NTH Consultants, Ltd.
Infrastructure Engineering
and Environmental Services

608 S. Washington Avenue
Lansing, MI 48933
517.484.6900
517.485.8323 Fax

Mr. Vrajesh Patel
Senior Environmental Engineer
Michigan Department of Environmental Quality
Air Quality Division
P.O. Box 30473
Lansing, MI 48909

November 5, 2008
NTH Project No. 16-060556

RE: Updated Application Support Materials
Holland Board of Public Works
Application 25-07

Dear Mr. Patel:

Per your e-mail, dated October 21, 2008, we are forwarding certain updated application support materials as a result of recent correspondence with MDEQ. Specifically, we are including the following information:

1. Updated Table 6-6
2. Updated Table 3-14
3. Updated Table B-1
4. Updated Table B-5
5. Updated Tables B-16 through B-18
6. Updated Control Cost Spreadsheet for Acid Gases
7. Updated Emissions Spreadsheet Reflecting 100% Fuel Usage
8. Updated TAC Modeling Analysis
9. Updated Table B-25 for Cooling Tower Emissions
10. New Table B-26 for Road Emissions
11. ProUCL Results for Various Bituminous Coals
12. 1 CD with Updated PM_{10} Modeling to Include Roads and Cooling Towers
13. 1 CD with Updated Hg Deposition Modeling Files

This information updates the netting analysis to adjust the "look-back" period to 2003-2007, provides a final emission spreadsheet based on 100% alternate fuel usage, updates the TAC modeling analysis, and details the control costs for a dry FGD to further control acid gases.

Further, based on other recent discussions with MDEQ regarding the potential chlorine content of the bituminous coals that HBPW proposes to consider as fuel for Unit 10 and a request that the MACT analysis address the worst-case fuel chlorine content, we are providing a revised MACT analysis for acid gases. The HCl limit proposed in the revised MACT is based upon a review of various bituminous coals contained in the USGS CoalQUAL database. The highest chlorine content was found in bituminous coals from Pennsylvania and ranged from 26 ppm to 2,828 ppm. For the MACT analysis, the 99% upper confidence on the mean (UCL) was used to set the MACT Floor, while the 95% UCL was used for the long-term limit and in calculating an appropriate control cost. Specifically, HBPW is proposing a MACT Floor limit of 0.063 lb/MMBtu based upon use of the 99% UCL for Pennsylvania bituminous coal. Our analysis shows a control cost of $17,205 per ton of acid gas removed using the 95% UCL for HCl.

Important to this analysis is the fact that this MACT limit and control cost represents the worst-case fuel that HBPW would consider or receive. As previously mentioned and discussed in the MACT determination, HBPW intends to burn a blend of fuels in Unit 10 and utilizing 100% of any given fuel is highly unlikely. Therefore, the control cost for acid gases is expected to be much higher than shown since lower chlorine fuels would be blended with this higher chlorine coal. See the following table for a summary of control costs based upon various coal blends.

Table 1. Summary of Acid Gas Control Costs for Varying Bituminous Coal Blends.

Bituminous Coal Blends			
100% PA	**80% PA / 20% CO**	**50% PA / 50% CO**	**100% CO**
$17,205	**$20,370**	**$27,772**	**$70,430**

If you have any further questions, please feel free to contact us at (517) 484-6900.

Sincerely,

NTH Consultants, Ltd.

Delbert Rector, P.E.
Project Manager

Jeffrey P. Jaros
Vice President

Attachments
cc: Mr. David Koster, Holland Board of Public Works
Mr. Daniel Mitas, HDR|CB

DR/JPJ/mjb

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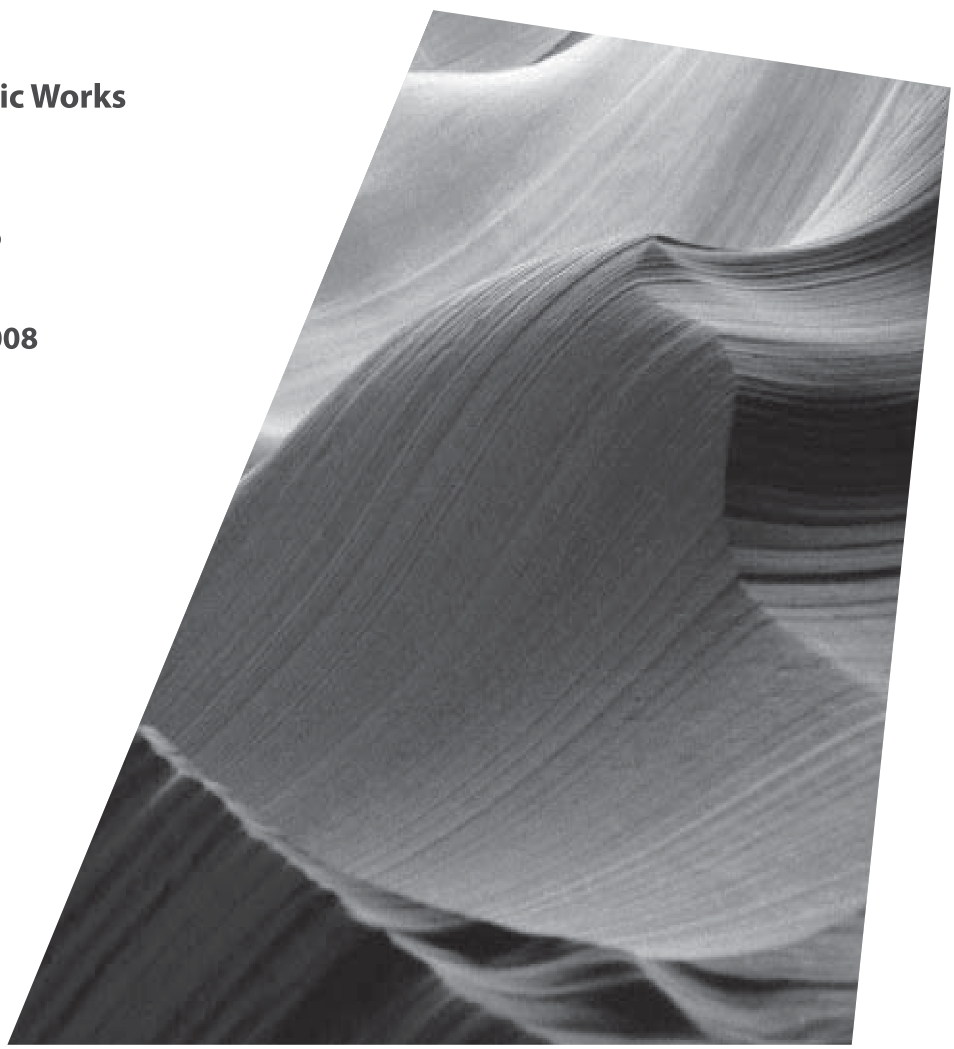
Case-by-Case MACT

Information and Clarification for Previous Clean Air Act Section 112(g) Analyses Holland Board of Public Works - PTI 25-07

NTH Consultants, Ltd.
608 S. Washington Avenue
Lansing, MI 48933

Prepared For:
Holland Board of Public Works
Holland, Michigan

Project No. 16-050556
October 16, 2008
Revised November 5, 2008



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ACEC MEMBER

NTH Consultants, Ltd.
608 S. Washington Avenue
Lansing, MI 48933
Phone: (517) 484-6900 · Fax: (517) 485-8323
www.nthconsultants.com

1.0 INTRODUCTION

Holland Board of Public Works (HBPW) is submitting this revised case-by-case Maximum Achievable Control Technology (MACT) determination for acid gases for the proposed circulating fluidized bed (CFB) boiler as a result of new information received regarding the expected removal efficiency using limestone injection in conjunction with a fabric filter. In summary, the assumptions that were used in the original application to establish limits were based on the AP-42 emission factors for HCl and HF, and applied a control efficiency of 91 percent. During the past several weeks, new and relevant information has been obtained that indicates that these emission limits are too aggressive and do not represent either the MACT floor or a beyond-the-floor limit.

Specifically, the background document for Chapter 1 of *AP-42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources*, was reviewed to determine the source for the published emission factors of 1.2 lb/ton for HCl and 0.15 lb/ton for HF. In summary, these limits are a mathematical summary of limited test data from pulverized coal (PC) boilers only. Further, these limits include data from both controlled and uncontrolled PC boilers. Therefore, including an additional control factor on top of these emission factors was inappropriate.

Finally, HBPW has performed an exhaustive review of similar sources and has contacted several boiler and fabric filter manufacturers for additional information regarding expected control efficiencies for HCl and HF from a CFB boiler operating on the range of fuels proposed for Unit 10. As a result of new information obtained, it is necessary and prudent to update the case-by-case MACT determination for acid gases, including HCl and HF. This revision addresses only these HAPs.

1.1 CIRCULATED FLUIDIZED BED BOILER

CFB boilers are specifically designed to minimize the formation of nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOC) including organic hazardous air pollutants (HAP), and particulate matter (PM). HBPW will utilize state-of-the-art combustion and post-combustion control systems to further minimize emissions. For particulate emissions, including metal HAPs, the CFB is equipped with a high temperature cyclone to capture the unburned portion of the ash and return it to the primary combustion chamber, in conjunction with a fabric filter for additional control. In order to minimize the sulfur dioxide (SO_2) emissions, limestone will be fed into the boiler bed simultaneously with the coal. Acid gas emissions, including hydrogen chloride (HCl) and hydrogen fluoride (HF), are also captured in smaller proportions via limestone injection. Through proper design and good combustion practices the formation of NO_x, CO, VOCs, and organic HAP emissions can be limited by controlling the peak combustion temperature, gas residence time at peak temperature, and the air-to-fuel ratio. To further control NO_x emissions, HBPW will be installing a selective non-catalytic reduction (SNCR) system in the primary cyclone where temperatures are conducive to removal of NO_x. Finally, an activated carbon injection (ACI), or other appropriate sorbent, system will be installed to enhance the removal of mercury (Hg) emissions from the new unit.

1.2 FUELS

As described in the original application and via correspondence to MDEQ, HBPW will be designing the CFB boiler to utilize a wide range of fuels, including bituminous and sub-bituminous coals, wood waste, sewage sludge, tire derived fuel, and petcoke. Each of these fuels contains varying quantities of chlorine (Cl) and Fluorine (F), and trace amounts of these compounds are also present in the limestone.

2.0 REGULATORY BACKGROUND

On February 8, 2008, the United States Circuit Court of Appeals for the District of Columbia (Court) issued an opinion evidencing its intent to vacate the Clean Air Mercury Rule (CAMR) and to overturn the United States Environmental Protection Agency's (USEPA) decision to delist electric generating units as sources regulated under Section 112 of the Clean Air Act (CAA). At this time, the exact implications of this decision on electric generating units (EGUs) in the permitting process are not known. One interpretation is that the vacatur now results in a requirement for major new sources of HAPs to conduct case-by-case preconstruction reviews, until such time as a MACT standard can be promulgated for EGUs. Regardless of the uncertainty surrounding the issue, HBPW has applied for a case-by-case MACT preconstruction review consistent with section 112(g) of the CAA. In the event that a successful appeal of the vacatur or other action results in re-instatement of CAMR and the delisting of EGUs from MACT review, HBPW requests that the permit contain language rendering all permit conditions associated with the MACT requirements as not applicable.

2.1 STATE SPECIFIC REGULATION

Michigan has developed rules in order to both implement and supplement the federal requirements. Specifically, MDEQ has promulgated rules and regulations under the Natural Resources and Environmental Protection Act (Act 451 of 1994, As Amended) and Section 336 of the Michigan Compiled Law (MCL) for the control of air pollution. Per R 336.1299(e) Rule 299(e), Michigan has adopted by reference, the regulations implementing Section 112(g), codified as 40 CFR §63.40 through §63.44. Michigan has also published Operational Memorandum No. 15 which defines the "procedure for processing permit applications subject to Federal Clean Air Act Section 112(g)."

This case-by-case determination revision for acid gases has been prepared in accordance with Michigan Rule 299(e) and Operational Memorandum No. 15. Section 112(g) MACT requirements apply to the proposed CFB boiler because the boiler itself is a major source of HAPs.

3.0 APPLICATION REQUIREMENTS

The application requirements for a case-by-case MACT determination under CAA Section 112(g) are provided at 40 CFR 63.43(e). It states: "(1) An application for a MACT determination … shall specify a control technology selected by the owner or operator that, if properly operated and maintained, will meet the MACT emission limitation or standard as determined according to the principles set forth in paragraph (d) of this section." In each instance where a constructed or reconstructed major source would require additional control technology or a change in control technology, the application for a MACT determination must contain the following information in Table 3-1. Much of this required information has already been provided with Application No. 25-07 and the remaining is included with this application for a MACT determination.

Table 3-1. Application Information

Required Information	Where Found
i) The name and address (physical location) of the major source to be constructed or reconstructed;	Application
(ii) A brief description of the major source to be constructed or reconstructed and identification of any listed source category or categories in which it is included;	Application and MACT Analysis
(iii) The expected commencement date for the construction or reconstruction of the major source;	MACT Analysis
(iv) The expected completion date for construction or reconstruction of the major source;	MACT Analysis
(v) The anticipated date of start-up for the constructed or reconstructed major source;	MACT Analysis
(vi) The HAP emitted by the constructed or reconstructed major source, and the estimated emission rate for each such HAP, to the extent this information is needed by the permitting authority to determine MACT;	Application
(vii) Any federally enforceable emission limitations applicable to the constructed or reconstructed major source;	Application
(viii) The maximum and expected utilization capacity of the constructed or reconstructed major source, and the associated uncontrolled emission rates for that source, to the extent this information is needed by the permitting authority to determine MACT;	Application
(ix) The controlled emissions for the constructed or reconstructed major source in tons/yr at expected and maximum utilization of capacity, to the extent this information is needed by the permitting authority to determine MACT;	Application and MACT Analysis

Required Information	Where Found
(x) A recommended emission limitation for the constructed or reconstructed major source consistent with the principles set forth in paragraph (d) of this section;	Application and MACT Analysis
(xi) The selected control technology to meet the recommended MACT emission limitation, including technical information on the design, operation, size, estimated control efficiency of the control technology (and the manufacturer's name, address, telephone number, and relevant specifications and drawings, if requested by the permitting authority);	MACT Analysis
(xii) Supporting documentation including identification of alternative control technologies considered by the applicant to meet the emission limitation, and analysis of cost and non-air quality health environmental impacts or energy requirements for the selected control technology; and	MACT Analysis
xiii) Any other relevant information required pursuant to subpart A.	MACT Analysis

4.0 HAP EMISSIONS

The proposed CFB boiler will be nominally rated at 865 MMBtu/hr heat input with a gross output of approximately 78 MW. The emission rates are reflective of maximum operation with the range of fuels proposed and consistent with the maximum pollutant emissions across the range of fuels proposed for this project.

As identified in the permit to install support materials, as updated on July 1, 2008 in a letter to Mr. John Vial of the MDEQ, the proposed CFB boiler will emit HAPs listed in Section 112(b)(1) of the CAA. In its proposed 2004 National Emission Standard for Hazardous Air Pollutants (NESHAP), the USEPA only established a limit for mercury emissions from coal-fired EGUs. Nevertheless, this case-by-case MACT analysis will evaluate non-mercury HAPs; specifically inorganic HAP emissions (acid gases). Pursuant to Michigan Rule 299(e) and Operational Memorandum No. 15, the analysis does not require that each HAP be considered independently, but rather different forms of HAPs (e.g., particulate HAPs, organic HAPs, etc.) are expected to be evaluated separately. USEPA has allowed the grouping of HAPs based on how they are characterized and controlled together, along with using surrogates for measuring compliance. HAPs are typically categorized into inorganic acid gases, mercury compounds, metal compounds, and organic HAPs.

The potential emissions of HAPs from the CFB are detailed in Appendix B of PTI Application No. 25-07 and updated on July 1, 2008. Please refer to the previously submitted emission estimate spreadsheet for a summary of the expected HAP emission from the proposed Unit 10 CFB boiler.

5.0 CASE-BY-CASE MACT ANALYSIS METHODOLOGY

MACT is a case-by-case analysis for categories of major sources of HAP emissions where USEPA has not promulgated emission standards. It is meant as a means to predict what USEPA would determine is MACT in rulemaking for each source category.

5.1 MAXIMUM ACHIEVABLE CONTROL TECHNOLOGY

MACT is defined in §63.41 as:

> *the **emission limitation** which is **not less stringent** than the **emission limitation achieved in practice** by the **best controlled similar source**, and which reflects the **maximum degree of reduction in emissions** that the permitting authority, taking into consideration the **cost of achieving such emission reduction**, and **any non-air quality health and environmental impacts** and **energy requirements**, determines is **achievable** by the constructed or reconstructed major source.* (emphasis added)

The principles of case-by case MACT determinations have been codified in 40 CFR 63.43(d):
(d) Principles of MACT determinations.

> *The following general principles shall govern preparation by the owner or operator of each permit application or other application requiring a case-by-case MACT determination concerning construction or reconstruction of a major source, and all subsequent review of and actions taken concerning such an application by the permitting authority:*

1) *The MACT emission limitation or MACT requirements recommended by the applicant and approved by the permitting authority shall not be less stringent than the emission control which is achieved in practice by the best controlled similar source, as determined by the permitting authority.*

2) *Based upon available information, as defined in this subpart, the MACT emission limitation and control technology (including any requirements under paragraph (d)(3) of this section) recommended by the applicant and approved by the permitting authority shall achieve the maximum degree of reduction in*

emissions of HAP which can be achieved by utilizing those control technologies that can be identified from the available information, taking into consideration the costs of achieving such emission reduction and any non-air quality health and environmental impacts and energy requirements associated with the emission reduction.

