BRAUN INTERTEC
The Science You Build On.

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February 17, 2023

Wisconsin Department of Natural Resources
Air Management Program, AM/7
Attention: Permits
PO Box 7921
Madison WI 53707-7921

RE: Air Pollution Control Type A Registration Construction and Operation Permit Application
Waupaca AD1
N1757 County Road A
Waupaca, Wisconsin

To Whom it May Concern:

Waupaca AD1, LLC herewith submits the enclosed Air Pollution Control Type A Registration Construction and Operation Permit Application for the Waupaca AD1 facility located at N1757 County Road A, Waupaca, WI 54981.

Waupaca AD1 (Facility) is a proposed renewable natural gas (RNG) production facility located in Waupaca, WI. Emissions units at the proposed Facility will include an emergency flare, a gas upgrading process (for removal of CO2 and H2S), two natural gas-fired boilers, two natural gas-fired back-up generators, one diesel-fired fire pump engine, hydrolysis tanks, and organics unloading and de-packaging operations taking place within the organics receiving area (ORA) building. Fugitive sources at the proposed Facility will include truck traffic on paved roads, a storage pad for storing excess fiber (negligible emissions due to high moisture content), material handling using a skid loader or similar equipment (negligible emissions due to high moisture content), and equipment component (valves, pumps, etc.) leaks (negligible non-methane VOC emissions).

The application package includes applicable application forms, emissions calculations, and attachments. An electronic copy of the emissions calculations spreadsheet may be provided upon request.

As instructed on Form 4530-156, one paper copy of the application with an ink signature has been submitted to Wisconsin Department of Natural Resources, Air Management Program, ATTN: Permits, P.O. BOX 7921, Madison, WI 53707-7921.

Please feel free to contact me at 651-318-5065 or joscarlson@braunintertec.com should you have any questions or if you require additional information regarding this application.

Sincerely,

BRAUN INTERTEC CORPORATION

Joseph D. Carlson

Joseph D. Carlson, PE
Project Engineer

Kelsey E. Suddard

Kelsey E. Suddard, PE
Senior Engineer

Enclosure
AA/EOE

Air Pollution Control Type A Registration Construction and Operation Permit Application

Waupaca AD1
N1757 County Road A
Waupaca, Wisconsin

Prepared for

Wisconsin Department of Natural Resources

BRAUN INTERTEC
The Science You Build On.

Project B2202402.01
February 17, 2023

Braun Intertec Corporation

Table of Contents

Appendices

A. Facility Description

Waupaca AD1 (Facility) is a proposed renewable natural gas (RNG) production facility located in Waupaca, WI. Emissions units at the proposed Facility will include an emergency flare, a gas upgrading process (for removal of carbon dioxide (CO_2) and hydrogen sulfide (H_2S)), two natural gas-fired boilers, two natural gas-fired back-up generators, one diesel-fired fire pump engine, hydrolysis tanks, and organics unloading and de-packaging operations taking place within the organics receiving area (ORA) building. Fugitive sources at the proposed Facility will include truck traffic on paved roads, a storage pad for storing excess fiber (negligible emissions due to high moisture content), material handling using a skid loader or similar equipment (negligible emissions due to high moisture content), and equipment component (valves, pumps, etc.) leaks (negligible non-methane VOC emissions).

The proposed facility will receive biomass feedstock (cattle manure) from a neighboring dairy production site and will receive food waste from nearby food production facilities. Manure and food waste will be fed into an anaerobic digester. The anaerobic digester uses microorganisms to break down the manure and food waste, producing biogas containing methane (CH_4), CO_2, nitrogen (N_2), oxygen (O_2), H_2S, and water vapor (H_2O). Biogas produced in the digestor will first pass through a blower to increase the gas pressure. After the inlet blower, the biogas will pass through a gas upgrading process for CO_2 and H_2S removal and dehydration. The finished renewable natural gas will pass through a gas flow meter prior to being fed into the natural gas supply line for delivery to natural gas customers.

Gases from the ORA building will be collected using a forced ventilation system and passed through an odor control system for destruction of ammonia and hydrogen sulfide prior to being exhausted through a stack. The hydrolysis tanks will also include a forced ventilation system which will collect exhaust gases from these tanks and pass them through a separate odor control system for destruction of ammonia and hydrogen sulfide prior to being exhausted through a stack.

Excess fiber removed from the digester will be stored on an outdoor storage pad until the materials are used for bedding or land-applied to a nearby farm field.

The proposed boiler will use pipeline quality natural gas only. All compressors and pumps will be powered using electric motors.

The proposed facility will use the emergency flare to combust biogas during limited process upset and equipment startup periods, including periods when renewable natural gas cannot be routed to the pipeline.

B. Regulatory Overview

B.1. Type A Registration Permit Eligibility

Emissions from the proposed facility will meet the emission limits contained in Type A Registration Permit ROP-A03/RCP-A03. Table B-1 includes a comparison of the total facility estimated actual emissions to the emission limits contained in the Type A Registration Permit.

Table B-1. Facility Emissions Summary

Pollutant	Total Facility Estimated Actual Annual Emissions (tpy)[1]	Type A Registration Permit Emission Limit (tpy)	Emission Limit Exceeded?
PM	0.549	25	No
VOC	1.96	25	No
NO_X	5.45	25	No
SO_2	4.08	25	No
CO	7.32	25	No
Lead	3.47×10^{-5}	0.5	No
Single HAP	0.125	2.5	No
Combined HAPs	0.156	6.25	No

[1] Calculations included in Appendix E.

B.2. New Source Performance Standards (NSPS)

The proposed Facility will include one diesel-fired fire pump engine with a rating of approximately 106 brake horsepower. The engine is subject to requirements under 40 CFR pt. 60, subp. IIII as it is a compression ignition internal combustion engine for which construction commences after July 11, 2005 and is manufactured after April 1, 2006. The engine meets the standard's definition of "emergency engine".

