E+00
Polychlorinated Biphenyls	-	-	-	-	-	-	-	1.37E-08	lb/MMBtu	1.14E-04							1.14E-04	5.0E-04
Polycyclic Organic Matter	-	-	-	-	-	-	-	6.21E-06	lb/MMBtu	5.16E-02							5.16E-02	2.3E-01
Propylene Dichloride	-	-	-	-	-	-	-	1.20E-06	lb/MMBtu	9.97E-03							9.97E-03	4.4E-02
Sodium Cyanide	-	-	-	-	-	-	-	8.09E-05	lb/MMBtu	6.71E-01							6.71E-01	2.9E+00
Toluene-2,4-Diamine	-	-	-	-	-	-	-	1.38E-08	lb/MMBtu	1.14E-04							1.14E-04	5.0E-04
Vinyl Chloride	-	-	-	-	-	-	-	7.14E-07	lb/MMBtu	5.92E-03							5.92E-03	2.6E-02
Metals																		
Antimony	1.80E-05	lb/ton	8.78E-03	7.51E-03				0.87	lb/trillion btu	7.25E-03	1.71E-06	lb/MMBtu	1.42E-02	1.75E-06	lb/MMBtu	1.46E-02	1.46E-02	6.4E-02
Arsenic	4.10E-04	lb/ton	2.00E-01	1.71E-01	5.6E-04	lb/1,000 gal	5.2E-03	6.21	lb/trillion btu	5.16E-02	3.77E-05	lb/MMBtu	3.13E-01	2.71E-05	lb/MMBtu	2.25E-01	3.13E-01	1.4E+00
Beryllium	2.10E-05	lb/ton	1.02E-02	8.76E-03	4.2E-04	lb/1,000 gal	3.9E-03	0.72	lb/trillion btu	5.99E-03	2.11E-06	lb/MMBtu	1.75E-02	3.43E-06	lb/MMBtu	2.85E-02	2.85E-02	1.2E-01
Cadmium	5.10E-05	lb/ton	2.49E-02	2.13E-02	4.2E-04	lb/1,000 gal	3.9E-03	0.34	lb/trillion btu	2.79E-03	3.53E-07	lb/MMBtu	2.93E-03	6.45E-06	lb/MMBtu	5.35E-02	5.35E-02	2.3E-01
Chromium, total	2.60E-04	lb/ton	1.27E-01	1.08E-01	4.2E-04	lb/1,000 gal	3.9E-03	7.69	lb/trillion btu	6.38E-02	1.53E-05	lb/MMBtu	1.27E-01	1.89E-05	lb/MMBtu	1.57E-01	1.57E-01	6.9E-01
Chromium, hexavalent	7.90E-05	lb/ton	3.86E-02	3.29E-02													3.86E-02	1.7E-01
Cobalt	1.00E-04	lb/ton	4.88E-02	4.17E-02				2.38	lb/trillion btu	1.98E-02	4.86E-06	lb/MMBtu	4.04E-02	4.62E-06	lb/MMBtu	3.83E-02	4.88E-02	2.1E-01
Copper			-	-	8.4E-04	lb/1,000 gal	7.8E-03										7.80E-03	
Lead	4.20E-04	lb/ton	2.05E-01	1.75E-01	1.3E-03	lb/1,000 gal	1.2E-02	7.64	lb/trillion btu	6.34E-02	1.01E-05	lb/MMBtu	8.38E-02	6.40E-05	lb/MMBtu	5.31E-01	5.31E-01	2.3E+00
Mercury	8.30E-05	lb/ton	4.05E-02	3.46E-02	4.2E-04	lb/1,000 gal	3.9E-03	5.26	lb/trillion btu	4.36E-02	1.68E-06	lb/MMBtu	1.39E-02				1.39E-02	6.E-02
Magnesium	1.10E-02	lb/ton	5.37E+00	4.59E+00													5.37E+00	
Manganese	4.90E-04	lb/ton	2.39E-01	2.04E-01	8.4E-04	lb/1,000 gal	7.8E-03	19.27	lb/trillion btu	1.60E-01	1.13E-04	lb/MMBtu	9.35E-01	9.70E-05	lb/MMBtu	8.05E-01	9.35E-01	4.1E+00
Nickel	2.80E-04	lb/ton	1.37E-01	1.17E-01	4.2E-04	lb/1,000 gal		6.04	lb/trillion btu	5.01E-02	1.46E-05	lb/MMBtu	1.21E-01	1.98E-05	lb/MMBtu	1.64E-01	1.64E-01	7.2E-01
Phosphorus			-	-				31.50	lb/trillion btu	2.61E-01							2.61E-01	1.1E+00
Selenium	1.30E-03	lb/ton	6.34E-01	5.42E-01	2.1E-03	lb/1,000 gal	2.0E-02	18.76	lb/trillion btu	1.56E-01	2.15E-06	lb/MMBtu	1.79E-02	2.65E-06	lb/MMBtu	2.20E-02	6.34E-01	2.8E+00
Zinc			-		5.6E-04	lb/1,000 gal	5.2E-03										5.20E-03	

1)AP-42 Table 1.1-13, 1.1-14, & 1.1-18

2)AP-42 Tables 1.3-9 & 1.3-10

3) Test Report Data Table A-1 and A-4 from the study of Hazardous Air Pollutant emissions from Electric Utility Steam Generating Units- Final report to Congress (1998) and Data derived from EPA NEI HAP emissions inventory data - 2002 NEI V3 last updated September 2007 and 2006 TRI Database

4) MACT Analysis HAP Emissions rate data derived from USGS COALQUAL Data as indicated in Sections 17, 18, and 19 of calculations.

5) Worst case ton/yr emissions indicated for HAPs. Emissions indicated worst case value of emission estimate resources reviewed with four exceptions. Value indicated for HF, HCl, mercury, and lead representative of emission limits proposed for Plant Washington.

Completed by: PBS 4/10/09
Checked by: JDF 4/10/09