3) *The applicant may recommend a specific design, equipment, work practice, or operational standard, or a combination thereof, and the permitting authority may approve such a standard if the permitting authority specifically determines that it is not feasible to prescribe or enforce an emission limitation under the criteria set forth in section 112(h)(2) of the Act.*

4) *If the Administrator has either proposed a relevant emission standard pursuant to section 112(d) or section 112(h) of the Act or adopted a presumptive MACT determination for the source category which includes the constructed or reconstructed major source, then the MACT requirements applied to the constructed or reconstructed major source shall have considered those MACT emission limitations and requirements of the proposed standard or presumptive MACT determination.*

The methodology establishes a two-step analysis in determining MACT. Step 1 of the MACT analysis is to identify the emission limit achieved in practice by the best controlled similar source. This is often referred to as the "MACT floor." While the term "MACT floor" is specifically defined in 40 CFR 63.51 for sources subject to 112(j) of the CAA, it is used here to describe the compilation of the best controlled similar sources. Step 2 of the MACT analysis requires the applicant to look at the maximum reduction in HAPs using any technology, not just that representing the MACT floor. This entails determining the maximum reduction in HAP emissions that the specific source, on a case-by-case basis, can achieve taking into consideration cost and non-air quality health and environmental impacts and energy requirements. Step 2 is referred to as "beyond-the-floor" MACT analysis.

5.2 IDENTIFYING THE MACT FLOOR

Pursuant to 40 CFR 63.43(d), an applicant is required to review all "available information" in determining the emission limit achieved in practice by the best controlled similar source. Available information is defined in §63.41 as:

for purposes of identifying control technology options for the affected source, information contained in the following information sources as of the date of approval of the MACT determination by the permitting authority:

1) *A relevant proposed regulation, including all supporting information;*
2) *Background information documents for a draft or proposed regulation;*
3) *Data and information available from the Control Technology Center developed pursuant to section 113 of the Act;*
4) *Data and information contained in the Aerometric Informational Retrieval System including information in the MACT data base;*
5) *Any additional information that can be expeditiously provided by the Administrator; and*
6) *For the purpose of determinations by the permitting authority, any additional information provided by the applicant or others, and any additional information considered available by the permitting authority.*

40 CFR 63.43(d)(4) as well as the definition of "available information" described above, require that the emission limitations and requirements of a proposed standard or presumptive MACT determination for a source category be considered in a MACT determination. Therefore, it is appropriate to consider background and supporting information for the proposed and vacated regulations regarding EGUs when establishing the MACT floor (e.g., CAMR, 40 CFR Part 63, Subpart UUUUU).

5.2.1 Determination of Similar Source

It is important to recognize that not all EGUs will qualify as a similar source. USEPA defined "similar source" at 40 CFR 63.41as:

> *"a stationary source or process that has **comparable emissions** and is **structurally similar in design and capacity** to a constructed or reconstructed major source such that the source could be **controlled using the same control technology**."* (emphasis added)

Based on this definition, when proposing the mercury NESHAP for EGUs, USEPA proposed subcategories based on the fuel used, as well as distinct combustion technologies. Specifically, USEPA subcategorized coal-fired EGUs based on the rank of coal fired (e.g., bituminous, sub-bituminous, etc.) and identified IGCC units separately (69 FR 4652, 4662-63, Jan. 30, 2004). For units that fire multiple fuels (e.g., bituminous coal and sub-bituminous coal), USEPA proposed a blended standard based on the amount of each fuel fired (69 FR 4674-75, Jan. 30, 2004). For example, an EGU burning 80 percent bituminous coal and 20 percent sub-bituminous coal would be subject to a different standard than a unit burning 50 percent bituminous coal and 50 percent sub-bituminous coal even though both units may be using the same control technologies. Thus, in determining what a best controlled similar source is for a proposed coal-fired EGU for which a case-by-case MACT is being performed, the most important parameter is the fuel that will be fired.

The design of the unit can also be a factor in determining whether the source is similar. USEPA recognized that fluidized bed combustion (FBC) units are a "distinct type of boiler" (FR 4693 January 30, 2004). USEPA did not subcategorize the mercury limits based on process because their "test data results for FBC units were not substantially different from those at similarly fueled conventionally fired units…". For acid gases, the combustion process, control technology, and fuel are of critical importance and the similar sources for acid gases consist of CFB boilers with limestone injection.

5.2.2 Achieved In Practice

The determination of best controlled similar source is limited to emission limits that have been achieved in practice, which of necessity means existing operating units and not units that may operate in the future. As proposed, the CFB boiler will be capable of firing 100 percent sub-bituminous coal, 100 percent bituminous coal, a blend of these coals, or a blend with the other fuels identified in Section 1.2. One of the great advantages of CFB technology is the ability to accommodate a wide range of fuels while minimizing air pollutant emissions. Therefore, similar sources to be considered and compared to the proposed CFB are multi-fuel CFB boilers. Emissions of HAPs (such as acid gases) are directly related to the amount of the pollutant (or precursor) in the fuel, which varies even within the same fuel type. Coal properties affecting emissions (mercury, fluorine and chlorine contents) vary from each mine and even from each seam. Short-term stack test results do not adequately account for that variability in fuel type, much less with different blends.

Achieved in practice means a MACT limit that is able to be met continuously under reasonably foreseeable worst-case conditions (*Sierra Club v. EPA*, 167 F.3d 658, 665, D.C. Cir. 1999). It does not mean the lowest HAP emission rate ever measured from a similar source, which primarily, if not exclusively, are the result of short-term stack tests conducted under normal operations. To establish a limit based on the lowest emission rate ever measured would guarantee that limit would be violated, even by the source upon which it is based. *See id.* ("It is reasonable to suppose that if an emissions standard is as stringent as 'the emissions control that is achieved in practice' by a particular unit, then that particular unit will not violate the standard. This only results if 'achieved in practice' is interpreted to mean 'achieved under the worst foreseeable circumstances.'") Thus, to ensure the MACT limits are continuously achievable, it is appropriate to include a margin of safety in the limit to ensure that reasonably foreseeable worst-case circumstances are covered, particularly when based on limited data. *See id.*; *see also* 69 Fed. Reg. at 4678 (describing approach USEPA used in developing proposed MACT limits for new EGUs to address uncertainty and variability in emission test results).

The method of measurement of the emissions is also an important factor when it comes to the determination of variability and achievability. This is especially important when evaluating acid gas emissions. In evaluating the emission rates that have been achieved by similar sources, it is important to compare units with similar methods of measurement.

5.3 BEYOND THE MACT FLOOR

Having identified the MACT floor, the next step is referred to as "beyond the floor" (BTF) analysis. The BTF analysis involves a review of whether or not it is appropriate to set an emission limit at a level more stringent than the MACT floor. BTF determines the maximum reduction that can be achieved using available technology and taking into consideration economic cost, non air quality related health and environmental impacts and energy requirements (40 CFR 63.43(d)(2)).

6.0 CASE-BY-CASE MACT ANALYSIS

The case-by-case MACT analysis for acid gases (HCl and HF) is described below.

6.1 ACID GAS HAPS

The primary acid gas (inorganic HAP) emissions from the proposed CFB boiler will be hydrogen fluoride (HF) and hydrogen chloride (HCl). HF and HCl formation are a result of oxidation of the fluorine and chlorine present in the fuel during combustion. For Unit 10, control systems have not been specifically designed to control emissions of HF and HCl. Instead, reductions of acid gas emissions are achieved as a co-benefit from the sulfur dioxide (SO_2) and particulate control systems; namely injection of limestone into the CFB boiler and the fabric filter.

6.1.1 Acid Gas MACT Floor Analysis

As mentioned above, the primary acid gas emissions from a CFB boiler utilizing coal as the primary solid fuel are HF and HCl. In the proposed Utility Boiler MACT (40 CFR 63 – Subpart UUUUU) USEPA concluded that emissions of HF and HCl did not pose a significant health risk because no exceedances of the benchmark were found (see Utility Report to Congress). Consequently, USEPA chose not to propose an emission standard for inorganic (acid gas) HAP emissions. Nonetheless, as part of the case-by-case MACT analysis, HBPW is required to address these emissions and determine the appropriateness of establishing a MACT Floor.

SO_2 is typically a PSD pollutant for coal-fired boilers; therefore, there is available data on control technology and emission limits. As detailed in the Technical Support Document (TSD) for Application No. 25-07, the proposed project will not result in a significant net increase in emissions of SO_2. In fact, HBPW is proposing to shutdown and remove existing Unit 3, an uncontrolled pulverized coal-fired boiler, as part of the project, which will result in an overall reduction in SO_2 emissions of 178.8 tpy. Therefore, HBPW was not required to complete a control technology review and implement BACT per 40 CFR 52.21(j). This makes the HBPW analysis unique when setting the MACT floor in that most CFB boilers use additional control systems for SO_2 emissions to meet PSD BACT.

In defining a similar source, the case-by-case MACT analysis is defined as a CFB boiler (utility) firing both bituminous and sub-bituminous coals and employing limestone injection technology within the CFB boiler bed. There is no data available for petcoke or renewable fuels. Since chlorine and fluorine levels are similar to the levels in bituminous and sub-bituminous coals, the MACT Floor review is based on the use of bituminous and sub-bituminous coals.

Emissions of HF and HCl are dependent upon the fluorine and chlorine content of the fuels. The uncontrolled emissions were based upon emission factors for bituminous and sub-bituminous coal combustion found in USEPA's AP-42 document; *AP-42, Fifth Edition, Volume I, Chapter 1, External Combustion Sources, Section 1.1*. In the original application, HBPW calculated the expected emission of HCl and HF assuming a control efficiency of 92 percent with a 15 percent safety factor (resultant control efficiency of 91 percent). This resulted in an emission limit of 0.005 lb/MMBtu for HCl and 0.0006 lb/MMBtu for HF.

However, a review of the background document supporting Section 1 of the USEPA AP-42 document details that the emission factors published for both HCl and HF are based upon a mathematical average of limited data and represents: 1.) only PC boilers; 2.) data from both controlled and uncontrolled PC boilers; and 3.) both EGUs and non-EGUs (i.e., industrial boilers). Therefore, the data used to develop these emission factors are not representative of similar sources.

Similar sources with emission limits for HCl and HF were reviewed to determine if compliance testing has been completed. This review identified only one (1) similar source; Manitowoc Public Utilities (MPU) Unit 9 (Permit No. 02-RV-147). Unit 9 is a 64 MWe (650 MMBtu/hr) CFB boiler utilizing limestone injection for control of SO_2 and acid gases, and capable of firing coal, petcoke and paper pellets. The MPU Unit 9 permit contains an emission limit for HF of 0.0017 lb/MMBtu and does not contain a limit for HCl. MPU completed compliance testing in March 2006 and was able to meet this limit; therefore 0.0017 lb/MMBtu represents the MACT Floor for HF emissions.

A review of available information did not find a similar source with a permitted HCl limit. It is concluded that a MACT Floor for HCl emissions from a CFB boiler with limestone injection does not exist. Therefore, HBPW is required to identify the MACT floor for HCl specific to Unit 10. Discussions with boiler and fabric filter baghouse vendors has resulted in a wide variety of opinions regarding expected HCl removal efficiencies from the CFB boiler and fabric filter. There is little experience in the industry that provides a basis for clear understanding of the variables that affect HCl control. Given the range of fuels planned for Unit 10 and lack of industry test data, particularly for small CFB boilers (i.e., less than 100 MW), the MACT Floor is best identified by calculating the emission limit that would result based on the expected chlorine content of the fuel assuming minimal control. In the case of Unit 10, analytical data from coal suppliers indicates that bituminous coals can have widely varying chlorine content and range from 80 ppm to over 800 ppm. Recent discussions with major CFB boiler manufacturers have indicated that, while it is recognized that some reduction in HCl emissions is likely within the CFB boiler, actual quantification of this reduction cannot be derived from available data. Indications from CFB boiler manufacturers indicate that removal rates of 30 to 50 percent might be achieved, but cannot be guaranteed. Consequently, a minimal control efficiency of 30 percent for HCl emissions from the combination of the CFB boiler and fabric filter is reasonable.

The CoalQUAL database was used to determine expected chlorine levels from various bituminous coals. Pennsylvania coals were found to have the highest chlorine levels. Using the 99% Upper Confidence Limit (UCL) on the mean, the theoretical HCl emissions from Unit 10 assuming 100 percent Pennsylvania bituminous coal firing with a Cl content of 1,118 ppm yields an HCl emission limit of 0.063 lb/MMBtu. This is based on bituminous coal with a heating value of 12,847 Btu/lb and 30 percent control.

$$\text{HCl Input} = \frac{1{,}118\ \text{ppm}}{12{,}847\ \text{Btu/lb}} \times \frac{36.45\ \text{g/mol}}{35.45\ \text{g/mol}} \times (1 - 0.30) = 0.063\ \text{lb/MMBtu}$$

HBPW proposes a MACT Floor emission limit for HCl of 0.063 lb/MMBtu based on a chlorine content of 860 ppmd for bituminous coals and no control.

6.1.2 Acid Gas Beyond the Floor Analysis

Having identified, and proposed in the case of HCl, the MACT Floors for HF and HCl, the next step is to identify a MACT limit based on a review of additional information in order to complete the beyond-the-floor (BTF) analysis.

As discussed above, recent discussions with CFB boiler manufacturers revealed that, while it is recognized that some reduction of HCl and HF emissions is likely to occur inside the boiler, actual quantification of expected control efficiencies cannot be derived from available data. Previously, HBPW has stated that limestone injection is expected to achieve a minimum control efficiency of 91 percent for acid gas emissions. However, as a result of these discussions, this level of control cannot be supported by any data and is likely in error. Instead, a wide range of control efficiencies of between 30 and 80 percent for acid gases could be expected from the combination of the CFB boiler with limestone injection and the downstream fabric filter. In general, the upper range of this expected control efficiency could be appropriate for HF while the lower range is most appropriate for HCl.

In the case of HCl, however, test data for a CFB boiler at Michigan State University (Unit 4) has been obtained by MDEQ and the results show that the HCl emissions were 0.082 lb/MMBtu based on bituminous coal firing. Unit 4 is a CFB boiler rated at 350,000 lb/hr steam capable of firing coal and natural gas utilizing limestone injection for control of SO_2 and acid gases. This test data information indicates that very low capture efficiencies of HCl are achieved in the CFB boiler via limestone injection. The likely sources of bituminous coal for the HBPW Unit 10 CFB boiler will be similar to the source of coal for Michigan State University. Given this information, it seems unlikely that HBPW's Unit 10 can rely on any additional control beyond 30 percent for HCl emissions from the proposed boiler and downstream fabric filter.

For HF, HBPW estimates that the fluorine content of the coals proposed could be as high as 100 ppm on a dry basis. Assuming this input level into the boiler yields uncontrolled HF emissions of 0.008 lb/MMBtu calculated, as done for HCl. As the MACT floor for HF has been determined to be 0.0017 lb/MMBtu, this represents a control efficiency of 79 percent. This value is above the upper range of control expected for HF emissions utilizing LI and no further control is expected. Therefore, the BTF limit for HF is proposed to be 0.0017 lb/MMBtu.

6.1.3 MACT for Acid Gases

Emission limits of 0.0017 lb/MMBtu for HF and 0.063 lb/MMBtu for HCl are proposed to satisfy MACT requirements. The use of limestone injection and a fabric filter baghouse will be utilized to minimize emissions of these acid gases. HBPW will meet the proposed limits identified above and conduct initial and periodic performance tests to demonstrate compliance with MACT.

Shutdown of Unit 3

The Holland Board of Public Works has committed to shut down existing Unit 3, an 11 MW pulverized coal-fired boiler. Unit 3 is not equipped with an FGD system to control SO_2 or acid gas emissions. Therefore, emissions of acid gases from Unit 3 are emitted as uncontrolled. In fact, the estimated uncontrolled emissions of HF and HCl are 3.3 tpy and 23.8 tpy, respectively, based on a composite average fluorine concentration in coal for HF and AP-42 emission factor of 1.2 lb/ton for HCl. The estimated annual emissions of HF and HCl from the proposed Unit 10 CFB boiler are 6.44 tpy and 215.96 tpy. Therefore, a net emissions reduction of 1.8 tpy for HF as a result of this project is expected.

7.0 SUMMARY

As detailed in the previous sections, recent and relevant information required that HBPW revise the original case-by-case MACT analysis for acid gases. The MACT limits proposed in Section 6 now represent the BTF MACT limits for both HF and HCl, based on very limited test data and information from boiler manufacturers and fabric filter vendors. In summary, HBPW proposes an emission limit of 0.063 lb/MMBtu for HCl and 0.0017 lb/MMBtu for HF, consistent with the requirements of R 336.299(e) and Section 112 of the Clean Air Act.