The proposed facility will include two natural gas-fired back-up generator engines, each with a rating of approximately 1,114 brake horsepower and electrical generating capacity of approximately 750 electrical kilowatts (ekW). The engines are subject to requirements under 40 CFR pt. 60, subp. JJJJ as they are spark ignition internal combustion engines for which construction commences after June 12, 2006 and are manufactured after July 1, 2007. The engines each meet the standard's definition of "emergency engine". The engines will be certified to meet the emissions standards of 40 CFR pt. 60, subp. JJJJ.

The Facility is proposing to construct two natural gas-fired boilers, each with a heat input capacity of approximately 4.0 million British thermal units per hour (MMBtu/h). The boilers will not be subject to the requirements of 40 CFR pt. 60, subp. Dc (Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units) because the boilers will have heat input capacities of less than 10 MMBtu/h.

The proposed facility will not be subject to 40 CFR pt. 60, subp. O (Standards of Performance for Sewage Treatment Plants) because the facility will not operate a sewage sludge incinerator.

The proposed facility will not be subject to 40 CFR pt. 60, subp. KKK (Standards of Performance for Equipment Leaks of VOC From Onshore Natural Gas Processing Plants for Which Construction, Reconstruction, or Modification Commenced After January 20, 1984, and on or Before August 23, 2011) because the facility is not a *natural gas processing plant* as defined at 40 CFR § 60.631.

The proposed facility will not be subject to 40 CFR pt. 60, subp. LLL (Standards of Performance for SO_2 Emissions From Onshore Natural Gas Processing for Which Construction, Reconstruction, or Modification Commenced After January 20, 1984, and on or Before August 23, 2011) because the biogas treated at the facility will not meet the definition of *natural gas* under 40 CFR § 60.641.

The proposed facility will not be subject to 40 CFR pt. 60, subp. OOOOa (Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015) because the facility will not operate any of the affected facilities listed in 40 CFR § 60.5365a(a)-(j).

There are no New Source Performance Standards applicable to any other proposed process equipment at the facility.

B.3. National Emission Standards for Hazardous Air Pollutants (NESHAP)

The proposed facility will be a true area source of hazardous air pollutants (HAP).

The proposed diesel-fired fire pump engine and natural gas-fired back-up generator engines will be subject to 40 CFR pt. 63, subp. ZZZZ (National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines) because the proposed engines will be new stationary reciprocating internal combustion engines (RICE) located at an area source of HAP. The engines will meet the definition of "Stationary RICE subject to Regulations under 40 CFR Part 60" under 40 CFR §63.6590(c) and will meet the requirements of 40 CFR pt. 63, subp. ZZZZ by complying with the requirements of 40 CFR pt. 60, subp. IIII and 40 CFR pt. 60, subp. JJJJ.

The facility is proposing to construct two natural gas-fired boilers, which belong to the area source category "Industrial, Commercial, and Institutional Boilers and Process Heaters – Area Sources (40 CFR pt. 63, subp. JJJJJJ)." As provided at 40 CFR § 63.11195(e), gas-fired boilers are not subject to 40 CFR pt. 63, subp. JJJJJJ.

The proposed facility will not be subject to 40 CFR pt. 63, subp. HH (National Emission Standards for Hazardous Air Pollutants Form Oil and Natural Gas Production Facilities) because the source does not meet the definition of a *natural gas processing plant* under 40 CFR § 63.761 and the source does not include a triethylene glycol dehydration unit.

B.4. Emergency Flare

The emergency flare will only operate under process upset conditions and during equipment startup. The proposed facility is not required to combust methane or hydrogen sulfide gases generated from an anaerobic digester using a flare; therefore, the flare is not considered air pollution control equipment. H_2S and ammonia (NH_3) emissions generated from the Facility are exempt from the requirements of NR 445 Control of Hazardous Pollutants because under NR 445.08(6)(d) they are emissions of hazardous air contaminants associated with agricultural waste.

As a worst-case sulfur dioxide (SO_2) emissions assumption, calculated SO_2 emissions during process upset events will assume that the gas combusted in the flare contains the highest potential H_2S content (i.e., no H_2S removal prior to flaring). Additionally, for the purposes of calculating maximum theoretical emissions (MTE) and potential to emit (PTE), it was assumed that the flare operates at maximum capacity, 8,760 hrs/yr.

Hydrogen sulfide data from a similar Vanguard Renewables co-digestion facility located in Salisbury, VT is presented in **Appendix F**. Of all of the anaerobic co-digestion facilities that Vanguard Renewables operates, the Salisbury, VT is the most similar to the proposed Waupaca AD1 facility based on type of equipment and anaerobic digestion operating practices. The maximum expected hydrogen sulfide content of the Waupaca AD1 biogas was estimated as the maximum of each monthly Salisbury, VT mean biogas hydrogen sulfide content plus two standard deviations (478 ppm H_2S). A biogas hydrogen sulfide content of 500 ppm has been assumed in the emissions calculations as worst-case. Co-digestion facilities have a lower biogas hydrogen sulfide content than is typically observed from a manure-only anaerobic digester, because most of the food waste contains lower levels of sulfur than the manure does.

C. Air Quality Analysis

C.1. Air Quality Analysis

Some of the stack parameters for the proposed facility do not meet the screening criteria identified in form 4530-156; therefore, the maximum controlled emission rate was compared against the ROP-A emissions thresholds contained in Table 2 of form 4530-156A to determine which pollutants must be included in an air dispersion modeling analysis. **Table C-1** below compares the maximum controlled emission rate from the proposed facility to the applicable thresholds from form 4530-156A.

Table C-1. Pollutants Required for Air Dispersion Modeling Analysis

Pollutant	ROP-A Air Dispersion Modeling Threshold (tons/year)	Total Facility Maximum Controlled Emission Rate (tons/year) [1]	Required for Air Dispersion Modeling Analysis?
PM10	> 5 (PM)	2.97 (PM)	No (PM emissions < 5 TPY)
NO_X	> 5	24.6	**Yes**
SO_2	> 5	29.2	**Yes**
CO	N/A	32.7	No
Pb	> 0.2	1.88×10^{-4}	No (Pb emissions < 0.2 TPY)

[1] The maximum controlled emission rate is the maximum controlled hourly emissions multiplied by 8,760 hours per year.

As demonstrated in **Table C-1** above, the maximum controlled emission rate of NO_X and SO_2 exceeds the thresholds; therefore, an air quality analysis was performed for NO_2 and SO_2 in accordance with the instructions on form 4530-156A and the Wisconsin Air Dispersion Modeling Guidelines, Air Dispersion Modeling Guidelines for Registration Permits, March 2018, pp. 42-50 (https://widnr.widen.net/view/pdf/gnggfzcxbp/AM528.pdf?t.download=true). The results of this air quality analysis demonstrates that the operation of the facility does not cause an exceedance of the National Ambient Air Quality Standards (NAAQS).

C.2. Emissions Sources/Stacks Not Included in Air Dispersion Modeling Analysis

Several emissions sources were not included on form 4530-156A and were not included in the air dispersion modeling demonstration. **Table C-2** below provides a summary of the justification for exclusion of these emissions sources.

Table C-2. Emissions Sources/Stacks Not Included in Air Dispersion Modeling Analysis

Stack ID	Process No.	Description	Justification for Exclusion from Air Dispersion Modeling Analysis
S02	P02	CO_2 Removal System	No emissions of NO_X or SO_2
S05	P03	Back-up Generator 1	Intermittent source (WDNR modeling guidelines, pp. 46)
S06	P04	Back-up Generator 2	Intermittent source (WDNR modeling guidelines, pp. 46)
S07	P05	Fire Pump Engine	Intermittent source (WDNR modeling guidelines, pp. 46)
S08	P06	ORA Process Area Exhaust	No emissions of NO_X or SO_2 except for emissions from insignificant emissions units (convenience space heating units with heat input capacity of less than 5 million Btu per hour that burn gaseous fuels)
S09	P07	ORA Non-Process Area Exhaust	No emissions of NO_X or SO_2 except for emissions from insignificant emissions units (convenience space heating units with heat input capacity of less than 5 million Btu per hour that burn gaseous fuels)

Appendix A

Registration Permit (ROP) Application Checklist

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AIR POLLUTION CONTROL PERMIT
REGISTRATION PERMIT (ROP) APPLICATION CHECKLIST
AM-555 June 2022

Air pollution control registration operation permit (ROP) applications must include the information listed below. Include supporting information as necessary. This checklist may be used for all types of ROP applications, including Type A, Type B, Type C or Type G. The department may request additional information as needed to process the application.

1. Complete one of the following Forms† for the appropriate type of ROP

† Application forms and guides for completing the forms can be found on the Air permit and compliance forms webpage. Additional information about ROPs can be found on the Registration tab of the Air permit options webpage. Each form and its associated guide includes detailed instructions. Download fillable PDF forms before opening and entering information. See DNR's PDF Help page for more information.

☒ **Form 4530-156** for a Type A Registration Construction and Operation Permit Application

(facilities with actual emissions below 25% of the major source thresholds for criteria and hazardous air pollutants (HAPs))

☐ **Form 4530-183** for a Type B Registration Construction and Operation Permit Application

(facilities with actual emissions below 50% of the major source thresholds for criteria and HAPs)

☐ **Form 4530-172** for a Type C Registration Construction and Operation Permit Application

(printing facilities with actual emissions below 25% of the major source thresholds for criteria pollutants and below 50% of the major source thresholds for HAPs)

☐ **Form 4530-185** for a Type G Registration Construction and Operation Permit Application

(For tier 2 Green Tier facilities)

2. Include the following information on the ROP application form

☒ Describe the facility's operations in detail on the front page of the application, or in attachments as needed.

☒ List and describe all air pollution sources at the facility on the front page of the application or in attachments as needed.

☒ Include the email address, mailing address and telephone of the applicant and consultant

☒ Ensure the individual identified as the Responsible Official meets the criteria in the definition at the end of the application form

3. Provide emission calculations

☒ Include detailed calculations of **actual emissions** of:

- particulate matter with an aerodynamic diameter less than or equal to of 10 microns (PM_{10}),
- volatile organic compounds (VOC),
- carbon monoxide (CO),
- nitrogen oxides (NO_x),
- sulfur dioxide (SO_2),
- lead(Pb),
- hazardous air pollutants (HAPs) listed under section 112(b) of the Clean Air Act, as revised by 40 CFR part 63 Subpart C*,

- hazardous air contaminants listed in Tables A, B and C of s. NR 445.07, Wis. Adm. Code are included.

See instructions for Questions 7 and 8 in the ROP-A or ROP-B Application Guides, Questions 7 and 9 in the ROP-G Application Guide, or Questions 5 and 6 in the ROP-C Application Guide for an explanation of calculating actual emissions.

*NEW: 1-Bromopropane (CAS# 106-94-5) was added to the hazardous air pollutants listed under section 112(b) of the Clean Air Act, pursuant to 40 CFR part 63 Subpart C, effective February 4, 2022. For more information, see 1bp-q-and-a-document-final.pdf (epa.gov).

☒ Include detailed calculations of **maximum controlled emissions** of:

- particulate matter with an aerodynamic diameter less than or equal to of 10 microns (PM_{10}),
- volatile organic compounds (VOC),
- carbon monoxide (CO),
- nitrogen oxides (NO_x),
- sulfur dioxide (SO_2),
- lead(Pb),
- hazardous air pollutants (HAPs) listed under section 112(b) of the Clean Air Act, as revised by 40 CFR part 63 Subpart C*,
- hazardous air contaminants listed in Tables A, B and C of s. NR 445.07, Wis. Adm. Code are included.

See instructions for Question 10 in the ROP-A or ROP-B Application Guides, Questions 7 and 9 in the ROP-G Application Guide, or Questions 5 and 6 in the ROP-C Application Guide for an explanation of calculating maximum controlled emissions.

*NEW: 1-Bromopropane (CAS# 106-94-5) was added to the hazardous air pollutants listed under section 112(b) of the Clean Air Act, pursuant to 40 CFR part 63 Subpart C, effective February 4, 2022. For more information, see 1bp-q-and-a-document-final.pdf (epa.gov).