Table 6-6. PM_{10} Emission Rates – Future Potential Emissions (NAAQS Modeling Analysis)

Point Sources			Potential Emission Rates (lbs/hr)	Modeled Emission Rates (gram/sec)
New CFB Boiler Unit #10 Baghouse			21.63	2.72
Existing Unit #4 (ESP Control) - Based on ROP Limit			75.53	9.517E+00
Existing Unit #5 (ESP Control) - Based on ROP Limit			95.74	1.206E+01
Transfer/Crusher House Baghouse			0.34	0.043
Unit #10 Coal Storage Silos Baghouse			0.51	0.064
Unit #10 Limestone Bin Filter			0.17	5.93E-05
Unit #10 Fly Ash Silo Vent			0.04	7.46E-05
Cooling Tower			0.22	0.004
Roads			0.0186	0.0023
Unit #4 and #5 Existing Fly Ash Silo Vent			5.17E-04	6.51E-05
Fugitive Area Sources	**Source Area (m^2)**	**Maximum Net Emission Rate (lbs/day)**	**Potential Emission Rates (lbs/hr)**	**Modeled Emission Rates (gram/sec/m^2)**
Active Coal Pile [1]	8,803.0	35.42	1.476	2.112E-05
Compacted Coal Pile [2]	13,274.0	2.93	0.122	1.159E-06
Fugitive Volume Sources			**Potential Emission Rate (lbs/hr)**	**Modeled Emission Rate (gram/sec)**
Underground Loading Hopper			0.0142	1.785E-03

[1] The fugitive emission rate for the active coal pile is the sum of the maximum daily emissions for the coal drop from ship unloading, bull dozer activities, wind erosion on the active pile (normal daily activities) and wind erosion during shipments. The potential emission rate represents the maximum daily

Table 3-14. Emission Netting Analysis

Pollutant	Unit #3 (2-year Past Actual)	Unit #10 (New CFB Boiler)					NSPS		Cooling Tower (7 Cells)	Fugitive Emissions (Roads, Piles, Silos)	Net Change		Significant Emission Rates
	tpy	lb/ $MWhr_{gross}$	lb/ MMBtu[1]	lb/ hr	lb/ yr	tpy	lb/ $MWhr_{gross}$	lb/ MMBtu	tpy	tpy	tpy	lb/ yr	tpy
PM	10.13		0.011	9.52		41.68		0.015	0.95	8.78	41.28		25
$PM_{10}/PM_{2.5}$	10.13		0.025	21.63		94.72		0.015	0.95	5.56	91.10		15
NO_x	425.82	1.0	0.09	78.0		341.64	1.0				-84.18		40
SO_2	531.99	1.4	0.126	109.2		478.30	1.4				-53.69		40
CO	10.58		0.15	129.75		568.31					557.73		100
VOC	0.0041		0.0036	3.11		13.64					13.64		40
Lead	0.0088		2.17E-05	0.019		0.082					0.073		0.6
H_2SO_4	32.69		0.006	5.28		23.11					-9.58		7
HF	4.82		0.0017	1.47		6.44					1.62		3
Mercury	0.00093	7.80E-06	7.03E-07	6.08E-04	5.33	2.66E-03	20E-06				0.002	3.47	

Table B-1. Netting Demonstration

Pollutant	2-year Past Actual		New CFB Boiler						NSPS		Net Change		Significance Level
	Unit #3		Unit #10										
	tpy	Fugitives (tpy)	lb/$MWhr_{gross}$	lb/MMBTU	lb/hr	lb/yr	tpy	Fugitives (tpy)	lb/$MWhr_{gross}$	lb/MMBTU	tpy	lb/yr	tpy
PM [1]	10.13	2.48		0.011	9.52		41.68	12.21		0.015	41.28		15
$PM_{10}/PM_{2.5}$	10.13	0.66		0.025	21.63		94.72	6.14		0.015	91.10		15
NO_x	425.73		1.00	0.09	78.00		341.64		1.0		-84.09		40
SO_2	531.99		1.40	0.126	109.20		478.30		1.4		-53.69		40
H_2SO_4	32.69			6.10E-03	5.28		23.11				-9.58		7
CO	10.58			0.150	129.75		568.31				557.73		100
VOC	0.0041			0.005	4.33		18.94				18.94		40
HF	4.82			0.0017	1.47		6.44				1.62		3
Lead	0.0088			2.17E-05	0.02		0.08				0.07		0.6
Mercury [2]	0.00093		7.80E-06	7.03E-07	6.08E-04	5.33	2.66E-03		2.00E-05		0.002	3.47	

[1] The PM emission factor for Unit #10 is based on the MACT limit using PM as a surrogate for non-mercury metal HAPs.

[2] The mercury emission factor for Unit #10 is based on the MACT limit.

Holland Board of Public Works

Baseline Emission Rates

Table B-5. Baseline Emission Rates

Emission	2000 Unit 3 (tons)	2000 Unit 4 (tons)	2000 Unit 5 (tons)	2000 Total (tons)	2001 Unit 3 (tons)	2001 Unit 4 (tons)	2001 Unit 5 (tons)	2001 Total (tons)	2002 Unit 3 (tons)	2002 Unit 4 (tons)	2002 Unit 5 (tons)	2002 Total (tons)	2003 Unit 3 (tons)	2003 Unit 4 (tons)	2003 Unit 5 (tons)	2003 Total (tons)
PM_{10} Total	3.2	8.64	38.04	49.88	2.96	8.26	39.29	50.51	3.35	7.5	32.5	43.25	5.93	31.02	42.87	79.82
NO_x	392.11	725.64	464.09	1581.84	362.1	694.36	496.31	1552.81	410.3	625.8	417.2	1453.34	370.8	722.6	499.7	1593.02
SO_2	589.71	1054.16	1437.92	3081.79	581.1	1076.55	1406.49	3064.17	680.1	1002.5	1273.2	2955.82	634.1	1194.9	1582.4	3411.44
H_2SO_4	30.47				32.14				33.24				30.03			
CO	8.82	15.75	19.48	44.05	8.38	15.54	19.83	43.75	9.52	14.0	16.8	40.31	8.65	16.1	20.1	44.91
Lead	0.010	0.01	0.02	0.04	0.007	0.01	0.02	0.04	0.008	0.01	0.01	0.03	0.0072	0.01	0.02	0.04
HF	4.030				3.840				4.350				3.9200			
Total VOCs	0.002				0.001				0.000				0.008			
Mercury	8.54E-04				7.89E-04				8.94E-04				8.07E-04	1.98E-03	1.15E-03	0.0039

Emission	2004 Unit 3 (tons)	2004 Unit 4 (tons)	2004 Unit 5 (tons)	2004 Total (tons)	2005 Unit 3 (tons)	2005 Unit 4 (tons)	2005 Unit 5 (tons)	2005 Total (tons)	2006 Unit 3 (tons)	2006 Unit 4 (tons)	2006 Unit 5 (tons)	2006 Total (tons)	2007 Unit 3 (tons)	2007 Unit 4 (tons)	2007 Unit 5 (tons)	2007 Total (tons)
PM_{10} Total	4.28	26.53	36.79	67.60	6.77	31.00	35.42	73.19	13.49	1.35	2.69	17.53	2.38	6.83	2.80	12.01
NO_x	267.5	618.02	419.11	1304.64	422.5	722.00	383.10	1527.60	429.0	532.31	319.30	1280.58	412.0	557.25	382.35	1351.62
SO_2	381.8	851.90	1299.10	2532.75	536.1	885.41	874.50	2296.01	471.5	564.87	792.00	1828.35	592.5	774.13	784.70	2151.33
H_2SO_4	28.32				44.72				33.35				32.02			
CO	6.52	14.64	17.40	38.56	10.13	16.66	17.00	43.79	10.65	12.79	14.91	38.35	10.51	13.79	15.49	39.79
Lead	0.000	0.01	0.01	0.02	0.008	0.01	0.01	0.04	0.009	0.01	0.01	0.03	0.009	0.01	0.01	0.03
HF	2.970				2.970				4.840				4.800			
Total VOCs	0.000			0.0165	0.000				0.000							
Mercury	5.83E-04	1.70E-03	9.80E-04	0.0033	9.20E-04	2.00E-03	9.46E-04	0.0039	9.35E-04	1.00E-03	7.96E-03	0.0099	8.98E-04	5.40E-04	8.33E-04	0.0023

Table B-6. 24-Month Average Emission Rates

Emission	2000-2001 Average Unit 3 (tons)	2000-2001 Average Unit 4 (tons)	2000-2001 Average Unit 5 (tons)	2000-2001 Average Total (tons)	2001-2002 Average Unit 3 (tons)	2001-2002 Average Unit 4 (tons)	2001-2002 Average Unit 5 (tons)	2001-2002 Average Total (tons)	2002-2003 Average Unit 3 (tons)	2002-2003 Average Unit 4 (tons)	2002-2003 Average Unit 5 (tons)	2002-2003 Average Total (tons)	2003-2004 Average Unit 3 (tons)	2003-2004 Average Unit 4 (tons)	2003-2004 Average Unit 5 (tons)	2003-2004 Average Total (tons)
PM_{10} Total	3.08	8.45	38.67	50.19	3.16	7.86	35.87	25.35	4.64	19.24	37.66	61.54	5.10	28.78	39.83	73.71
NO_x	377.13	710.00	480.20	1567.33	386.22	660.09	456.78	1039.57	390.52	674.21	458.45	1523.18	319.13	670.31	459.39	1448.83
SO_2	585.42	1065.36	1422.21	3072.98	630.62	1039.53	1339.85	1979.17	657.13	1098.70	1427.81	3183.63	507.95	1023.39	1440.76	2972.10
H_2SO_4	31.30				32.69				31.63				29.17			
CO	8.60	15.65	19.66	43.90	8.95	14.77	18.31	27.16	9.09	15.07	18.46	42.61	7.58	15.39	18.76	41.73
Lead	0.009	0.010	0.020	0.04	0.007	0.010	0.015	0.02	0.008	0.010	0.015	0.03	0.004	0.010	0.015	0.03
HF	3.935				4.095				4.135				3.445			
Total VOCs	0.001				0.000				0.004				0.004			
Mercury	8.22E-04				8.42E-04				8.51E-04	1.98E-03	1.15E-03		6.95E-04	1.84E-03	1.06E-03	

Emission	2004-2005 Average Unit 3 (tons)	2004-2005 Average Unit 4 (tons)	2004-2005 Average Unit 5 (tons)	2004-2005 Average Total (tons)	2005-2006 Average Unit 3 (tons)	2005-2006 Average Unit 4 (tons)	2005-2006 Average Unit 5 (tons)	2005-2006 Average Total (tons)	2006-2007 Average Unit 3 (tons)	2006-2007 Average Unit 4 (tons)	2006-2007 Average Unit 5 (tons)	2006-2007 Average Total (tons)	Max 24-month Unit 3 (tons)	Max 24-month Total (tons)
PM_{10} Total	5.53	28.77	36.11	70.40	10.13	16.18	19.06	45.36	7.94	4.09	2.75	14.77	10.13	73.71
NO_x	345.00	670.01	401.11	1416.12	425.73	627.16	351.20	1404.09	420.50	544.78	350.83	1316.10	425.73	1567.33
SO_2	458.93	868.66	1086.80	2414.38	503.79	725.14	833.25	2062.18	531.99	669.50	788.35	1989.84	531.99	3183.63
H_2SO_4	36.52				39.04				32.69				39.04	
CO	8.32	15.65	17.20	41.17	10.39	14.73	15.96	41.07	10.58	13.29	15.20	39.07	10.58	43.90
Lead	0.004	0.012	0.012	0.03	0.008	0.013	0.012	0.03	0.009	0.011	0.012	0.03	0.01	0.04
HF	2.970				3.905				4.820				4.82	0.00
Total VOCs	0.000				0.000				0.000				0.00	0.00
Mercury	7.51E-04	1.85E-03	9.63E-04		9.27E-04	1.50E-03	4.45E-03		9.16E-04	7.70E-04	4.40E-03		0.00	0.00

			2000	2001	2002	2003	2004	2005	2006	2007
		MMBtu/yr	902252.2	833632.4	944222.2	852963.7	615548	972090.1	987656.35	948242.4
NOx Emission Factors from TEST run:	0.847	lb/MMBtu	382.10	353.04	399.88	361.23	260.68	411.68	418.27	401.58
Coal Only	0.878	lb/MMBtu	396.09	365.96	414.51	374.45	270.23	426.75	433.58	416.28
	0.881	lb/MMBtu	397.44	367.22	415.93	375.73	271.15	428.21	435.06	417.70
Average	0.869	lb/MMBTU	391.88	362.07	410.11	370.47	267.35	422.21	428.97	411.85
Oil Only		TPY	0.23	0.07	0.18	0.285	0.155	0.286	0.286	0.17
Total		TPY	392.11	362.14	410.29	370.76	267.51	422.50	429.26	412.02
Hg Emission Factors from TEST Run:	2.51E-06	lb/MMBtu	1.13E-03	1.05E-03	1.18E-03	1.07E-03	7.73E-04	1.22E-03	1.24E-03	1.19E-03
	1.52E-06	lb/MMBtu	6.86E-04	6.34E-04	7.18E-04	6.48E-04	4.68E-04	7.39E-04	7.51E-04	7.21E-04
	1.65E-06	lb/MMBtu	7.44E-04	6.88E-04	7.79E-04	7.04E-04	5.08E-04	8.02E-04	8.15E-04	7.82E-04
	1.89E-06	lb/MMBTU	8.54E-04	7.89E-04	8.94E-04	8.07E-04	5.83E-04	9.20E-04	9.35E-04	8.98E-04

	2000	2001	2002	2003	2004	2005	2006	2007
MMBtu/hr	114.0	120.3	124.4	112.4	106.0	167.4	124.8	119.8

NOTE: HF Emissions are calculated based upon an emission factor of 0.23 lb/ton, consistent with recommendations by USEPA. Details of this emission factor are found in EPA 745-B-00-004, EPCRA Section 313 Guidance for calculating HF emissions for TRI.

Appendix C
Control Technology Cost Basis for Dry Flue Gas Desulfurization for Acid Gas Control
One (1) 78 MW Circulating Fluidized Bed Boiler - Bituminous Coal (1,005 ppm Chloride Case)
REVISED: November 5, 2008

Cost Item	Cost Description	Cost Factor		Cost 2007 $
DIRECT CAPITAL INVESTMENTS (DCI)				
	Buildings		$	524,000
	Site Preparation		$	34,500
	Installation Cost		$	3,910,000
	Purchased Equipment		$	9,340,000
	Taxes on Real Property Only	No taxes applied to Production Equipment	$	35,700
	TOTAL DCI		**$**	**13,840,000**
INDIRECT CAPITAL INVESTMENT (ICI)				
	Engineering and Proj Management		$	824,000
	Construction & Field Expenses		$	922,000
	Contractor Fees	Included with Field Expense		
	Start-up	Included with Field Expense		
	Performance Test	Included with Field Expense		
	Contingencies		$	3,120,000
	TOTAL ICI		**$**	**4,866,000**
TOTAL CAPITAL INVESTMENT (TCI)	DCI + ICI		**$**	**18,706,000**
DIRECT OPERATING COSTS (DOC)				
	Labor			
	- Operator	2 equivalent operators @ $115,000/year	$	230,000
	- Supervisory	20% of Operator Labor Cost	$	46,000
	- Maintenance	1 technician @ $115,000/year	$	115,000
	Materials			
	- Maintenance Materials	3.5% of DCI	$	484,400
	- Reagent (Lime)	$70 per ton	$	44,600
	- Limestone	NA	$	-
	- Water	650 gpm	$	2,100
	Utilities		$	-
	- Electricity	450 kW @ $60/MWh	$	237,000
	- Fuel		$	-
	- Pressure Drop	4.5 " pressure drop	$	100,000
	- Waste Disposal	Incremental Waste Solids, 1,400 tpy at $12/ton	$	16,500
	TOTAL DOC		**$**	**1,275,600**
INDIRECT OPERATING COSTS (IOC)				
	Overhead	60% of Operator labor & Maintenance	$	234,600
	Property Taxes	Applicable to Project - Assume $0 - Conservative	$	-
	Insurance	1% of TCI	$	187,060
	Administrative Charges	2% of TCI	$	374,120
	Capital Recovery	20 years; 7% interest = 0.0944 CRF	$	1,765,846
	TOTAL IOC			**2,561,626**
RECOVERY CREDITS (RC)				
	Materials			-
	SO2 Market Credits	320.5 tpy based on 67% removal @ $400/ton	$	(128,200)
	TOTAL RC		**$**	**(128,200)**
TOTAL ANNUALIZED COSTS (TAC)	DOC + IOC - RC		**$**	**3,709,026**
HF EMISSIONS	80% Control	0.0017 lb/MMBtu		6.44
	98% Control	0.0002 lb/MMBtu		0.76
	TOTAL REDUCTION			**5.68**
	Cost-Effectivness	$ per ton of HF removed	**$**	**652,647**
HCl EMISSIONS	30% Control	0.057 lb/MMBtu		215.96
	98% Control	0.0016 lb/MMBtu		6.06
	TOTAL REDUCTION			**209.89**
	Cost-Effectivness	$ per ton of HCl removed	**$**	**17,671**
	Cost Effectiveness - Total Acid Gas	$ per ton of Acid Gas Removed	**$**	**17,205**

Table B2. Boiler Specifications

Boiler Parameters	Specification
Boiler Type	CFB
Maximum Rated Heat Input, (MMBtu/hr)	865
Gross Output (MW/hr)	78

Table B3. Raw Material Specifications

Material	Sulfur Content	Material Usage (%)	Heat Input (MMBtu/hr)	Heating Value (Btu/lb)	Material Throughput (lb/hr)	Material Throughput (tph)	Material Throughput (tpy)
Coal, Western Bituminous	0.50%	100.0%	865	13,118	65,940	32.97	288,817
Coal, Southern Illinois	4.30%	100.0%	865	11,484	75,322	37.66	329,911
Coal, Western Sub-bituminous	0.50%	100.0%	865	8,800	98,295	49.15	430,534
Petcoke	5.00%	50.0%	432.5	15,000	28,833	14.42	126,290
Sewage Sludge	0.00%	20.0%	173	7,000	15,817	7.91	69,279
Tire Derived Fuel	1.33%	30.0%	259.5	13,500	19,222	9.61	84,193
Waste Wood	0.00%	30.0%	259.5	8,000	32,438	16.22	142,076