☒ Clearly identify the emission factors, hours of operation, and/or material usage in the emission calculations provided.

☐ Use the control efficiencies listed in the ROP for calculations of actual and maximum controlled emissions.

See section G of each ROP for a table of allowed control efficiencies.

☐ Provide information to support that the control efficiency of any air pollution control device use meets the control efficiencies listed in section G of the appropriate ROP. (e.g. manufacturer's specifications)

3. Verify eligibility criteria are met and applicable standards are identified

☒ Verify the calculated emissions of hazardous air contaminants are below the thresholds in s. NR 445.07, Wis. Adm. Code

See instructions for Question 8 in ROP-A or ROP-B Application Guides or Question 9 in ROP-G Application Guide for an explanation of calculating HAP emissions. The same calculations are used for ROP-C.

☒ Determine the applicability of New Source Performance Standards (NSPS) and list the NSPSs that apply to the facility.

See instructions for Question 4 in the ROP-A, ROP-B or ROP-G Application Guides for an explanation of NSPS applicability. The same information can be used for ROP-C.

☒ Determine the applicability of National Emission Standards for Hazardous Air Pollutants (NESHAP) and list the NESHAPs that apply to the facility.

See instructions for Question 5 in ROP-A, ROP-B or ROP-G Application Guides for an explanation of NESHAP applicability. The same information can be used for ROP-C.

4. Provide modeling assessment, if required
☒ If modeling was necessary, include the Air Pollution Control Registration Construction and Operation Permit Modeling Assessment Attachment (**Form 4530-156A**, http://dnr.wi.gov/files/PDF/forms/4500/4530-156A.pdf) *See instructions for Question 9 in the ROP-A or ROP-B Application Guides, Question 7 in the ROP-C Application Guide, or Question 8 in the ROP-G Application Guide for an explanation of modeling requirements.*
5. Describe compliance method for VOC emissions from process lines, if necessary
☐ If facility emits VOCs from process lines, describe the method for complying with s. NR 424.03(2), Wis. Adm. Code (e.g. LACT of 10 tons per year per process line). *See instructions for Question 1 in the ROP-A or ROP-B Application Guides, Question 8 in the ROP-C Application Guide, or Question 11 in the ROP-G Application Guide for an explanation of LACT applicability.*
6. For ROP-C and ROP-G Applications – complete application checklist
☐ For a ROP-C or ROP-G application complete the application checklist in Attachment 1 of the application form

Additional Information:

- Additional information about ROPs can be found on the Registration tab of the Air permit options webpage and the Registration Permit Options webpage.

Submit permit applications by:

Option 1: Email an **ELECTRONIC COPY*** to DNRAMAIRPERMIT@wisconsin.gov.

* Applications must be signed by the responsible official for the source. If submitting an electronic application, the department will send an email with instructions for e-Signing or submitting an ink signature upon receipt of the electronic application. A photocopied or scanned signature does not meet the department's signature requirements. The department will not process an application until the signature is received.

- OR -

Option 2: Mail the original copy of all materials with ink signature to:

Wisconsin Department of Natural Resources
Air Management Program, AM/7
Attention: Permits
PO Box 7921
Madison WI 53707-7921

Appendix B

Air Pollution Control Type A Registration Construction and Operation Permit Application Form (4530-156)

BRAUN INTERTEC

State of Wisconsin
Department of Natural Resources
dnr.wi.gov

Air Pollution Control Type A Registration Construction and Operation Permit Application

Form 4530-156 (R 06/22)

Notice: Pursuant to ss. NR 406.17(4)(a), and 407.105(4)(a), Wis. Adm. Code, completion of this form is required to apply for coverage under the registration permits. This application is for coverage under the Type A Registration Operation Permit and its companion Type A Registration Construction Permit. These two permits are referred to as the registration permits throughout the rest of this document. The department will not consider or act upon an application unless this form is submitted and complete. Any personal information collected will be used for administrative purposes only and may be provided to requestors to the extent required by Wisconsin's Public Records Law [ss. 19.31-19.39, Wis. Stats.].

To qualify for a registration permit, all existing permits (active and inactive) must be revoked and all applications withdrawn. This registration permit application constitutes a request for those revocations and withdrawals to take place. Before the registration permit application is declared complete, a public written notification of the department's intent to revoke previously issued permits will be prepared followed by either a 14-day waiting period for construction permits or a 21-day waiting period for operation permits. After the waiting period is over, the application can be declared complete and the review of the registration permit application will begin. A final decision on registration permit coverage will be made within 15 days of the application being declared complete. If the facility qualifies for coverage, coverage approval will be given under the registration permit, and the previous permits will be formally revoked and any pending air permit applications withdrawn. **Be sure to send copies of all calculations with the application.**

Supplemental Materials:

For help completing this application, see the instructions beginning on page 14.

For more detailed instructions review the following documents all found on the department's Registration Permit Options webpage under the ROP-A tab at: https://dnr.wisconsin.gov/topic/AirPermits/Registration.html:
Registration Permit Application Guide – Guide for Assisting Facilities in Applying for Type A Registration Permits (AM-539)
Registration Permit application checklist (AM-555)
Type A Registration Permit Fact Sheet (AM-364)

To submit modeling results or request modeling, use the Modeling Assessment Form (Form 4530-156A) available at the department's Air Permit and Compliance forms webpage under the General and Registration Permit Forms tab at:
https://dnr.wisconsin.gov/topic/AirPermits/Forms.html

For additional assistance, contact the registration permit program coordinator at (608) 266-7718 or by email at DNRamROPSairpermit@wisconsin.gov or visit the department's Small Business Environmental Assistance webpage:
http://dnr.wi.gov/topic/smallbusiness/