Table B4. Emission Factors and Emission Rates

Compound	Coal, Western Bituminous					Coal, Southern Illinois					Coal, Western Sub-bituminous					Petcoke (Maximum 50% Heat Input)				
	Emission Factors			Emission Rates		Emission Factors			Emission Rates		Emission Factors			Emission Rates		Emission Factor			Emission Rates	
	Value	Units	Basis	(lb/hr)	(tpy)	Value	Units	Basis	(lb/hr)	(tpy)	Value	Units	Basis	(lb/hr)	(tpy)	Value	Units	Basis	(lb/hr)	(tpy)
PM_{10}	0.025	lb/MMBtu	PSD-BACT	21.6	94.7	0.025	lb/MMBtu	PSD-BACT	21.6	94.7	0.025	lb/MMBtu	PSD-BACT	21.6	94.7	0.025	lb/MMBtu	PSD-BACT	21.6	47.4
PM	0.011	lb/MMBtu	PSD-BACT	9.5	41.7	0.011	lb/MMBtu	PSD-BACT	9.52	41.68	0.011	lb/MMBtu	PSD-BACT	9.5	41.7	0.011	lb/MMBtu	PSD-BACT	9.5	20.8
SO_2	1.4	lb/MW_{hr}	NSPS	109.2	478.3	1.4	lb/MW_{hr}	NSPS	109.2	478.3	1.4	lb/MW_{hr}	NSPS	109.2	478.3	1.4	lb/MW_{hr}	NSPS	109.2	239.1
NO_x	1.0	lb/MW_{hr}	NSPS	78.0	341.6	1.0	lb/MW_{hr}	NSPS	78.0	341.6	1.0	lb/MW_{hr}	NSPS	78.0	341.6	1.0	lb/MW_{hr}	NSPS	78.0	170.8
CO	0.15	lb/MMBtu	PSD-BACT	129.8	568.3	0.15	lb/MMBtu	PSD-BACT	129.8	568.3	0.15	lb/MMBtu	PSD-BACT	129.8	568.3	0.15	lb/MMBtu	PSD-BACT	129.8	284.2
Lead	2.17E-05	lb/MMBtu	99% Control	0.02	0.082	2.17E-05	lb/MMBtu	99% Control	0.02	0.082	2.17E-05	lb/MMBtu	99% Control	0.02	0.082	2.17E-05	lb/MMBtu	99% Control	0.02	0.041
VOC	0.005	lb/MMBtu	MACT	4.33	18.94	0.005	lb/MMBtu	MACT	4.33	18.94	0.005	lb/MMBtu	MACT	4.33	18.94	0.005	lb/MMBtu	MACT	4.33	9.47
Mercury	7.034E-07	lb/MMBtu	MACT	6.08E-04	2.66E-03	7.034E-07	lb/MMBtu	MACT	6.08E-04	2.66E-03	7.034E-07	lb/MMBtu	MACT	6.08E-04	2.66E-03	7.034E-07	lb/MMBtu	MACT	6.08E-04	1.33E-03
Hydrogen chloride (HCl)[4]	0.063	lb/MMBtu	MACT	54.50	215.96	0.063	lb/MMBtu	MACT	54.50	215.96	0.063	lb/MMBtu	MACT	54.50	215.96	0.063	lb/MMBtu	MACT	54.50	215.96
Hydrogen fluoride (HF)	0.0017	lb/MMBtu	MACT	1.47	6.4	0.0017	lb/MMBtu	MACT	1.47	6.4	0.0017	lb/MMBtu	MACT	1.47	6.4	0.0017	lb/MMBtu	MACT	1.47	3.2
Sulfuric Acid Mist (H_2SO_4)	6.10E-03	lb/MMBtu	PSD-BACT	5.28	23.11	6.10E-03	lb/MMBtu	PSD-BACT	5.28	23.11	6.10E-03	lb/MMBtu	PSD-BACT	5.28	23.11	6.10E-03	lb/MMBtu	PSD-BACT	5.28	11.56
Total Dioxin/Furan	2.32E-09	lb/ton	AP-42	7.66E-08	3.35E-07	2.32E-09	lb/ton	AP-42	8.75E-08	3.83E-07	2.32E-09	lb/ton	AP-42	1.14E-07	5.00E-07	2.32E-09	lb/ton	Stack Test[2]	3.35E-08	7.33E-08
Hazardous Air Pollutants																				
Acetaldehyde	6.56E-04	lb/ton	AP-42	2.16E-02	9.47E-02	6.56E-04	lb/ton	AP-42	2.47E-02	1.08E-01	6.56E-04	lb/ton	AP-42	3.22E-02	1.41E-01	6.56E-04	lb/ton	AP-42	9.45E-03	2.07E-02
Acetophenone	1.73E-05	lb/ton	AP-42	5.69E-04	2.49E-03	1.73E-05	lb/ton	AP-42	6.50E-04	2.85E-03	1.73E-05	lb/ton	AP-42	8.48E-04	3.71E-03	1.73E-05	lb/ton	AP-42	2.49E-04	5.45E-04
Acrolein[2]	3.34E-04	lb/ton	AP-42	1.10E-02	4.82E-02	3.34E-04	lb/ton	AP-42	1.26E-02	5.50E-02	3.34E-04	lb/ton	AP-42	1.64E-02	7.18E-02	3.34E-04	lb/ton	AP-42	4.81E-03	1.05E-02
Antimony	2.07E-05	lb/ton	AP-42	6.82E-04	`	2.07E-05	lb/ton	AP-42	7.80E-04	3.41E-03	2.07E-05	lb/ton	AP-42	1.02E-03	4.46E-03	2.07E-05	lb/ton	AP-42	2.98E-04	6.54E-04
Arsenic	4.72E-04	lb/ton	AP-42	1.55E-02	6.81E-02	4.72E-04	lb/ton	AP-42	1.78E-02	7.78E-02	4.72E-04	lb/ton	AP-42	2.32E-02	1.01E-01	4.72E-04	lb/ton	AP-42	6.80E-03	1.49E-02
Benzene	1.50E-03	lb/ton	AP-42	4.93E-02	2.16E-01	1.50E-03	lb/ton	AP-42	5.63E-02	2.47E-01	1.50E-03	lb/ton	AP-42	7.35E-02	3.22E-01	1.50E-03	lb/ton	AP-42	2.16E-02	4.72E-02
Benzyl chloride	8.05E-04	lb/ton	AP-42	2.65E-02	1.16E-01	8.05E-04	lb/ton	AP-42	3.03E-02	1.33E-01	8.05E-04	lb/ton	AP-42	3.96E-02	1.73E-01	8.05E-04	lb/ton	AP-42	1.16E-02	2.54E-02
Beryllium	2.42E-05	lb/ton	AP-42	7.96E-04	3.49E-03	2.42E-05	lb/ton	AP-42	9.10E-04	3.98E-03	2.42E-05	lb/ton	AP-42	1.19E-03	5.20E-03	2.42E-05	lb/ton	AP-42	3.48E-04	7.62E-04
Bis(2-Ethylhexyl)phthalate	8.40E-05	lb/ton	AP-42	2.77E-03	1.21E-02	8.40E-05	lb/ton	AP-42	3.16E-03	1.38E-02	8.40E-05	lb/ton	AP-42	4.13E-03	1.81E-02	8.40E-05	lb/ton	AP-42	1.21E-03	2.65E-03
Bromoform	4.49E-05	lb/ton	AP-42	1.48E-03	6.48E-03	4.49E-05	lb/ton	AP-42	1.69E-03	7.40E-03	4.49E-05	lb/ton	AP-42	2.20E-03	9.65E-03	4.49E-05	lb/ton	AP-42	6.47E-04	1.42E-03
Bromomethane (Methyl bromide)	1.84E-04	lb/ton	AP-42	6.07E-03	2.66E-02	1.84E-04	lb/ton	AP-42	6.93E-03	3.04E-02	1.84E-04	lb/ton	AP-42	9.04E-03	3.96E-02	1.84E-04	lb/ton	AP-42	2.65E-03	5.81E-03
Cadmium	5.87E-05	lb/ton	AP-42	1.93E-03	8.47E-03	5.87E-05	lb/ton	AP-42	2.21E-03	9.67E-03	5.87E-05	lb/ton	AP-42	2.88E-03	1.26E-02	5.87E-05	lb/ton	AP-42	8.46E-04	1.85E-03
Carbon disulfide	1.50E-04	lb/ton	AP-42	4.93E-03	2.16E-02	1.50E-04	lb/ton	AP-42	5.63E-03	2.47E-02	1.50E-04	lb/ton	AP-42	7.35E-03	3.22E-02	1.50E-04	lb/ton	AP-42	2.16E-03	4.72E-03
Carbon tetrachloride																				
Chlorine																				
Chlorobenzene	2.53E-05	lb/ton	AP-42	8.34E-04	3.65E-03	2.53E-05	lb/ton	AP-42	9.53E-04	4.17E-03	2.53E-05	lb/ton	AP-42	1.24E-03	5.45E-03	2.53E-05	lb/ton	AP-42	3.65E-04	7.99E-04
Chloroform	6.79E-05	lb/ton	AP-42	2.24E-03	9.80E-03	6.79E-05	lb/ton	AP-42	2.56E-03	1.12E-02	6.79E-05	lb/ton	AP-42	3.33E-03	1.46E-02	6.79E-05	lb/ton	AP-42	9.78E-04	2.14E-03
Chromium, total	2.99E-04	lb/ton	AP-42	9.86E-03	4.32E-02	2.99E-04	lb/ton	AP-42	1.13E-02	4.93E-02	2.99E-04	lb/ton	AP-42	1.47E-02	6.44E-02	2.99E-04	lb/ton	AP-42	4.31E-03	9.44E-03
Chromium, hexavalent	9.09E-05	lb/ton	AP-42	3.00E-03	1.31E-02	9.09E-05	lb/ton	AP-42	3.42E-03	1.50E-02	9.09E-05	lb/ton	AP-42	4.47E-03	1.96E-02	9.09E-05	lb/ton	AP-42	1.31E-03	2.87E-03
Cobalt	1.15E-04	lb/ton	AP-42	3.79E-03	1.66E-02	1.15E-04	lb/ton	AP-42	4.33E-03	1.90E-02	1.15E-04	lb/ton	AP-42	5.65E-03	2.48E-02	1.15E-04	lb/ton	AP-42	1.66E-03	3.63E-03
Cumene	6.10E-06	lb/ton	AP-42	2.01E-04	8.80E-04	6.10E-06	lb/ton	AP-42	2.30E-04	1.01E-03	6.10E-06	lb/ton	AP-42	3.00E-04	1.31E-03	6.10E-06	lb/ton	AP-42	8.79E-05	1.92E-04
Cyanide	2.88E-03	lb/ton	AP-42	9.48E-02	4.15E-01	2.88E-03	lb/ton	AP-42	1.08E-01	4.74E-01	2.88E-03	lb/ton	AP-42	1.41E-01	6.19E-01	2.88E-03	lb/ton	AP-42	4.14E-02	9.08E-02
1,4-Dichlorobenzene																				
1,2-Dichloroethane (Ethylene dichloride)	4.60E-05	lb/ton	AP-42	1.52E-03	6.64E-03	4.60E-05	lb/ton	AP-42	1.73E-03	7.59E-03	4.60E-05	lb/ton	AP-42	2.26E-03	9.90E-03	4.60E-05	lb/ton	AP-42	6.63E-04	1.45E-03
Dichloromethane (Methylene chloride)	3.34E-04	lb/ton	AP-42	1.10E-02	4.82E-02	3.34E-04	lb/ton	AP-42	1.26E-02	5.50E-02	3.34E-04	lb/ton	AP-42	1.64E-02	7.18E-02	3.34E-04	lb/ton	AP-42	4.81E-03	1.05E-02
1,2-Dichloropropane (Propylene dichloride)																				
Dimethyl sulfate	5.52E-05	lb/ton	AP-42	1.82E-03	7.97E-03	5.52E-05	lb/ton	AP-42	2.08E-03	9.11E-03	5.52E-05	lb/ton	AP-42	2.71E-03	1.19E-02	5.52E-05	lb/ton	AP-42	7.96E-04	1.74E-03
2,4-Dinitrophenol																				
2,4-Dinitrotoluene	3.22E-07	lb/ton	AP-42	1.06E-05	4.65E-05	3.22E-07	lb/ton	AP-42	1.21E-05	5.31E-05	3.22E-07	lb/ton	AP-42	1.58E-05	6.93E-05	3.22E-07	lb/ton	AP-42	4.64E-06	1.02E-05
Ethylbenzene	1.08E-04	lb/ton	AP-42	3.56E-03	1.56E-02	1.08E-04	lb/ton	AP-42	4.07E-03	1.78E-02	1.08E-04	lb/ton	AP-42	5.31E-03	2.33E-02	1.08E-04	lb/ton	AP-42	1.56E-03	3.41E-03
Ethylchloride (Chloroethane)	4.83E-05	lb/ton	AP-42	1.59E-03	6.97E-03	4.83E-05	lb/ton	AP-42	1.82E-03	7.97E-03	4.83E-05	lb/ton	AP-42	2.37E-03	1.04E-02	4.83E-05	lb/ton	AP-42	6.96E-04	1.52E-03
Ethylene dibromide (Dibromoethane)	1.38E-06	lb/ton	AP-42	4.55E-05	1.99E-04	1.38E-06	lb/ton	AP-42	5.20E-05	2.28E-04	1.38E-06	lb/ton	AP-42	6.78E-05	2.97E-04	1.38E-06	lb/ton	AP-42	1.99E-05	4.36E-05
Formaldehyde	2.76E-04	lb/ton	AP-42	9.10E-03	3.99E-02	2.76E-04	lb/ton	AP-42	1.04E-02	4.55E-02	2.76E-04	lb/ton	AP-42	1.36E-02	5.94E-02	2.76E-04	lb/ton	AP-42	3.98E-03	8.71E-03
Hexane	7.71E-05	lb/ton	AP-42	2.54E-03	1.11E-02	7.71E-05	lb/ton	AP-42	2.90E-03	1.27E-02	7.71E-05	lb/ton	AP-42	3.79E-03	1.66E-02	7.71E-05	lb/ton	AP-42	1.11E-03	2.43E-03
Hydrogen chloride (HCl)	0.063	lb/MMBtu	MACT	54.50	215.96	0.063	lb/MMBtu	MACT	5.45E+01	215.96	0.063	lb/MMBtu	MACT	5.45E+01	215.96	0.063	lb/MMBtu	MACT	5.45E+01	215.96
Hydrogen fluoride (HF)	0.0017	lb/MMBtu	MACT	1.47	6.44	0.0017	lb/MMBtu	MACT	1.47E+00	6.44	0.0017	lb/MMBtu	MACT	1.47E+00	6.44	0.0017	lb/MMBtu	MACT	1.47E+00	3.22
Isophorone	6.67E-04	lb/ton	AP-42	2.20E-02	9.63E-02	6.67E-04	lb/ton	AP-42	2.51E-02	1.10E-01	6.67E-04	lb/ton	AP-42	3.28E-02	1.44E-01	6.67E-04	lb/ton	AP-42	9.62E-03	2.11E-02
Lead (IS NOT A TAC)	2.17E-05	lb/MMBtu	PSD-BACT	1.88E-02	8.22E-02	2.17E-05	lb/MMBtu	AP-42	1.88E-02	8.22E-02	2.17E-05	lb/MMBtu	AP-42	1.88E-02	8.22E-02	2.17E-05	lb/MMBtu	AP-42	1.88E-02	4.11E-02
Manganese[3]	5.64E-04	lb/ton	AP-42	1.86E-04	8.14E-04	5.64E-04	lb/ton	AP-42	2.12E-04	9.30E-04	5.64E-04	lb/ton	AP-42	2.77E-04	1.21E-03	5.64E-04	lb/ton	AP-42	8.12E-05	1.78E-04
Mercury	7.03E-07	lb/MMBtu	90% Control	6.08E-04	2.66E-03	7.03E-07	lb/MMBtu	90% Control	6.08E-04	2.66E-03	7.03E-07	lb/MMBtu	90% Control	6.08E-04	2.66E-03	7.03E-07	lb/MMBtu	AP-42	6.08E-04	1.33E-03
Methyl chloride (Chloromethane)	6.10E-04	lb/ton	AP-42	2.01E-02	8.80E-02	6.10E-04	lb/ton	AP-42	2.30E-02	1.01E-01	6.10E-04	lb/ton	AP-42	3.00E-02	1.31E-01	6.10E-04	lb/ton	AP-42	8.79E-03	1.92E-02
Methyl hydrazine	1.96E-04	lb/ton	AP-42	6.45E-03	2.82E-02	1.96E-04	lb/ton	AP-42	7.36E-03	3.22E-02	1.96E-04	lb/ton	AP-42	9.61E-03	4.21E-02	1.96E-04	lb/ton	AP-42	2.82E-03	6.17E-03
Methyl methacrylate	2.30E-05	lb/ton	AP-42	7.58E-04	3.32E-03	2.30E-05	lb/ton	AP-42	8.66E-04	3.79E-03	2.30E-05	lb/ton	AP-42	1.13E-03	4.95E-03	2.30E-05	lb/ton	AP-42	3.32E-04	7.26E-04
Methyl tert butyl ether	4.03E-05	lb/ton	AP-42	1.33E-03	5.81E-03	4.03E-05	lb/ton	AP-42	1.52E-03	6.64E-03	4.03E-05	lb/ton	AP-42	1.98E-03	8.66E-03	4.03E-05	lb/ton	AP-42	5.80E-04	1.27E-03
Nickel	3.22E-04	lb/ton	AP-42	1.06E-02	4.65E-02	3.22E-04	lb/ton	AP-42	1.21E-02	5.31E-02	3.22E-04	lb/ton	AP-42	1.58E-02	6.93E-02	3.22E-04	lb/ton	AP-42	4.64E-03	1.02E-02
4-Nitrophenol																				
Pentachlorophenol																				
Phenol	1.84E-05	lb/ton	AP-42	6.07E-04	2.66E-03	1.84E-05	lb/ton	AP-42	6.93E-04	3.04E-03	1.84E-05	lb/ton	AP-42	9.04E-04	3.96E-03	1.84E-05	lb/ton	AP-42	2.65E-04	5.81E-04
Phosphorus																				
Propionaldehyde (Propanal)	4.37E-04	lb/ton	AP-42	1.44E-02	6.31E-02	4.37E-04	lb/ton	AP-42	1.65E-02	7.21E-02	4.37E-04	lb/ton	AP-42	2.15E-02	9.41E-02	4.37E-04	lb/ton	AP-42	6.30E-03	1.38E-02
Selenium	1.50E-03	lb/ton	AP-42	4.93E-02	2.16E-01	1.50E-03	lb/ton	AP-42	5.63E-02	2.47E-01	1.50E-03	lb/ton	AP-42	7.35E-02	3.22E-01	1.50E-03	lb/ton	AP-42	2.16E-02	4.72E-02
Styrene	2.88E-05	lb/ton	AP-42	9.48E-04	4.15E-03	2.88E-05	lb/ton	AP-42	1.08E-03	4.74E-03	2.88E-05	lb/ton	AP-42	1.41E-03	6.19E-03	2.88E-05	lb/ton	AP-42	4.14E-04	9.08E-04
1,1,1-Trichloroethane (Methyl chloroform)	2.30E-05	lb/ton	AP-42	7.58E-04	3.32E-03	2.30E-05	lb/ton	AP-42	8.66E-04	3.79E-03	2.30E-05	lb/ton	AP-42	1.13E-03	4.95E-03	2.30E-05	lb/ton	AP-42	3.32E-04	7.26E-04
Toluene	2.76E-04	lb/ton	AP-42	9.10E-03	3.99E-02	2.76E-04	lb/ton	AP-42	1.04E-02	4.55E-02	2.76E-04	lb/ton	AP-42	1.36E-02	5.94E-02	2.76E-04	lb/ton	AP-42	3.98E-03	8.71E-03
Trichlorethene (Trichloroethylene)																				
2,4,6-Trichlorophenol																				
Vinyl acetate	8.74E-05	lb/ton	AP-42	2.88E-03	1.26E-02	8.74E-05	lb/ton	AP-42	3.29E-03	1.44E-02	8.74E-05	lb/ton	AP-42	4.30E-03	1.88E-02	8.74E-05	lb/ton	AP-42	1.26E-03	2.76E-03
Vinyl Chloride																				
Xylenes	4.26E-05	lb/ton	AP-42	1.40E-03	6.14E-03	4.26E-05	lb/ton	AP-42	1.60E-03	7.02E-03	4.26E-05	lb/ton	AP-42	2.09E-03	9.16E-03	4.26E-05	lb/ton	AP-42	6.13E-04	1.34E-03
o-Xylene																				
Polycyclic Organic Matter (POMs)																				
2-Chloroacetophenone	8.05E-06	lb/ton	AP-42	2.65E-04	1.16E-03	8.05E-06	lb/ton	AP-42	3.03E-04	1.33E-03	8.05E-06	lb/ton	AP-42	3.96E-04	1.73E-03	8.05E-06	lb/ton	AP-42	1.16E-04	2.54E-04
2-Chloronaphthalene																				
2-Methylnaphthalene																				
3-Methylcholanthrene																				
5-Methyl chrysene	2.53E-08	lb/ton	AP-42	8.34E-07	3.65E-06	2.53E-08	lb/ton	AP-42	9.53E-07	4.17E-06	2.53E-08	lb/ton	AP-42	1.24E-06	5.45E-06	2.53E-08	lb/ton	AP-42	3.65E-07	7.99E-07
Acenaphthylene	2.88E-07	lb/ton	AP-42	9.48E-06	4.15E-05	2.88E-07	lb/ton	AP-42	1.08E-05	4.74E-05	2.88E-07	lb/ton	AP-42	1.41E-05	6.19E-05	2.88E-07	lb/ton	AP-42	4.14E-06	9.08E-06
Anthracene	2.42E-07	lb/ton	AP-42	7.96E-06	3.49E-05	2.42E-07	lb/ton	AP-42	9.10E-06	3.98E-05	2.42E-07	lb/ton	AP-42	1.19E-05	5.20E-05	2.42E-07	lb/ton	AP-42	3.48E-06	7.62E-06
Benz(a)anthracene[1]	9.20E-08	lb/ton	AP-42	3.03E-06	1.33E-05	9.20E-08	lb/ton	AP-42	3.46E-06	1.52E-05	9.20E-08	lb/ton	AP-42	4.52E-06	1.98E-05	9.20E-08	lb/ton	AP-42	1.33E-06	2.90E-06
Benzo(a)pyrene[1]	4.37E-08	lb/ton	AP-42	1.44E-06	6.31E-06	4.37E-08	lb/ton	AP-42	1.65E-06	7.21E-06	4.37E-08	lb/ton	AP-42	2.15E-06	9.41E-06	4.37E-08	lb/ton	AP-42	6.30E-07	1.38E-06