Section 1: Facility Information

Facility Name			
Waupaca AD1			
Mailing Address	City	State	ZIP Code
133 Boston Post Road, Building 15, 2nd Floor	Weston	MA	02493
Facility Physical Address			
N1757 County Road A			
◯ City ◉ Town ◯ Village of Lind	County: Waupaca		
Parent Corporation Name		Country (if not U.S.)	
Waupaca AD1, LLC			
Street or Route	City	State	ZIP Code
133 Boston Post Road, Building 15, 2nd Floor	Weston	MA	02493
Responsible Official Name	Title		
Raycho Spilkov	Vice President of Development		
Phone (include area code)	Email		
(781) 232-7597	development@vanguardrenewables.com		
Street or Route	City	State	ZIP Code
133 Boston Post Road, Building 15, 2nd Floor	Weston	MA	02493

Permit Contact Person Name		Title		
Libby McDonald		Development Manager		
Phone (include area code)	Fax	Email		
(617) 571-0323		development@vanguardrenewables.com		
Street or Route		City	State	ZIP Code
133 Boston Post Road, Building 15, 2nd Floor		Weston	MA	02493
Facility NAICS code description:		Facility Identification (FID) Number:		
221210 - Natural Gas Distribution		469068930		

General Facility Description:
Waupaca AD1 (Facility) is a proposed renewable natural gas (RNG) production facility located in Waupaca, WI.The proposed facility will receive biomass feedstock (cattle manure) from a neighboring dairy production site and will receive food waste from nearby food production facilities. Manure and food waste will be fed into an anaerobic digester. The anaerobic digester uses microorganisms to break down the manure and food waste, producing biogas containing methane (CH4), carbon dioxide (CO2), nitrogen (N2), oxygen (O2), hydrogen sulfide (H2S), and water vapor (H2O). Biogas produced in the digestor will first pass through a blower to increase the gas pressure. After the inlet blower, the biogas will pass through a gas upgrading process for CO2 and H2S removal and dehydration. The finished renewable natural gas will pass through a gas flow meter prior to being fed into the natural gas supply line for delivery to natural gas customers.

Provide a Listing and Description of all Air Pollution Sources:
Emissions units at the proposed Facility will include an emergency flare, a gas upgrading process (for removal of CO2 and H2S), two natural gas-fired boilers, two natural gas-fired back-up generators, one diesel-fired fire pump engine, hydrolysis tanks, and organics unloading and de-packaging operations taking place within the organics receiving area (ORA) building.

Other emissions sources include insignificant emissions units listed in the insignificant emissions units table on this form.

Section 2: Eligibility Questions

1a. Does the facility have any existing air permits (construction or operation)? ○ Yes ◉ No

1b. If "Yes" to 1a, are the permits all revocable? ○ Yes ○ No
(To understand whether permits may not be revocable, please review the Additional Information below.) If answering No to this question, the facility is NOT eligible for the Registration permit.

- ► If answering Yes to 1b., go on to question 2.
- ► Answering No to 1b, indicates the facility has a permit condition that may NOT be revocable. A facility that needs case-by-case determinations in a permit, such as BACT or LAER, is not eligible for a registration permit. A permit with RACT or LACT avoidance limits or case-by-case determinations may be revocable if the facility elects to comply with alternative requirements. The department will need to review the existing permits to determine if they are revocable.

ADDITIONAL INFORMATION: *Permits that have conditions set either as avoidance limits or as case-by-case determinations to comply with certain requirements (i.e. emissions caps, control requirements) may not be revocable. The requirements that may trigger avoidance limits or case-by-case determinations in existing permits may include: chs. NR 405 or 408 New Source Review (NSR) Major Source construction permits (caps or Prevention of Significant Deterioration (PSD) BACT/Nonattainment NSR LAER controls); ch. NR 445 (caps or BACT/LAER); ch. NR 420 or 422 RACT (avoidance caps); or ch. NR 424 LACT (case-by-case determination).*

If the facility has been issued permits in the past, they can help determine if the facility has emission units covered by avoidance limits or BACT/LAER/LACT/RACT requirements. When answering this question, please note that the emission caps in the Registration Permit are considered enforceable caps on potential to emit. These limits may eliminate the need to retain any avoidance limits in existing permits. Use the comment section below to provide additional information on such situations. Keep in mind that some NSR Major Source construction permit (PSD or Nonattainment) avoidance limits may not be maintained using ROPA emission limits of 25 tons per year. And specifically, a limit set under s. NR 405.08, Wis. Adm. Code, cannot be modified or revoked.

Facilities that have case-by-case BACT or LAER determinations in their permits, whether for a NSR Major Source construction permit or for NR 445 requirements, do NOT qualify for registration permit coverage.

There is further explanation of this in the Registration Permit Application Guide - Guide for Assisting Facilities in Applying for Type A Registration Permits (AM-539) linked in the Supplemental Materials section at the beginning of this form.

Comments:
N/A

Section 2: Eligibility Questions (continued)

2. Is the facility an affected source under the Acid Rain Program? ○ Yes ◉ No

- ► If answering NO, go on to question 3.
- ► If answering YES, the facility is an affected facility under the Acid Rain Program and as such would not be eligible for a registration permit.

ADDITIONAL INFORMATION: *Unless the facility generates electricity by combusting fossil fuels and the capacity to generate electricity is greater than 25 megawatts, answer No to this question. If unsure whether or not the facility is an affected source for the Acid Rain Program, go to http://docs.legis.wisconsin.gov/code/admin_code/nr/400/409.pdf for more information.*

Comments:
N/A

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3. Is the facility a municipal solid waste combustor or a combustor of infectious waste? ○ Yes ◉ No

- ► If answering NO, go on to question 4.
- ► If answering YES, the facility is either a municipal solid waste combustor or an infectious waste combustor and as such, will not qualify for coverage under the registration permit.

ADDITIONAL INFORMATION*: Municipal solid waste is household waste or solid waste from commercial or industrial sources that does not contain hazardous waste and does not contain any process waste which is the direct or indirect result of the manufacturing of a product or the performance of a service such as dry cleaning or painting. "Municipal solid waste" does not include waste wood, paper mill sludge, sewage sludge, tires or industrial process wastes.*

The facility is a municipal solid waste combustor if it is a solid waste treatment facility that is used to burn municipal solid waste or products derived from municipal solid waste, alone or in conjunction with other materials. For more information, go to the department's Solid Waste webpage: http://dnr.wi.gov/topic/Waste/Solid.html

Infectious waste is solid waste that contains pathogens with sufficient virulence and in sufficient quantity that exposure of a susceptible human or animal to the solid waste could cause the human or animal to contract an infectious disease. The facility is a combustor of infectious waste if it burns any such infectious wastes. For more information, go to the department's webpage on Managing Healthcare Waste: http://dnr.wi.gov/topic/HealthWaste

Municipal solid waste combustors and infectious waste combustors are subject to special rules and do NOT qualify for coverage under the registration permit.