Compound	Sewage Sludge (Maximum 20% Sewage Sludge)					Tire Derived Fuel (Maximum 30% Heat Input)					Waste Wood (Maximum 30% Heat Input)					Maximum Short-term Emissions	
	Emission Factor			Emission Rates		Emission Factor			Emission Rates		Emission Factor			Emission Rates			
	Value	Units	Basis	(lb/hr)	(tpy)	Value	Units	Basis	(lb/hr)	(tpy)	Value	Units	Basis	(lb/hr)	(tpy)	(lb/hr)	Fuel
PM_{10}	0.025	lb/MMBtu	PSD-BACT	21.6	18.9	0.025	lb/MMBtu	PSD-BACT	21.6	28.42	0.025	lb/MMBtu	PSD-BACT	21.6	28.42	21.6	Coal, Western Bituminous
PM	0.011	lb/MMBtu	PSD-BACT	9.5	8.3	0.011	lb/MMBtu	PSD-BACT	9.5	12.5	0.011	lb/MMBtu	PSD-BACT	9.5	12.5	9.5	Coal, Western Bituminous
SO_2	1.4	lb/MW_{hr}	NSPS	109.2	95.7	1.4	lb/MW_{hr}	NSPS	109.2	143.5	1.4	lb/MW_{hr}	NSPS	109.2	143.5	109.2	Coal, Western Bituminous
NO_x	1.0	lb/MW_{hr}	NSPS	78.0	68.3	1.0	lb/MW_{hr}	NSPS	78.0	102.5	1.0	lb/MW_{hr}	NSPS	78.0	102.5	78.0	Coal, Western Bituminous
CO	0.15	lb/MMBtu	PSD-BACT	129.8	113.7	0.15	lb/MMBtu	PSD-BACT	129.8	170.49	0.15	lb/MMBtu	PSD-BACT	129.8	170.4915	129.8	Coal, Western Bituminous
Lead	2.17E-05	lb/MMBtu	99% Control	1.88E-02	1.64E-02	2.17E-05	lb/MMBtu	99% Control	0.019	0.02	2.17E-05	lb/MMBtu	99% Control	0.019	2.47E-02	0.019	Coal, Western Bituminous
VOC	0.005	lb/MMBtu	MACT	4.3	3.8	0.005	lb/MMBtu	MACT	4.325	5.68	0.005	lb/MMBtu	MACT	4.33	5.683	4.33	Coal, Western Bituminous
Mercury	7.034E-07	lb/MMBtu	MACT	6.08E-04	5.33E-04	7.034E-07	lb/MMBtu	MACT	6.08E-04	7.99E-04	7.034E-07	lb/MMBtu	MACT	6.08E-04	7.99E-04	6.08E-04	Coal, Western Bituminous
Hydrogen chloride (HCl)[4]	0.063	lb/MMBtu	MACT	54.5	215.96	0.063	lb/MMBtu	MACT	54.50	215.96	0.063	lb/MMBtu	MACT	54.50	215.96	54.50	Coal, Western Bituminous
Hydrogen fluoride (HF)	0.0017	lb/MMBtu	MACT	1.5	1.3	0.0017	lb/MMBtu	MACT	1.471	1.93	0.0017	lb/MMBtu	MACT	1.47	1.932	1.47	Coal, Western Bituminous
Sulfuric Acid Mist (H_2SO_4)																5.28	Coal, Western Bituminous
Total Dioxin/Furan	4.4E-09	lb/ton	AP-42	3.48E-08	3.05E-08											1.14E-07	Coal, Western Sub-bituminous
Hazardous Air Pollutants																	
Acetaldehyde											9.55E-04	lb/MMBtu	AP-42	8.26E-01	1.08E+00	8.26E-01	Waste Wood
Acetophenone											3.68E-09	lb/MMBtu	AP-42	3.18E-06	4.18E-06	8.48E-04	Coal, Western Sub-bituminous
Acrolein[2]											3.60E-03	lb/MMBtu	MACT	7.47E-01	9.82E-01	7.47E-01	Waste Wood
Antimony											9.09E-06	lb/MMBtu	AP-42	7.86E-03	1.03E-02	7.86E-03	Waste Wood
Arsenic	3.45E-05	lb/ton	AP-42	2.73E-04	2.39E-04	7.67E-07	lb/MMBtu	Stack Test[1]	6.63E-04	8.72E-04	2.53E-05	lb/MMBtu	AP-42	2.19E-02	2.88E-02	2.32E-02	Coal, Western Sub-bituminous
Benzene	4.60E-04	lb/ton	AP-42	3.64E-03	3.19E-03						4.83E-03	lb/MMBtu	AP-42	4.18E+00	5.49E+00	4.18E+00	Waste Wood
Benzyl chloride																3.96E-02	Coal, Western Sub-bituminous
Beryllium	4.60E-07	lb/ton	AP-42	3.64E-06	3.19E-06	2.00E-08	lb/MMBtu	Stack Test[1]	1.73E-05	2.27E-05	1.27E-06	lb/MMBtu	AP-42	1.09E-03	1.44E-03	1.19E-03	Coal, Western Sub-bituminous
Bis(2-Ethylhexyl)phthalate	9.43E-02	lb/ton	AP-42	7.46E-01	0.65						5.41E-08	lb/MMBtu	AP-42	4.68E-05	6.14E-05	7.46E-01	Sewage Sludge
Bromoform																2.20E-03	Coal, Western Sub-bituminous
Bromomethane (Methyl bromide)											1.73E-05	lb/MMBtu	AP-42	1.49E-02	1.96E-02	1.49E-02	Waste Wood
Cadmium	1.27E-03	lb/ton	AP-42	1.00E-02	8.76E-03	9.59E-08	lb/MMBtu	Stack Test[1]	8.30E-05	1.09E-04	4.72E-06	lb/MMBtu	AP-42	4.08E-03	5.36E-03	1.00E-02	Sewage Sludge
Carbon disulfide																7.35E-03	Coal, Western Sub-bituminous
Carbon tetrachloride	2.76E-05	lb/ton	AP-42	2.18E-04	1.91E-04						5.18E-05	lb/MMBtu	AP-42	4.48E-02	5.88E-02	4.48E-02	Waste Wood
Chlorine											9.09E-04	lb/MMBtu	AP-42	7.86E-01	1.03E+00	7.86E-01	Waste Wood
Chlorobenzene	1.15E-05	lb/ton	AP-42	9.09E-05	7.97E-05						3.80E-05	lb/MMBtu	AP-42	3.28E-02	4.31E-02	3.28E-02	Waste Wood
Chloroform	4.60E-03	lb/ton	AP-42	3.64E-02	3.19E-02						3.22E-05	lb/MMBtu	AP-42	2.79E-02	3.66E-02	3.64E-02	Sewage Sludge
Chromium, total	57.5	ppm	Analytical	1.24E-03	1.09E-03	1.20E-06	lb/MMBtu	Stack Test[1]	1.03E-03	1.36E-03	2.42E-05	lb/MMBtu	AP-42	2.09E-02	2.74E-02	2.09E-02	Waste Wood
Chromium, hexavalent											4.03E-06	lb/MMBtu	AP-42	3.48E-03	4.57E-03	4.47E-03	Coal, Western Sub-bituminous
Cobalt											7.48E-06	lb/MMBtu	AP-42	6.47E-03	8.50E-03	6.47E-03	Waste Wood
Cumene																3.00E-04	Coal, Western Sub-bituminous
Cyanide																1.41E-01	Coal, Western Sub-bituminous
1,4-Dichlorobenzene	0.552	lb/ton	AP-42	4.37E+00	3.82E+00											4.37E+00	Sewage Sludge
1,2-Dichloroethane (Ethylene dichloride)											3.34E-05	lb/MMBtu	AP-42	2.88E-02	3.79E-02	2.88E-02	Waste Wood
Dichloromethane (Methylene chloride)	1.61E-03	lb/ton	AP-42	1.27E-02	1.12E-02						3.34E-04	lb/MMBtu	AP-42	2.88E-01	3.79E-01	2.88E-01	Waste Wood
1,2-Dichloropropane (Propylene dichloride)											3.80E-05	lb/MMBtu	AP-42	3.28E-02	4.31E-02	3.28E-02	Waste Wood
Dimethyl sulfate																2.71E-03	Coal, Western Sub-bituminous
2,4-Dinitrophenol											2.07E-07	lb/MMBtu	AP-42	1.79E-04	2.35E-04	1.79E-04	Waste Wood
2,4-Dinitrotoluene																1.58E-05	Coal, Western Sub-bituminous
Ethylbenzene	5.75E-05	lb/ton	AP-42	4.55E-04	3.98E-04						3.57E-05	lb/MMBtu	AP-42	3.08E-02	4.05E-02	3.08E-02	Waste Wood
Ethylchloride (Chloroethane)																2.37E-03	Coal, Western Sub-bituminous
Ethylene dibromide (Dibromoethane)																6.78E-05	Coal, Western Sub-bituminous
Formaldehyde											5.06E-03	lb/MMBtu	AP-42	4.38E+00	5.75E+00	4.38E+00	Waste Wood
Hexane																3.79E-03	Coal, Western Sub-bituminous
Hydrogen chloride (HCl)	0.063	lb/MMBtu	MACT	5.45E+01	215.96											5.45E+01	Coal, Western Bituminous
Hydrogen fluoride (HF)																1.47E+00	Coal, Western Bituminous
Isophorone																3.28E-02	Coal, Western Sub-bituminous
Lead (IS NOT A TAC)	2.17E-05	lb/MMBtu	AP-42	1.88E-02	1.64E-02	3.15E-06	lb/MMBtu	Stack Test[1]	2.73E-03	3.58E-03	0.00E+00	lb/MMBtu	AP-42	0.00E+00	0.00E+00	1.88E-02	Coal, Western Bituminous
Manganese[3]	6.90E-04	lb/ton	AP-42	5.46E-05	4.78E-05	9.30E-06	lb/MMBtu	Stack Test[1]	8.05E-05	1.06E-04	1.84E-03	lb/MMBtu	AP-42	1.59E-02	2.09E-02	1.59E-02	Waste Wood
Mercury	7.03E-07	lb/MMBtu	AP-42	6.08E-04	5.33E-04	2.00E-08	lb/MMBtu	Stack Test[1]	1.73E-05	2.27E-05	0.00E+00	lb/MMBtu	AP-42	0.00E+00	0.00E+00	6.08E-04	Coal, Western Bituminous
Methyl chloride (Chloromethane)	6.90E-04	lb/ton	AP-42	5.46E-03	4.78E-03						2.65E-05	lb/MMBtu	AP-42	2.29E-02	3.01E-02	3.00E-02	Coal, Western Sub-bituminous
Methyl hydrazine																9.61E-03	Coal, Western Sub-bituminous
Methyl methacrylate																1.13E-03	Coal, Western Sub-bituminous
Methyl tert butyl ether																1.98E-03	Coal, Western Sub-bituminous
Nickel	3.91E-03	lb/ton	AP-42	3.09E-02	2.71E-02	1.67E-06	lb/MMBtu	Stack Test[1]	1.44E-03	1.90E-03	3.80E-05	lb/MMBtu	AP-42	3.28E-02	4.31E-02	3.28E-02	Waste Wood
4-Nitrophenol											1.27E-07	lb/MMBtu	AP-42	1.09E-04	1.44E-04	1.09E-04	Waste Wood
Pentachlorophenol											5.87E-08	lb/MMBtu	AP-42	5.07E-05	6.67E-05	5.07E-05	Waste Wood
Phenol											5.87E-05	lb/MMBtu	AP-42	5.07E-02	6.67E-02	5.07E-02	Waste Wood
Phosphorus	26,450	ppm	Analytical	5.72E-01	0.50						3.11E-05	lb/MMBtu	AP-42	2.69E-02	3.53E-02	5.72E-01	Sewage Sludge
Propionaldehyde (Propanal)											7.02E-05	lb/MMBtu	AP-42	6.07E-02	7.97E-02	6.07E-02	Waste Wood
Selenium	8.28	ppm	Analytical	1.79E-04	1.57E-04						3.22E-06	lb/MMBtu	AP-42	2.79E-03	3.66E-03	7.35E-02	Coal, Western Sub-bituminous
Styrene											2.19E-03	lb/MMBtu	AP-42	1.89E+00	2.48E+00	1.89E+00	Waste Wood
1,1,1-Trichloroethane (Methyl chloroform)											3.57E-05	lb/MMBtu	AP-42	3.08E-02	4.05E-02	3.08E-02	Waste Wood
Toluene	8.05E-04	lb/ton	AP-42	6.37E-03	5.58E-03						1.06E-03	lb/MMBtu	AP-42	9.15E-01	1.20E+00	9.15E-01	Waste Wood
Trichlorethene (Trichloroethylene)	6.90E-05	lb/ton	AP-42	5.46E-04	4.78E-04						3.45E-05	lb/MMBtu	AP-42	2.98E-02	3.92E-02	2.98E-02	Waste Wood
2,4,6-Trichlorophenol											2.53E-08	lb/MMBtu	AP-42	2.19E-05	2.88E-05	2.19E-05	Waste Wood
Vinyl acetate																4.30E-03	Coal, Western Sub-bituminous
Vinyl Chloride											2.07E-05	lb/MMBtu	AP-42	1.79E-02	2.35E-02	1.79E-02	Waste Wood
Xylenes																2.09E-03	Coal, Western Sub-bituminous
o-Xylene											2.88E-05	lb/MMBtu	AP-42	2.49E-02	3.27E-02	2.49E-02	Waste Wood
Polycyclic Organic Matter (POMs)																	
2-Chloroacetophenone											2.76E-09	lb/MMBtu	AP-42	2.39E-06	3.14E-06	3.96E-04	Coal, Western Sub-bituminous
2-Chloronaphthalene											2.76E-09	lb/MMBtu	AP-42	2.39E-06	3.14E-06	2.39E-06	Waste Wood
2-Methylnaphthalene						2.94E-06	lb/MMBtu	Stack Test[1]	2.55E-03	3.35E-03	1.84E-07	lb/MMBtu	AP-42	1.59E-04	2.09E-04	2.55E-03	Tire Derived Fuel
3-Methylcholanthrene	0.15	lb/ton	AP-42	1.18E+00	1.04											1.18E+00	Sewage Sludge
5-Methyl chrysene											9.89E-12	lb/MMBtu	AP-42	8.55E-09	1.12E-08	1.24E-06	Coal, Western Sub-bituminous
Acenaphthylene						1.27E-07	lb/MMBtu	Stack Test[1]	1.09E-04	1.44E-04	5.75E-06	lb/MMBtu	AP-42	4.97E-03	6.54E-03	4.97E-03	Waste Wood
Anthracene						5.45E-07	lb/MMBtu	Stack Test[1]	4.72E-04	6.20E-04	3.45E-06	lb/MMBtu	AP-42	2.98E-03	3.92E-03	2.98E-03	Waste Wood
Benz(a)anthracene[1]						4.28E-08	lb/MMBtu	Stack Test[1]	3.70E-05	4.86E-05	7.48E-08	lb/MMBtu	AP-42	6.47E-05	8.50E-05	6.47E-05	Waste Wood
Benzo(a)pyrene[1]						3.30E-09	lb/MMBtu	Stack Test[1]	2.85E-06	3.75E-06	2.99E-06	lb/MMBtu	AP-42	2.59E-03	3.40E-03	2.59E-03	Waste Wood

Holland Board of Public Works
Emission Factors and Emissions Rates
REVISED 11/5/2008

Table B2. Boiler Specifications

Boiler Parameters	Specification
Boiler Type	CFB
Maximum Rated Heat Input, (MMBtu/hr)	865
Gross Output (MW/hr)	78

Table B3. Raw Material Specifications

Material	Sulfur Content	Material Usage (%)	Heat Input (MMBtu/hr)	Heating Value (Btu/lb)	Material Throughput (lb/hr)	Material Throughput (tph)	Material Throughput (tpy)
Coal, Western Bituminous	0.50%	100.0%	865	13,118	65,940	32.97	288,817
Coal, Southern Illinois	4.30%	100.0%	865	11,484	75,322	37.66	329,911
Coal, Western Sub-bituminous	0.50%	100.0%	865	8,800	98,295	49.15	430,534
Petcoke	5.00%	50.0%	432.5	15,000	28,833	14.42	126,290
Sewage Sludge	0.00%	20.0%	173	7,000	15,817	7.91	69,279
Tire Derived Fuel	1.33%	30.0%	259.5	13,500	19,222	9.61	84,193
Waste Wood	0.00%	30.0%	259.5	8,000	32,438	16.22	142,076

Table B4. Emission Factors and Emission Rates

Compound	Coal, Western Bituminous					Coal, Southern Illinois				
	Emission Factors			Emission Rates		Emission Factors			Emission Rates	
	Value	Units	Basis	(lb/hr)	(tpy)	Value	Units	Basis	(lb/hr)	(tpy)
Benzo(b)fluoranthene[1]										
Benzo(e)pyrene										
Benzo(g,h,i)perylene	3.11E-08	lb/ton	AP-42	1.02E-06	4.48E-06	3.11E-08	lb/ton	AP-42	1.17E-06	5.12E-06
Benzo(j,k)fluoranthene										
Benzo(k)fluoranthene										
Biphenyl	1.96E-06	lb/ton	AP-42	6.45E-05	2.82E-04	1.96E-06	lb/ton	AP-42	7.36E-05	3.22E-04
Carbazole										
Chrysene	1.15E-07	lb/ton	AP-42	3.79E-06	1.66E-05	1.15E-07	lb/ton	AP-42	4.33E-06	1.90E-05
Crotonaldehyde										
Dibenzo(a,h)anthracene										
Fluoranthene	8.17E-07	lb/ton	AP-42	2.69E-05	1.18E-04	8.17E-07	lb/ton	AP-42	3.08E-05	1.35E-04
Fluorene	1.05E-06	lb/ton	AP-42	3.45E-05	1.51E-04	1.05E-06	lb/ton	AP-42	3.94E-05	1.73E-04
Indeno(1,2,3,c,d)pyrene	7.02E-08	lb/ton	AP-42	2.31E-06	1.01E-05	7.02E-08	lb/ton	AP-42	2.64E-06	1.16E-05
Naphthalene	1.50E-05	lb/ton	AP-42	4.93E-04	2.16E-03	1.50E-05	lb/ton	AP-42	5.63E-04	2.47E-03
Pyrene	3.80E-07	lb/ton	AP-42	1.25E-05	5.48E-05	3.80E-07	lb/ton	AP-42	1.43E-05	6.26E-05
Total Dioxin/Furan	2.32E-09	lb/ton	AP-42	7.66E-08	3.35E-07	2.32E-09	lb/ton	AP-42	8.75E-08	3.83E-07
Monochlorobiphenyl										
Decachlorobiphenyl										
Dichlorobiphenyl										
Heptachlorobiphenyl										
Hexachlorobiphenyl										
Pentachlorobiphenyl										
Tetrachlorobiphenyl										
Trichlorobiphenyl										
Total PCBs										
Total POMs				1.05E-03	4.61E-03				1.20E-03	5.27E-03
Total HAPs				**54.50**	**215.96**				**54.50**	**215.96**
Maximum Single HAP (HCl)				**56.42**	**224.37**				**56.48**	**224.65**
Non-HAP Toxic Air Contaminants										
Acetone										
Aluminum										
Barium										
Benzaldehyde										
Benzoic acid										
Calcium										
2-Chlorophenol										
Copper										
1,2-Dibromoethene										
Iron										
Isobutyraldehyde										
Magnesium	1.27E-02	lb/ton	AP-42	4.17E-01	1.83E+00	1.27E-02	lb/ton	AP-42	4.76E-01	2.09E+00
Methyl ethyl ketone	4.49E-04	lb/ton	AP-42	1.48E-02	6.48E-02	4.49E-04	lb/ton	AP-42	1.69E-02	7.40E-02
Molybdenum										
2-Nitrophenol										
Perylene										
Potassium										
Silicon										
Silver										
Sodium										
Sulfuric Acid	6.10E-03	lb/MMBtu	PSD-BACT	5.28	23.11	6.10E-03	lb/MMBtu	PSD-BACT	5.28E+00	23.11
Strontium										
Tin										
Titanium										
o-Tolualdehyde										
p-Tolualdehyde										
Trichlorofluoromethane										
Vanadium										
Yttrium										
Zinc (as ZnO)										

Compound	Coal, Western Sub-bituminous					Petcoke (Maximum 50% Heat Input)				
	Emission Factors			Emission Rates		Emission Factor			Emission Rates	
	Value	Units	Basis	(lb/hr)	(tpy)	Value	Units	Basis	(lb/hr)	(tpy)
Benzo(b)fluoranthene[1]										
Benzo(e)pyrene										
Benzo(g,h,i)perylene	3.11E-08	lb/ton	AP-42	1.53E-06	6.68E-06	3.11E-08	lb/ton	AP-42	4.48E-07	9.80E-07
Benzo(j,k)fluoranthene										
Benzo(k)fluoranthene										
Biphenyl	1.96E-06	lb/ton	AP-42	9.61E-05	4.21E-04	1.96E-06	lb/ton	AP-42	2.82E-05	6.17E-05
Carbazole										
Chrysene	1.15E-07	lb/ton	AP-42	5.65E-06	2.48E-05	1.15E-07	lb/ton	AP-42	1.66E-06	3.63E-06
Crotonaldehyde										
Dibenzo(a,h)anthracene										
Fluoranthene	8.17E-07	lb/ton	AP-42	4.01E-05	1.76E-04	8.17E-07	lb/ton	AP-42	1.18E-05	2.58E-05
Fluorene	1.05E-06	lb/ton	AP-42	5.14E-05	2.25E-04	1.05E-06	lb/ton	AP-42	1.51E-05	3.30E-05
Indeno(1,2,3,c,d)pyrene	7.02E-08	lb/ton	AP-42	3.45E-06	1.51E-05	7.02E-08	lb/ton	AP-42	1.01E-06	2.21E-06
Naphthalene	1.50E-05	lb/ton	AP-42	7.35E-04	3.22E-03	1.50E-05	lb/ton	AP-42	2.16E-04	4.72E-04
Pyrene	3.80E-07	lb/ton	AP-42	1.87E-05	8.17E-05	3.80E-07	lb/ton	AP-42	5.47E-06	1.20E-05
Total Dioxin/Furan	2.32E-09	lb/ton	AP-42	1.14E-07	5.00E-07	2.32E-09	lb/ton	AP-42	3.35E-08	7.33E-08
Monochlorobiphenyl										
Decachlorobiphenyl										
Dichlorobiphenyl										
Heptachlorobiphenyl										
Hexachlorobiphenyl										
Pentachlorobiphenyl										
Tetrachlorobiphenyl										
Trichlorobiphenyl										
Total PCBs										
Total POMs				1.57E-03	6.87E-03				4.59E-04	1.01E-03
Total HAPs				**54.50**	**215.96**				**54.50**	**215.96**
Maximum Single HAP (HCl)				**56.63**	**225.31**				**56.17**	**219.63**
Non-HAP Toxic Air Contaminants										
Acetone										
Aluminum										
Barium										
Benzaldehyde										
Benzoic acid										
Calcium										
2-Chlorophenol										
Copper										
1,2-Dibromoethene										
Iron										
Isobutyraldehyde										
Magnesium	1.27E-02	lb/ton	AP-42	6.22E-01	2.72E+00	1.27E-02	lb/ton	AP-42	1.82E-01	3.99E-01
Methyl ethyl ketone	4.49E-04	lb/ton	AP-42	2.20E-02	9.65E-02	4.49E-04	lb/ton	AP-42	6.47E-03	1.42E-02
Molybdenum										
2-Nitrophenol										
Perylene										
Potassium										
Silicon										
Silver										
Sodium										
Sulfuric Acid	6.10E-03	lb/MMBtu	PSD-BACT	5.28E+00	23.11	6.10E-03	lb/MMBtu	PSD-BACT	5.28E+00	11.56
Strontium										
Tin										
Titanium										
o-Tolualdehyde										
p-Tolualdehyde										
Trichlorofluoromethane										
Vanadium										
Yttrium										
Zinc (as ZnO)										

Compound	Sewage Sludge (Maximum 20% Sewage Sludge)					Tire Derived Fuel (Maximum 30% Heat Input)				
	Emission Factor			Emission Rates		Emission Factor			Emission Rates	
	Value	Units	Basis	(lb/hr)	(tpy)	Value	Units	Basis	(lb/hr)	(tpy)
Benzo(b)fluoranthene[1]										
Benzo(e)pyrene						1.54E-08	lb/MMBtu	Stack Test[1]	1.33E-05	1.75E-05
Benzo(g,h,i)perylene										
Benzo(j,k)fluoranthene										
Benzo(k)fluoranthene						6.64E-09	lb/MMBtu	Stack Test[1]	5.74E-06	7.54E-06
Biphenyl										
Carbazole										
Chrysene						5.09E-08	lb/MMBtu	Stack Test[1]	4.41E-05	5.79E-05
Crotonaldehyde										
Dibenzo(a,h)anthracene										
Fluoranthene						8.11E-07	lb/MMBtu	Stack Test[1]	7.01E-04	9.22E-04
Fluorene						2.23E-07	lb/MMBtu	Stack Test[1]	1.93E-04	2.54E-04
Indeno(1,2,3,c,d)pyrene						3.55E-09	lb/MMBtu	Stack Test[1]	3.07E-06	4.04E-06
Naphthalene	0.22	lb/ton	AP-42	1.73E+00	1.51	2.88E-05	lb/MMBtu	Stack Test[1]	2.49E-02	3.27E-02
Pyrene						3.86E-07	lb/MMBtu	Stack Test[1]	3.34E-04	4.39E-04
Total Dioxin/Furan	4.40E-09	lb/ton	AP-42	3.48E-08	3.05E-08					
Monochlorobiphenyl										
Decachlorobiphenyl										
Dichlorobiphenyl										
Heptachlorobiphenyl										
Hexachlorobiphenyl										
Pentachlorobiphenyl										
Tetrachlorobiphenyl										
Trichlorobiphenyl										
Total PCBs										
Total POMs				2.91E+00	2.55E+00				2.93E-02	3.86E-02
Total HAPs				**54.50**	**215.96**				**0.03**	**0.04**
Maximum Single HAP (HCl)				**63.22**	**223.60**				**0.04**	**0.05**
Non-HAP Toxic Air Contaminants										
Acetone										
Aluminum	4.37E-03	lb/ton	AP-42	3.46E-02	3.03E-02					
Barium	5.52E-04	lb/ton	AP-42	4.37E-03	3.82E-03	7.31E-06	lb/MMBtu	Stack Test[1]	6.33E-03	8.31E-03
Benzaldehyde										
Benzoic acid										
Calcium	1.15E-02	lb/ton	AP-42	9.09E-02	7.97E-02					
2-Chlorophenol										
Copper	240.35	ppm	AP-42	5.20E-03	4.55E-03					
1,2-Dibromoethene										
Iron										
Isobutyraldehyde										
Magnesium	1.38E-03	lb/ton	AP-42	1.09E-02	9.56E-03					
Methyl ethyl ketone										
Molybdenum	63.25	ppm	Analytical	1.37E-03	1.20E-03					
2-Nitrophenol										
Perylene										
Potassium	8050	ppm	Analytical	1.74E-03	1.52E-03					
Silicon	0.00736	lb/ton	AP-42	5.82E-02	5.10E-02					
Silver										
Sodium										
Sulfuric Acid										
Strontium										
Tin	8.05E-04	lb/ton	AP-42	6.37E-03	5.58E-03					
Titanium	9.20E-04	lb/ton	AP-42	7.28E-03	6.37E-03					
o-Tolualdehyde										
p-Tolualdehyde										
Trichlorofluoromethane										
Vanadium						1.60E-06	lb/MMBtu	Stack Test[1]	1.38E-03	1.82E-03
Yttrium										
Zinc (as ZnO)	399.05	ppm	Analytical	8.63E-03	7.56E-03	2.83E-04	lb/MMBtu	Stack Test[1]	2.45E-01	3.22E-01