Comments:
N/A

Section 2: Eligibility Questions (continued)

4. Are any emission units at the facility subject to a New Source Performance Standard (NSPS)? ◉ Yes ○ No

- ► If answering NO, go on to question 5.
- ► If answering YES, list the standard the facility is subject to in the space below:

***ADDITIONAL INFORMATION**: New Source Performance Standards (NSPS) are federal regulations that apply to certain types of equipment or industries. If equipment at the facility is subject to a standard under an NSPS, and that standard is not allowed by the registration permit, the facility is NOT eligible for coverage.*

All NSPS have an applicability date. Equipment constructed or modified after the applicability date is affected. Sources subject to only the record keeping and notification requirements of an NSPS are still eligible to apply.

For a list of most common NSPS under Subparts of 40 CFR Part 60 and s. 111 of CAA allowed by the permit, see Table 4 of the Type A Registration Permit Fact Sheet (AM-364) linked in the Supplemental Materials section at the beginning of this form or proceed to the end of this application for a listing.

Use the comment section below to indicate if the facility is subject only to record keeping or notification requirements of an NSPS and any other special circumstances.

Comments:

Diesel-Fired Fire Pump Engine (40 CFR pt. 60, subp. IIII)
Natural gas-Fired Back-up Generator Engine 1 (40 CFR pt. 60, subp. JJJJ)
Natural gas-Fired Back-up Generator Engine 2 (40 CFR pt. 60, subp. JJJJ)

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5. Are any emission units at the facility subject to a National Emissions Standard for Hazardous Air Pollutants (NESHAP)? ◉ Yes ○ No

- ► If answering NO, then go on to question 6.
- ► If answering YES, list the standard(s) the facility is subject to in the space below:

***ADDITIONAL INFORMATION**: National Emission Standards for Hazardous Air Pollutants (NESHAPs) are federal regulations that apply to certain types of equipment or industries that emit hazardous air pollutants. If equipment at the facility is subject to a standard under a NESHAP and that standard is not allowed by the registration permit, the facility is NOT eligible for coverage.*

Sources subject to only the recordkeeping and notification requirements of a NESHAP are still eligible to apply. Any NESHAP for an area source under Section 112(d)(5) or (r) of the Clean Air Act that does not require the source to obtain a Part 70 permit is an allowed standard in the registration permit.

For a list of most common NESHAPs under Subparts of 40 CFR Part 63 and s. 112 of CAA allowed by the permit, see Table 4 of the Type A Registration Permit Fact Sheet (AM-364) linked in the Supplemental Materials section at the beginning of this form or proceed to the end of this application for a listing.

Use the comment section below to indicate if the facility is subject only to recordkeeping and notification requirements of any NESHAP, and any other special circumstances.

Comments:

Diesel-Fired Fire Pump Engine (40 CFR pt. 63, subp. ZZZZ)
Natural gas-Fired Back-up Generator Engine 1 (40 CFR pt. 63, subp. ZZZZ)
Natural gas-Fired Back-up Generator Engine 2 (40 CFR pt. 63, subp. ZZZZ)

Section 2: Eligibility Questions (continued)

6. Does the facility have any air pollution control devices?

- ► If answering NO, then go on to question 7.
- ► If answering YES, then address item b. and fill out the table below for each device.

○ Yes ◉ No

b. Does the control device meet the minimum control efficiency required by the registration permit listed below?

○ Yes ○ No

Control Device	Minimum Control Efficiency (Total Enclosure Capture)			Minimum Control Efficiency (Hood Capture)			Control Device Efficiencies	
	PM	PM_{10} and PHAP	VOC and VHAP	PM	PM_{10} and PHAP	VOC and VHAP	Hood	Total Enclosure
Low efficiency cyclone	40%	20%	%	32%	16%	%		
Medium efficiency cyclone	60%	40%	%	48%	32%	%		
High efficiency cyclone	80%	64%	%	60%	48%	%		
Multiple cyclone w/out fly ash reinjection	80%	60%	%	64%	48%	%		
Multiple cyclone with fly ash reinjection	50%	38%	%	40%	30%	%		
Wet cyclone separator	50%	40%	%	38%	30%	%		
HEPA and other wall filters (including paint overspray filters)	95%	95%	%	76%	76%	%		
Fabric filters (e.g., baghouse, cartridge collectors)	98%	92%	%	78%	73%	%		
Spray towers	80%	80%	70%	64%	64%	56%		
Venturi scrubber	90%	85%	%	72%	68%	%		
Condensation scrubber (packed bed)	90%	90%	%	72%	72%	%		
Impingement plate scrubber	75%	75%	%	60%	60%	%		
Electrostatic precipitators	95%	95%	%	76%	76%	%		
Thermal oxidizers	%	%	95%	%	%	76%		
Catalytic oxidizers	%	%	95%	%	%	76%		
Condenser	%	%	70%	%	%	56%		
Flaring or direct combustor	%	%	98%	%	%	78%		
Biofiltration	%	%	80%	%	%	64%		
Adsorber (activated Carbon Systems carbon adsorption, solvent recovery)	%	%	85%	%	%	68%		

ADDITIONAL INFORMATION: *The registration permit requires control devices to be able to meet specified minimum levels of control. If 100% of emissions produced are delivered to the control device then list the control efficiency in the total enclosure column. If emissions are only partially captured under a hood before being delivered to the control device use the hood column.*

For more information on calculating control efficiencies refer to the Registration Permit Application Guide – Guide for Assisting Facilities in Applying for Type A Registration Permits (AM-539) linked in the Supplemental Materials section at the beginning of this form.

Provide an identification number of for each control device at the facility that will be used to meet the registration permit emission cap or an applicable requirement. Use the comment section below to indicate any special circumstances like that if there are multiple control devices of the same variety or if there are varying control efficiencies.

Comments:

The proposed facility includes two odor control devices which use catalytic oxidation for destruction of ammonia and hydrogen sulfide. Operation of these odor control devices are not required in order to meet any applicable emission limits or standards.

The proposed facility includes an emergency flare for destruction of biogas during startup and during process upset conditions. Operation of the emergency flare is not required in order to meet any applicable emission limits or standards.

Section 2: Eligibility Questions (continued)

7. List expected facility-wide actual annual calendar year emissions for each of the following pollutants in tons per year.

PM10 (particulate matter less than 10 microns)	0.55 ton/yr
Sulfur dioxide (SO_2)	4.08 ton/yr
Nitrogen oxides (NO_x)	5.45 ton/yr
Carbon monoxide (CO)	7.32 ton/yr
Volatile Organic Compounds (VOC)	1.96 ton/yr
Lead	0 ton/yr

***ADDITIONAL INFORMATION**: The Type A registration permit caps emissions of each of these pollutants to less than 25% of the major source threshold. Enter the expected actual annual emissions in the ton/yr column. In order to qualify for registration permit coverage, actual calendar year emissions may not exceed 25% of the major source threshold which is equal to 25 tons per year of each of the listed pollutants except lead. Lead emissions may not exceed 0.5 tons per year. Be sure to send copies of all calculations with the application.*

If using a control device to meet an emission cap, use the minimum control efficiencies listed in Question 6 of this application or in Table 3 of the Type A Registration Permit Fact Sheet (AM-364) linked in the Supplemental Materials section at the beginning of this form.

For additional information on calculating facility-wide annual actual emissions, refer to the Registration Permit Application Guide – Guide for Assisting Facilities in Applying for Type A Registration Permits (AM-539) linked in the Supplemental Materials section at the beginning of this form.

Use the comment section below to indicate any special circumstances.

Comments:
N/A

Section 2: Eligibility Questions (continued)

8. Does the facility emit any federally regulated hazardous air pollutants? ◉ Yes ○ No

- ► If answering NO, then go on to question 9.
- ► If answering YES, list the pollutant and its annual emissions in the table or comment section below:

Federally Regulated Hazardous Air Pollutant	Annual emissions (lb/yr)
Benzene (71-43-2)	2.71
1,4-Dichlorobenzene (106-46-7)	0.167
Formaldehyde (50-00-0)	41.3
n-Hexane (110-54-3)	250
Toluene (108-88-3)	1.33
Polycyclic Organic Matter (POM)	0.462
Naphthalene (91-20-3)	0.235
1,1,2,2-Tetrachloroethane (79-34-5)	0.0380
1,1,2-Trichloroethane (79-00-5)	0.0230
1,3-Butadiene (106-99-0)	0.999
1,3-Dichloropropene (542-75-6)	0.0192
Acetaldehyde (75-07-0)	4.20
Acrolein (107-02-8)	3.95
Carbon Tetrachloride (56-23-5)	0.0266
Chlorobenzene (108-90-7)	0.0194
Chloroform (67-66-3)	0.0206
Dichloromethane (methylene chloride) (75-09-2)	0.0620
Ethyl benzene (100-41-4)	0.0373
Ethylene Dibromide (106-93-4)	0.0320
Methanol (67-56-1)	4.60
Styrene (100-42-5)	0.0179
Vinyl Chloride (75-01-4)	0.839
Xylenes (1330-20-7)	0.0108
Arsenic (7440-38-2)	0.0278
Beryllium (7440-41-7)	0.00167
Cadmium (7440-43-9)	0.153
Chromium (7440-47-3)	0.195
Cobalt (7440-48-4)	0.0117
Lead (7439-92-1)	0.0695
Manganese (7439-96-5)	0.0528
Mercury (7439-97-6)	0.0361
Nickel (7440-02-0)	0.292
Selenium (7782-49-2)	0.00334
Total Hazardous Air Pollutants	311

***ADDITIONAL INFORMATION**: The registration permit caps emissions of each federally regulated Hazardous Air Pollutant (HAP) to 5000 pounds per year and caps the total of all HAPs combined to 12,500 pounds per year. If the facility uses a control device to meet an emission cap, use the control efficiencies listed in Table 3 of the Type A Registration Permit Fact Sheet (AM-364) linked in the Supplemental Materials section at the beginning of this form. Be sure to send copies of all calculations with the application.*

For additional information on calculating facility-wide annual actual emissions, refer to the Registration Permit Application Guide – Guide for Assisting Facilities in Applying for Type A Registration Permits (AM-539) linked in the Supplemental Materials section at the beginning of this form.

Use the comment section, below, to indicate any special circumstances.

Comments:
N/A

Section 2: Eligibility Questions (continued)

9. Answer the following 3 questions about stacks at the facility. Exclude stacks that vent insignificant emissions units or insignificant pollutants.

9a. Are any stacks shorter than nearby buildings?	◉ Yes	○ No
9b. Do any stacks discharge horizontally or in a downward direction?	◉ Yes	○ No
9c. Do any stacks have rain hats or other devices that obstruct air flow?	○ Yes	◉ No

If answering YES to any of these questions, attach the results of an air quality modeling analysis to the application for coverage which shows that facility emissions do not cause or exacerbate a violation of the ambient air quality standards. If the facility had a modeling analysis done for a previous permit review and has not made changes to emission rates or stacks since the analysis was performed, attach those results.

If the facility does not have old modeling results or if changes were made since the analysis, modeling must be performed. Submit the results in any format or use Part 1 of the Modeling Assessment Form (Form 4530-156A) linked in the Supplemental Materials section at the beginning of this form.

ADDITIONAL INFORMATION:
For purposes of answering this question, an insignificant emissions unit is one that has maximum controlled emissions of each criteria pollutant less than 1 ton per year. An insignificant pollutant is a criteria pollutant with a facility-wide maximum controlled emission rate less than 5 tons per year.