Compound	Waste Wood (Maximum 30% Heat Input)					Maximum Short-term Emissions	
	Emission Factor			Emission Rates			
	Value	Units	Basis	(lb/hr)	(tpy)	(lb/hr)	Fuel
Benzo(b)fluoranthene[1]	1.15E-07	lb/MMBtu	AP-42	9.95E-05	1.31E-04	9.95E-05	Waste Wood
Benzo(e)pyrene	2.99E-09	lb/MMBtu	AP-42	2.59E-06	3.40E-06	1.33E-05	Tire Derived Fuel
Benzo(g,h,i)perylene	1.07E-07	lb/MMBtu	AP-42	9.25E-05	1.22E-04	9.25E-05	Waste Wood
Benzo(j,k)fluoranthene	1.84E-07	lb/MMBtu	AP-42	1.59E-04	2.09E-04	1.59E-04	Waste Wood
Benzo(k)fluoranthene	4.14E-08	lb/MMBtu	AP-42	3.58E-05	4.71E-05	3.58E-05	Waste Wood
Biphenyl						9.61E-05	Coal, Western Sub-bituminous
Carbazole	2.07E-06	lb/MMBtu	AP-42	1.79E-03	2.35E-03	1.79E-03	Waste Wood
Chrysene	4.37E-08	lb/MMBtu	AP-42	3.78E-05	4.97E-05	4.41E-05	Tire Derived Fuel
Crotonaldehyde	1.14E-05	lb/MMBtu	AP-42	9.85E-03	1.29E-02	9.85E-03	Waste Wood
Dibenzo(a,h)anthracene	1.05E-08	lb/MMBtu	AP-42	9.05E-06	1.19E-05	9.05E-06	Waste Wood
Fluoranthene	1.84E-06	lb/MMBtu	AP-42	1.59E-03	2.09E-03	1.59E-03	Waste Wood
Fluorene	3.91E-06	lb/MMBtu	AP-42	3.38E-03	4.44E-03	3.38E-03	Waste Wood
Indeno(1,2,3,c,d)pyrene	1.00E-07	lb/MMBtu	AP-42	8.65E-05	1.14E-04	8.65E-05	Waste Wood
Naphthalene	1.12E-04	lb/MMBtu	AP-42	9.65E-02	1.27E-01	1.73E+00	Sewage Sludge
Pyrene	4.26E-06	lb/MMBtu	AP-42	3.68E-03	4.84E-03	3.68E-03	Waste Wood
Total Dioxin/Furan						1.14E-07	Coal, Western Sub-bituminous
Monochlorobiphenyl	2.53E-10	lb/MMBtu	AP-42	2.19E-07	2.88E-07	2.19E-07	Waste Wood
Decachlorobiphenyl	3.11E-10	lb/MMBtu	AP-42	2.69E-07	3.53E-07	2.69E-07	Waste Wood
Dichlorobiphenyl	8.51E-10	lb/MMBtu	AP-42	7.36E-07	9.67E-07	7.36E-07	Waste Wood
Heptachlorobiphenyl	7.59E-11	lb/MMBtu	AP-42	6.57E-08	8.63E-08	6.57E-08	Waste Wood
Hexachlorobiphenyl	6.33E-10	lb/MMBtu	AP-42	5.47E-07	7.19E-07	5.47E-07	Waste Wood
Pentachlorobiphenyl	1.38E-09	lb/MMBtu	AP-42	1.19E-06	1.57E-06	1.19E-06	Waste Wood
Tetrachlorobiphenyl	2.88E-09	lb/MMBtu	AP-42	2.49E-06	3.27E-06	2.49E-06	Waste Wood
Trichlorobiphenyl	2.99E-09	lb/MMBtu	AP-42	2.59E-06	3.40E-06	2.59E-06	Waste Wood
Total PCBs				8.10E-06	1.06E-05	8.10E-06	Waste Wood
Total POMs				1.36E-01	1.79E-01	2.91E+00	Sewage Sludge
Total HAPs				**4.38**	**5.75**	**54.50**	**Coal, Western Bituminous**
Maximum Single HAP (HCl)				**14.78**	**19.42**	**63.22**	**Sewage Sludge**
Non-HAP Toxic Air Contaminants							
Acetone	2.19E-04	lb/MMBtu	AP-42	1.89E-01	2.48E-01	1.89E-01	Waste Wood
Aluminum						0.03456046	Sewage Sludge
Barium	1.96E-04	lb/MMBtu	AP-42	1.69E-01	2.22E-01	1.69E-01	Waste Wood
Benzaldehyde	9.78E-07	lb/MMBtu	AP-42	8.46E-04	1.11E-03	8.46E-04	Waste Wood
Benzoic acid	5.41E-08	lb/MMBtu	AP-42	4.68E-05	6.14E-05	4.68E-05	Waste Wood
Calcium						9.09E-02	Sewage Sludge
2-Chlorophenol	2.76E-08	lb/MMBtu	AP-42	2.39E-05	3.14E-05	2.39E-05	Waste Wood
Copper	5.64E-05	lb/MMBtu	AP-42	4.87E-02	6.40E-02	4.87E-02	Waste Wood
1,2-Dibromoethene	6.33E-05	lb/MMBtu	AP-42	5.47E-02	7.19E-02	5.47E-02	Waste Wood
Iron	1.14E-03	lb/MMBtu	AP-42	9.85E-01	1.29E+00	9.85E-01	Waste Wood
Isobutyraldehyde	1.38E-05	lb/MMBtu	AP-42	1.19E-02	1.57E-02	1.19E-02	Waste Wood
Magnesium						6.22E-01	Coal, Western Sub-bituminous
Methyl ethyl ketone	6.21E-06	lb/MMBtu	AP-42	5.37E-03	7.06E-03	2.20E-02	Coal, Western Sub-bituminous
Molybdenum	2.42E-06	lb/MMBtu	AP-42	2.09E-03	2.74E-03	2.09E-03	Waste Wood
2-Nitrophenol	2.76E-07	lb/MMBtu	AP-42	2.39E-04	3.14E-04	2.39E-04	Waste Wood
Perylene	5.98E-10	lb/MMBtu	AP-42	5.17E-07	6.80E-07	5.17E-07	Waste Wood
Potassium	4.49E-02	lb/MMBtu	AP-42	3.88E-01	5.10E-01	3.88E-01	Waste Wood
Silicon						5.82E-02	Sewage Sludge
Silver	1.96E-03	lb/MMBtu	AP-42	1.69E-02	2.22E-02	1.69E-02	Waste Wood
Sodium	4.14E-04	lb/MMBtu	AP-42	3.58E-01	4.71E-01	3.58E-01	Waste Wood
Sulfuric Acid						5.28E+00	Coal, Western Bituminous
Strontium	1.15E-05	lb/MMBtu	AP-42	9.95E-03	1.31E-02	9.95E-03	Waste Wood
Tin	2.65E-05	lb/MMBtu	AP-42	2.29E-02	3.01E-02	2.29E-02	Waste Wood
Titanium	2.30E-05	lb/MMBtu	AP-42	1.99E-02	2.61E-02	1.99E-02	Waste Wood
o-Tolualdehyde	8.28E-06	lb/MMBtu	AP-42	7.16E-03	9.41E-03	7.16E-03	Waste Wood
p-Tolualdehyde	1.27E-05	lb/MMBtu	AP-42	1.09E-02	1.44E-02	1.09E-02	Waste Wood
Trichlorofluoromethane	4.72E-05	lb/MMBtu	AP-42	4.08E-02	5.36E-02	4.08E-02	Waste Wood
Vanadium	1.13E-06	lb/MMBtu	AP-42	9.75E-04	1.28E-03	1.38E-03	Tire Derived Fuel
Yttrium	3.45E-07	lb/MMBtu	AP-42	2.98E-04	3.92E-04	2.98E-04	Waste Wood
Zinc (as ZnO)	4.83E-04	lb/MMBtu	AP-42	4.18E-01	5.49E-01	4.18E-01	Waste Wood

These shaded areas indicate no data available.

Unless otherwise noted below, emission factors have been increased by a 15% safety factor.

[1] Emission factors for TDF are based upon Wyandotte Municipal Power Plant stack test results. Fuel firing was 70% coal with 30% TDF.

[2] Acrolein emissions for wood-firing based upon Organic HAP MACT using VOC as a surrogate. From AP-42, Acrolein emissions are 24% of Total VOC emissions for wood. Therefore, Acrolein emissions were calculated as 0.0036 lb/MMBtu * 0.24.

[3] Emissions of manganese, potassium, and silver are based upon 99% control factor of metal emissions from use of fabric filter

[4] Short-term (pph) emission rate for HCl based upon short-term MACT limit of 0.063 lb/MMBtu; Long-term (tpy) emission rate based upon 95% UCL MACT limit of 0.057 lb/MMBtu.

Holland BPW - New CFB Boiler (Unit #10)
Toxic Air Contaminant Modeling Results
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Hazardous Air Pollutants	CAS	Potential Emission Rate (lb/hour)	Potential Emission Rate (gram/sec)	ITSL (ug/m3)	Averaging Period	Ambient Impact (ug/m3)	% of ITSL	IRSL (ug/m3)	Ambient Impact (ug/m3)	% of IRSL
Acetaldehyde	75070	8.26E-01	1.04E-01	9	24 hour	3.26E-02	0.36%	0.5	3.18E-03	0.64%
Acetophenone	98862	8.48E-04	1.07E-04	490	8 hour	7.01E-05	0.00%			
Acrolein	107028	7.47E-01	9.42E-02	0.02	Annual	2.88E-03	14.41%			
Acrolein	107028	7.47E-01	9.42E-02	0.5	1 hour	1.46E-01	29.28%			
Antimony	7440360	7.86E-03	9.90E-04	0.2	24 hour	3.10E-04	0.16%			
Arsenic	7440382	2.32E-02	2.92E-03					0.0002	8.93E-05	44.67%
Benzene	71432	4.18E+00	5.26E-01	30	24 hour	1.65E-01	0.55%	0.1	1.61E-02	16.11%
Benzyl chloride	100447	3.96E-02	4.98E-03		Annual			0.02	1.53E-04	0.76%
Beryllium	7440417	1.19E-03	1.50E-04	0.02	24 hour	4.69E-05	0.23%	0.0004	4.58E-06	1.14%
Bis(2-Ethylhexyl)phthalate	117817	7.46E-01	9.40E-02					0.2	2.88E-03	1.44%
Bromoform	75252	2.20E-03	2.78E-04					0.9	8.50E-06	0.00%
Bromomethane (Methyl bromide)	74839	1.49E-02	1.88E-03	5	24 hour	5.89E-04	0.01%			
Cadmium	7440439	1.00E-02	1.26E-03					0.0006	3.86E-05	6.43%
Carbon disulfide	75150	7.35E-03	9.26E-04	700	24 hour	2.90E-04	0.00%			
Carbon tetrachloride	56235	4.48E-02	5.64E-03					0.07	1.73E-04	0.25%
Chlorine	7782505	7.86E-01	9.90E-02	15	8 hour	6.49E-02	0.43%			
Chlorobenzene	108907	3.28E-02	4.14E-03	70	24 hour	1.30E-03	0.00%			
Chloroform	67663	3.64E-02	4.58E-03					0.4	1.40E-04	0.04%
Chromium, total	7440473	2.09E-02	2.63E-03	0.1	Annual	8.05E-05	0.08%			
Chromium, hexavalent	18540299	4.47E-03	5.63E-04	0.1	24 hour	1.76E-04	0.18%	8.30E-05	1.72E-05	20.74%
Cobalt	7440484	6.47E-03	8.15E-04	0.2	8 hour	5.34E-04	0.27%			
Cumene	98828	3.00E-04	3.77E-05	400	24 hour	1.18E-05	0.00%			
Cyanide	57125	1.41E-01	1.78E-02	50	1 hour	2.77E-02	0.06%			
1,4-Dichlorobenzene	106467	4.37E+00	5.50E-01	800	24 hour	1.72E-01	0.02%	0.14	1.68E-02	12.02%
1,2-Dichloroethane (Ethylene dichloride)	107062	2.88E-02	3.63E-03					0.04	1.11E-04	0.28%
Dichloromethane (Methylene chloride)	75092	2.88E-01	3.63E-02					2	1.11E-03	0.06%
1,2-Dichloropropane (Propylene dichloride)	78875	3.28E-02	4.14E-03	4	24 hour	1.30E-03	0.03%			
Dimethyl sulfate	77781	2.71E-03	3.42E-04	0.5	8 hour	2.24E-04	0.04%			
2,4-Dinitrophenol	51285	1.79E-04	2.26E-05	7	24 hour	7.07E-06	0.00%			
2,4-Dinitrotoluene	121142	1.58E-05	1.99E-06	2	8 hour	1.31E-06	0.00%	0.009	6.10E-08	0.00%
Ethylbenzene	100414	3.08E-02	3.89E-03	1000	24 hour	1.22E-03	0.00%	3	1.19E-04	0.00%
Ethylchloride (Chloroethane)	75003	2.37E-03	2.99E-04	10000	24 hour	9.37E-05	0.00%			
Ethylene dibromide (Dibromoethane)	106934	6.78E-05	8.55E-06	9	24 hour	2.68E-06	0.00%	0.002	2.61E-07	0.01%
Formaldehyde	50000	4.38E+00	5.51E-01					0.08	1.69E-02	21.09%
Hexane	110543	3.79E-03	4.77E-04	700	24 hour	1.50E-04	0.00%			
Hydrogen chloride (HCl)	7647010	5.45E+01	6.87E+00	20	24 hour	2.15E+00	10.76%			
Hydrogen fluoride (HF)	7664393	1.47E+00	1.85E-01	26	1 hour	2.88E-01	1.11%			
Isophorone	78591	3.28E-02	4.13E-03	280	1 hour	6.42E-03	0.00%	3.7	1.26E-04	0.00%
Manganese	7439965	1.59E-02	2.01E-03	0.05	24 hour	6.28E-04	1.26%			
Methyl chloride (Chloromethane)	74873	3.00E-02	3.77E-03	90	24 hour	1.18E-03	0.00%	1.6	1.15E-04	0.01%
Methyl hydrazine	60344	9.61E-03	1.21E-03	0.03	24 hour	3.79E-04	1.26%			
Methyl methacrylate	80626	1.13E-03	1.42E-04	700	24 hour	4.46E-05	0.00%			
Methyl tert butyl ether	1634044	1.98E-03	2.49E-04	3000	24 hour	7.81E-05	0.00%			
Nickel	7440020	3.28E-02	4.14E-03					0.0042	1.27E-04	3.01%
4-Nitrophenol	100027	1.09E-04	1.38E-05	0.7	Annual	4.22E-07	0.00%			
Pentachlorophenol	87865	5.07E-05	6.39E-06	100	24 hour	2.00E-06	0.00%	0.03	1.96E-07	0.00%
Phenol	108952	5.07E-02	6.39E-03	600	1 hour	9.94E-03	0.00%			
Phosphorus	7723140	5.72E-01	7.21E-02	1	8 hour	4.73E-02	4.73%			
Propionaldehyde (Propanal)	123386	6.07E-02	7.65E-03	4	Annual	2.34E-04	0.01%			
Selenium	7782492	7.35E-02	9.26E-03	2	8 hour	6.07E-03	0.30%			
Styrene	100425	1.89E+00	2.38E-01	10	8 hour	1.56E-01	1.56%			
1,1,1-Trichloroethane (Methyl chloroform)	71556	3.08E-02	3.89E-03	1000	24 hour	1.22E-03	0.00%	1.7	1.19E-04	0.01%
Tetrachloroethylene (Perchloroethylene)	127184	3.78E-02	4.76E-03	0.1	Annual	1.46E-04	0.15%			
Toluene	108883	9.15E-01	1.15E-01	5000	24 hour	3.61E-02	0.00%			
Trichlorethene (Trichloroethylene)	79016	2.98E-02	3.76E-03					0.6	1.15E-04	0.02%
2,4,6-Trichlorophenol	88062	2.19E-05	2.76E-06					0.3	8.44E-08	0.00%
Vinyl acetate	108054	4.30E-03	5.41E-04	200	24 hour	1.70E-04	0.00%			
Vinyl Chloride	75014	1.79E-02	2.26E-03	100	24 hour	7.07E-04	0.00%	0.11	6.90E-05	0.06%
Xylenes	1330207	2.09E-03	2.63E-04	100	24 hour	8.26E-05	0.00%			
o-Xylene	95476	2.49E-02	3.13E-03	100	24 hour	9.82E-04	0.00%			
Polycylic Organic Matter (POMs)										
2-Chloroacetophenone	532274	3.96E-04	4.98E-05	0.03	24 hour	1.56E-05	0.05%			
2-Chloronaphthalene	91587	2.39E-06	3.01E-07	0.1	Annual	9.20E-09	0.00%			
2-Methylnaphthalene	91576	2.55E-03	3.21E-04	10	Annual	9.82E-06	0.00%			
3-Methylcholanthrene	56495	1.18E+00	1.49E-01	0.1	Annual	4.56E-03	4.56%			
5-Methyl chrysene	3697243	1.24E-06	1.57E-07	0.1	Annual	4.79E-09	0.00%			
Acenaphthene	83329	9.05E-04	1.14E-04	210	24 hour	3.57E-05	0.00%			
Acenaphthylene	208968	4.97E-03	6.27E-04	35	24 hour	1.96E-04	0.00%			
Anthracene	120127	2.98E-03	3.76E-04	1000	24 hour	1.18E-04	0.00%			
Benz(a)anthracene[1]	56553	6.47E-05	8.15E-06	0.1	Annual	2.49E-07	0.00%			
Benzo(a)pyrene[1]	50328	2.59E-03	3.26E-04					0.0005	9.97E-06	1.99%
Benzo(b)fluoranthene[1]	205992	9.95E-05	1.25E-05	0.1	Annual	3.84E-07	0.00%			
Benzo(b,j,k)fluoranthene		9.95E-05	1.25E-05	0.1	Annual	3.84E-07	0.00%			
Benzo(e)pyrene	192972	1.33E-05	1.68E-06	0.1	Annual	5.14E-08	0.00%			

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Benzo(g,h,i)perylene	191242	9.25E-05	1.17E-05	12	24 hour	3.65E-06	0.00%			
Benzo(j,k)fluoranthene		1.59E-04	2.01E-05	**0.1**	Annual	6.14E-07	0.00%			
Benzo(k)fluoranthene[1]	205823	3.58E-05	4.51E-06	**0.1**	Annual	1.38E-07	0.00%			
Biphenyl	92524	9.61E-05	1.21E-05	15	8 hour	7.94E-06	0.00%			
Carbazole	86748	1.79E-03	2.26E-04					0.02	6.90E-06	0.03%
Chrysene[1]	218019	4.41E-05	5.55E-06	**0.1**	Annual	1.70E-07	0.00%			
Crotonaldehyde	4170303	9.85E-03	1.24E-03	9	1 hour	1.93E-03	0.02%			
Dibenzo(a,h)anthracene[1]	53703	9.05E-06	1.14E-06	**0.1**	Annual	3.49E-08	0.00%			
Fluoranthene	206440	1.59E-03	2.01E-04	140	24 hour	6.28E-05	0.00%			
Fluorene	86737	3.38E-03	4.26E-04	140	24 hour	1.34E-04	0.00%			
Indeno(1,2,3,c,d)pyrene[1]	193395	8.65E-05	1.09E-05	**0.1**	Annual	3.34E-07	0.00%			
Naphthalene	91203	1.73E+00	2.18E-01	3	24 hour	6.82E-02	2.27%	0.08	6.66E-03	8.33%
Phenanthrene	85018	6.96E-03	8.77E-04	0.1	Annual	2.68E-05	0.03%			
Pyrene	129000	3.68E-03	4.64E-04	100	24 hour	1.45E-04	0.00%			
Total Dioxin/Furan	1746016 & 132649	1.14E-07	1.44E-08					2.00E-08	4.40E-10	2.20%
Polychlorinated Biphenyls (PCBs)										
Monochlorobiphenyl	27323188	2.19E-07	2.76E-08	**0.1**	Annual	8.44E-10	0.00%			
Decachlorobiphenyl	2051243	2.69E-07	3.38E-08	**0.1**	Annual	1.04E-09	0.00%			
Dichlorobiphenyl	several isomers	7.36E-07	9.27E-08	**0.1**	Annual	2.84E-09	0.00%			
Heptachlorobiphenyl	28655712	6.57E-08	8.27E-09	**0.1**	Annual	2.53E-10	0.00%			
Hexachlorobiphenyl	26601649	5.47E-07	6.89E-08	**0.1**	Annual	2.11E-09	0.00%			
Pentachlorobiphenyl	several isomers	1.19E-06	1.50E-07	**0.1**	Annual	4.60E-09	0.00%			
Tetrachlorobiphenyl	several isomers	2.49E-06	3.13E-07	**0.1**	Annual	9.59E-09	0.00%			
Trichlorobiphenyl	several isomers	2.59E-06	3.26E-07	**0.1**	Annual	9.97E-09	0.00%			
Total PCBs		8.10E-06	1.02E-06	**0.1**	Annual	3.12E-08	0.00%			
Total POMs		2.91E+00	3.67E-01	**0.1**	Annual	1.12E-02	11.22%			
Non-HAP Toxic Air Contaminants										
Acetone	67641	1.89E-01	2.38E-02	5900	8 hour	0.01561717	0.00%			
Aluminum	7429905	3.46E-02	4.35E-03	**0.1**	Annual	0.00013325	0.13%			
Barium	7440393	1.69E-01	2.13E-02	5	8 hour	1.40E-02	0.28%			
Benzaldehyde	100527	8.46E-04	1.07E-04					0.4	3.26E-06	0.00%
Benzoic acid	65850	4.68E-05	5.89E-06	**0.1**	Annual	1.80E-07	0.00%			
Calcium	7440702	9.09E-02	1.15E-02	**0.1**	Annual	3.51E-04	0.35%			
2-Chlorophenol	95578	2.39E-05	3.01E-06	**0.1**	Annual	9.20E-08	0.00%			
Copper	7440508	4.87E-02	6.14E-03	2	8 hour	4.03E-03	0.20%			
1,2-Dibromoethene	540498	5.47E-02	6.89E-03	**0.1**	Annual	2.11E-04	0.21%			
Dichlorodifluoromethane	75718	6.96E-03	8.77E-04	49500	8 hour	5.75E-04	0.00%			
Iron	7439896	9.85E-01	1.24E-01	**0.1**	Annual	3.80E-03	3.80%			
Isobutyraldehyde	78842	1.19E-02	1.50E-03	160	24 hour	4.71E-04	0.00%			
Magnesium	7439954	6.22E-01	7.83E-02	100	8 hour	5.14E-02	0.05%			
Methyl ethyl ketone	78933	2.20E-02	2.78E-03	5000	24 hour	8.70E-04	0.00%			
Molybdenum	7439987	2.09E-03	2.63E-04	**0.1**	Annual	8.05E-06	0.01%			
2-Nitrophenol	88755	2.39E-04	3.01E-05	**0.1**	Annual	9.20E-07	0.00%			
Perylene	198550	5.17E-07	6.52E-08	**0.1**	Annual	1.99E-09	0.00%			
Potassium	7440097	3.88E-01	4.89E-02	**0.1**	Annual	1.50E-03	1.50%			
Silicon	7440213	5.82E-02	7.33E-03	**0.1**	Annual	2.24E-04	0.22%			
Silver	7440224	1.69E-02	2.13E-03	0.1	8 hour	1.40E-03	1.40%			
Sodium	7440235	3.58E-01	4.51E-02	**0.1**	Annual	1.38E-03	1.38%			
Strontium	7440246	5.28E+00	6.65E-01	**0.1**	Annual	2.03E-02	20.34%			
Sulfuric Acid	7664939	9.95E-03	1.25E-03	10	8 hour	8.22E-04	0.01%			
Tin	7440315	2.29E-02	2.88E-03	20	8 hour	1.89E-03	0.01%			
Titanium	7440326	1.99E-02	2.51E-03	**0.1**	Annual	7.67E-05	0.08%			
o-Tolualdehyde	529204	7.16E-03	9.02E-04	440	24 hour	2.83E-04	0.00%			
p-Tolualdehyde	104870	1.09E-02	1.38E-03	**0.1**	Annual	4.22E-05	0.04%			
Trichlorofluoromethane	75694	4.08E-02	5.14E-03	56200	1 hour	7.99E-03	0.00%			
Vanadium	7440622	1.38E-03	1.74E-04	**0.1**	Annual	5.33E-06	0.01%			
Yttrium	7440655	2.98E-04	3.76E-05	**0.1**	Annual	1.15E-06	0.00%			
Zinc (as ZnO)	7440666	4.18E-01	5.26E-02	50	8 hour	3.45E-02	0.07%			

Note: An ITSL of 0.1 that is red bolded is a default screening level per AQD air toxics policy

[1] The screening level for the seven carcinogenic polycyclic aromatic hydrocarbons (PAHs) can be determined by methods utilizing the estimated order of potential potency

Holland Board of Public Works

Cooling Tower Summary

Table B-25. Cooling Tower

Pumping rate of recirculation pumps (gal/min)	70,000
Flow of cooling water (lb/hr)	34,986,000.0
TDS of blowdown (mg/l or ppmw)	***4000***
Flow of dissolved solids (lb/hr)	139,944.0
Fraction of flow producing drift [1]	0.31
Control effiency of drift elminators	0.0005%
Particulate emissions from tower (lb/hr)	0.22
Particulate emissions from tower (tpy)	0.95
Particulate emissions from tower (g/sec)	0.027
Tower cells	***7***
Particulate emissions from each cell (g/sec)	0.004

[1] Technical Report EPA-600-7-79-251a, p63

Effects of Pathogenic and Toxic Materials Transported Via Cooling Device Drift - Volume 1

Fugitive Emissions

Table B-26. Summary of Fugitive Emissions from Roads

Emission Source	PM (lb/hr)	PM (tpy)	PM_{10} (lb/hr)	PM_{10} (tpy)	$PM_{2.5}$ (lb/hr)	$PM_{2.5}$ (tpy)
Paved Main Entrance Road	8.32E-04	3.64E-03	1.61E-04	7.06E-04	2.32E-05	1.02E-04
Paved Employee Driveway	1.49E-03	6.54E-03	2.86E-04	1.25E-03	3.88E-05	1.70E-04
Paved Limestone Delivery Road	1.83E-03	8.00E-03	3.56E-04	1.56E-03	5.33E-05	2.34E-04
Paved Alternate Fuels Delivery Road	9.14E-02	4.00E-01	1.78E-02	7.81E-02	2.67E-03	1.17E-02
Total Fugitive Emissions from Roads	**9.56E-02**	**4.19E-01**	**1.86E-02**	**8.16E-02**	**2.78E-03**	**1.22E-02**

AP-42 Equations for Paved Roads

Equation 1, for short-term emissions

$$E = \left(k \left(\frac{sL}{2} \right)^{0.65} \left(\frac{W}{3} \right)^{1.5} - C \right)$$

Equation 2, for annual emissions

$$E = \left(k \left(\frac{sL}{2} \right)^{0.65} \left(\frac{W}{3} \right)^{1.5} - C \right) \left(1 - \frac{P}{4N} \right)$$

Parameter	PM	PM_{10}	$PM_{2.5}$	
k, Particle size multiplier for PM	0.082	0.016	0.0024	From Table 13.2.1-1
C, Exhaust, brake wear, and tire wear for PM	0.00047	0.00047	0.00036	From Table 13.2.1-2
sL, silt loading	7.4	7.4	7.4	From Table 13.2.1-4 for MSWLF
$(sL/2)^{0.65}$ =	2.34	2.34	2.34	
W, mean vehicle weight (tons)	Shown Below			From HBPW
P, number of days of precipitation in one year	120	120	120	From Figure 13.2.1-2
N, number of days in the averageing period	365	365	365	
Control Efficiency	95%	95%	95%	

Main Entrance Road

Vehicle Type	Length Traveled (feet)	Vehicle weight (tons)	Vehicle Miles Traveled (VMT)	Vehicles (trips) per day	Percentage of Total Vehicles	Percentage of Vehicle Weight	VMT per day
Limestone Trucks (Full)	131.2	40	0.02	1.0	1.6%	0.63	0.02
Limestone Trucks (Empty)	131.2	15	0.02	1.0	1.6%	0.23	0.02
Alternative Fuels Trucks (Full)	131.2	40	0.02	1.0	1.6%	0.63	0.02
Alternative Fuel Trucks (Empty)	131.2	15	0.02	1.0	1.6%	0.23	0.02
Visitor/Employee/Maintenance Vehicles	131.2	2	0.02	60	93.8%	1.88	1.49

Mean Vehicle Weight, W (tons)	3.6
Total Miles Traveled on Paved Roads	1.6

Parameter	PM	PM_{10}	$PM_{2.5}$
Short-term emission factor (lb/VMT)	1.26E-02	2.43E-03	3.50E-04
Long-term emission factor (lb/VMT)	1.15E-02	2.23E-03	3.21E-04
Short-term Emissions (lb/hr)	**8.32E-04**	**1.61E-04**	**2.32E-05**
Long-term Emissions (tpy)	**3.64E-03**	**7.06E-04**	**1.02E-04**

Employee Road

Vehicle Type	Length Traveled (feet)	Vehicle weight (tons)	Vehicle Miles Traveled (VMT)	Vehicles (trips) per day	Percentage of Total Vehicles	Percentage of Vehicle Weight	VMT per day
Visitor/Employee/Maintenance Vehicles	606.8	2	0.11	60.0	100.0%	2.00	6.90

Mean Vehicle Weight, W (tons)	2.0
Total Miles Traveled on Paved Roads	6.9

Parameter	PM	PM_{10}	$PM_{2.5}$
Short-term emission factor (lb/VMT)	5.20E-03	9.96E-04	1.35E-04
Long-term emission factor (lb/VMT)	4.77E-03	9.14E-04	1.24E-04
Short-term Emissions (lb/hr)	**1.49E-03**	**2.86E-04**	**3.88E-05**
Long-term Emissions (tpy)	**6.54E-03**	**1.25E-03**	**1.70E-04**

Limestone Delivery Road

Vehicle Type	Length Traveled (feet)	Vehicle weight (tons)	Vehicle Miles Traveled	Vehicles (trips) per day	Percentage of Total Vehicles	Percentage of Vehicle Weight	VMT per day
Hydrated Lime Trucks (Full)	623.2	40	0.12	1.0	50.0%	20.00	0.12
Hydrated Lime Trucks (Empty)	246	15	0.05	1.0	50.0%	7.50	0.05

Mean Vehicle Weight, W (tons)	27.5
Total Miles Traveled on Paved Roads	0.2

Parameter	PM	PM_{10}	$PM_{2.5}$
Short-term emission factor (lb/VMT)	2.66E-01	5.19E-02	7.78E-03
Long-term emission factor (lb/VMT)	2.44E-01	4.77E-02	7.14E-03
Short-term Emissions (lb/hr)	**1.83E-03**	**3.56E-04**	**5.33E-05**
Long-term Emissions (tpy)	**8.00E-03**	**1.56E-03**	**2.34E-04**

Alternative Fuels Delivery Road

Vehicle Type	Length Traveled (feet)	Vehicle weight (tons)	Vehicle Miles Traveled	Vehicles (trips) per day	Percentage of Total Vehicles	Percentage of Vehicle Weight	VMT per day
Alternative Fuels Trucks (Full)	590.4	40	0.11	52.0	50.0%	20.00	5.81
Alternative Fuel Trucks (Empty)	246	15	0.05	52.0	50.0%	7.50	2.42

Mean Vehicle Weight, W (tons)	27.5
Total Miles Traveled on Paved Roads	8.2

Parameter	PM	PM_{10}	$PM_{2.5}$
Short-term emission factor (lb/VMT)	2.66E-01	5.19E-02	7.78E-03
Long-term emission factor (lb/VMT)	2.44E-01	4.77E-02	7.14E-03
Short-term Emissions (lb/hr)	**9.14E-02**	**1.78E-02**	**2.67E-03**
Long-term Emissions (tpy)	**4.00E-01**	**7.81E-02**	**1.17E-02**

Holland Board of Public Works - Application 25-07
ProUCL Results of COALQUAL Bituminous Data
November 5, 2008

COLORADO

	Btu/lb	Cl (lb/MMBtu)	HCl (lb/MMBtu)	Equivalent Cl (ppm)
Number of Samples	290		290	290
Number of Non-Zeroes	216		143	143
Minimum	7,705	0.005	0.005	37
Maximum	14,766	0.096	0.099	1,423
Mean	11,250	0.014	0.014	155
Standard Deviation	1,355	0.015	0.015	
Distribution	No Discernable Distribution	No Discernable Distribution	No Discernable Distribution	No Discernable Distribution
95% UCL	11,403	0.019	0.020	220
99% UCL	11,466	0.026	0.027	302
99% Percentile	14,639	0.096	0.099	1,407

ILLINOIS

	Btu/lb	Cl (lb/MMBtu)	HCl (lb/MMBtu)	Equivalent Cl (ppm)
Number of Samples	16		16	16
Number of Non-Zeroes	16		0	0
Minimum	10,449		0	0
Maximum	12,882		0	0
Mean	11,605		0	0
Standard Deviation	639		0	0
Distribution	Normal	No Discernable Distribution	No Discernable Distribution	No Discernable Distribution
95% UCL	11,885			
99% UCL	12,021		No chlorine data available	No chlorine data available
99% Percentile	13,091			

PENNSYLVANIA

	Btu/lb	Cl (lb/MMBtu)	HCl (lb/MMBtu)	Equivalent Cl (ppm)
Number of Samples	759		759	759
Number of Non-Zeroes	701		590	590
Minimum	7,151	0.004	0.004	26
Maximum	15,043	0.188	0.194	2,828
Mean	12,760	0.072	0.074	915
Standard Deviation	985	0.038	0.039	
Distribution	No Discernable Distribution	No Discernable Distribution	No Discernable Distribution	No Discernable Distribution
95% UCL	12,821	0.078	0.081	1,005
99% UCL	12,847	0.087	0.090	1,118
99% Percentile	14,351	0.165	0.170	2,368

UTAH

	Btu/lb	Cl (lb/MMBtu)	HCl (lb/MMBtu)	Equivalent Cl (ppm)
Number of Samples	159		159	159
Number of Non-Zeroes	151		73	73
Minimum	3,674	0.005	0.005	20
Maximum	13,370	0.024	0.025	321
Mean	10,061	0.009	0.009	89
Standard Deviation	2,611	0.005	0.005	
Distribution	No Discernable Distribution	No Discernable Distribution	No Discernable Distribution	No Discernable Distribution
95% UCL	10,413	0.010	0.010	102
99% UCL	10,561	0.010	0.010	107
99% Percentile	13,334	0.024	0.025	320

WYOMING

	Btu/lb	Cl (lb/MMBtu)	HCl (lb/MMBtu)	Equivalent Cl (ppm)
Number of Samples	45		45	45
Number of Non-Zeroes	41		24	24
Minimum	9,080	0.006	0.006	52
Maximum	14,880	0.013	0.013	189
Mean	10,996	0.007	0.007	77
Standard Deviation	985	0.002	0.002	
Distribution	No Discernable Distribution	No Discernable Distribution	No Discernable Distribution	No Discernable Distribution
95% UCL	11,253	0.008	0.008	87
99% UCL	11,361	0.008	0.008	91
99% Percentile	13,408	0.013	0.013	170

MONTANA

	Btu/lb	Cl (lb/MMBtu)	HCl (lb/MMBtu)	Equivalent Cl (ppm)
Number of Samples	7	7	7	7
Number of Non-Zeroes	7	7	7	7
Minimum	5,075	0.007	0.008	38
Maximum	9,382	0.014	0.014	129
Mean	6,790	0.011	0.011	73
Standard Deviation	1,562	0.002	0.002	
Distribution	Normal	No Discernable Distribution	No Discernable Distribution	No Discernable Distribution
95% UCL	Not enough data available to generate reliable conclusions.			
99% UCL				
99% Percentile				