Stack vented emissions must be exhausted from unobstructed discharge points that are within 10 degrees of vertical. Stacks that are closed when the process is not operating, but that are open when the process is operating are considered to be unobstructed Stacks must be taller than any building that influences the dispersion of emissions from the stack. A building is considered to influence the dispersion of emissions if the stack is located within a circle around the building, the radius of which is 5 times the height of the building.

For additional help in answering these questions refer to the Registration Permit Application Guide - Guide for Assisting Facilities in Applying for Type A Registration Permits (AM-539) linked in the Supplemental Materials section at the beginning of this form.

Comments:
An air quality analysis will be performed for NO2 and SO2 only. Maximum controlled emissions of PM are less than 5 tpy and maximum controlled emissions of Pb are less than 0.2 tpy; therefore, no air quality analysis is required for PM10 or Pb.

The following emissions units are included in the air quality analysis for NO2 and SO2:
- Flare
- Boiler 1
- Boiler 2
- Hydrolysis tanks and odor control system

The following emissions units are not included in the air quality analysis:

- CO2 Removal System (no emissions of SO2 or NO2)
- Natural gas-fired backup generator 1 (intermittent source)
- Natural gas-fired backup generator 2 (intermittent source)
- Diesel-fired fire pump engine (intermittent source)
- ORA building exhaust (no emissions of SO2 or NO2 except for emissions from insignificant emissions units)

10. What is the maximum controlled annual emission rate of particulate matter? 2.97 ton/yr

- ► If the answer is less than or equal to 5 tons per year, the application is complete.
- ► If the answer is greater than 5 tons per year, an air quality dispersion modeling analysis must be performed for the facility.
- ► If the facility meets all the stack requirements in Question 9, use the modeling request form to provide information to the department and the department will model for the facility, or the facility can submit air quality dispersion modeling results with the signed Registration Permit Application. Note, units in which maximum controlled emissions of each criteria pollutant are less than 1 ton per year are considered insignificant and do not need to be included in the modeling. The application will not be complete until a modeling request form or modeling results are received.

***ADDITIONAL INFORMATION**: For help in answering this question, refer to the Registration Permit Application Guide – Guide for Assisting Facilities in Applying for Type A Registration Permits (AM-539) linked in the Supplemental Materials section at the beginning of this form.*

If maximum controlled emissions of particulate matter are greater than 5 tons per year, the facility will need an air quality analysis to ensure that the ambient air quality standards can be met. If the facility meets all the stack requirements in Question 9, request the department to perform the analysis for the facility by filling out and attaching the Modeling Assessment Request Form (4530-156A) linked in the Supplemental Materials section at the beginning of this form.

Just fill out, print and attach to the application for coverage. If the facility does not meet the stack requirements, the facility will have to provide the air quality analysis and attach the results to this application. Use the Modeling Assessment Form (4530-156A) linked in the Supplemental Materials section at the beginning of this form.

If the facility had a modeling analysis done previously and has not made changes to emission rates or stacks since the analysis was performed, attach those results in lieu of submitting or requesting or performing a new analysis.

Comments:
Maximum controlled emissions of PM are less than 5 tpy; therefore, no air quality analysis is required for PM10.

Signature of Responsible Official

STATEMENT OF COMPLETENESS

I have reviewed this application in its entirety and, based on information and belief formed after reasonable inquiry, I certify that the statements and information contained in this application are true, accurate and complete.

Responsible Official Printed or Typed Name	Title
Rancho Spirov	VP Development
Responsible Official Signature*	Date Signed
	2/24/23

*Applications must be signed by the Responsible Official for the source. If submitting an electronic application, the department will send an email with instructions for e-Signing or submitting an ink signature upon receipt of the electronic application. A photocopied or scanned signature does not meet the department's signature requirements. An electronic signature has the same effect of certifying completeness reflected in the above statement. The department will not process an application until the signature is received.

Application Submittal

Submit the completed application, including the facility description, supporting calculations, air quality analysis or air quality analysis request form and any other supporting documents, as needed or required, using either Option 1 or Option 2 below:

Option 1:

Email an ELECTRONIC COPY* to DNRAMAirPermit@wisconsin.gov.

* Applications must be signed by the Responsible Official for the source. If submitting an electronic application, the department will send an email with instructions for e-Signing or submitting an ink signature upon receipt of the electronic application. A photocopied or scanned signature does not meet the department's signature requirements. An electronic signature has the same effect of certifying completeness reflected in the above statement. The department will not process an application until the signature is received.

OR

Option 2:

Mail the original copy of all materials with ink signature on this form to:

WISCONSIN DEPARTMENT OF NATURAL RESOURCES
AIR MANAGEMENT PROGRAM
ATTN: PERMITS
P. O. BOX 7921
MADISON, WI 53707-7921

Keep a copy of the materials submitted for the facility's files.

Instructions

Section 1: Facility Information

Facility name and mailing address

Provide the full business name and address of corporation, company, association, society, firm, partnership, individual or political subdivision of the state submitting the application.

Facility location

Specify the street address; city, and county where the facility is located. Do not use the mailing address, unless it is the same as the street address. Do not use the address of another location where a management unit or other corporate center is located. Check the appropriate box to indicate whether the location is a city, town, or village.

Parent corporation

If the facility is wholly or partly owned by another entity, identify that entity. If the buildings or land are rented, then identify the entity that owns and operates the equipment in the buildings on the site.

Responsible Official

The Responsible Official is defined in s. NR 400.02(136), Wis. Adm. Code. "Responsible Official" means one of the following:

(a) For a corporation, one of the following:
   1. A president, secretary, treasurer or vice-president of the corporation in charge of a principal business function.
   2. Any other person who performs similar policy or decision-making functions for the corporation.
   3. A duly authorized representative of a person listed in subd. 1. or 2. if the representative is responsible for the overall operation of one or more manufacturing, production or operating facilities applying for or subject to a permit and the representative is approved in advance by the department.

(b) For a partnership or sole proprietorship: a general partner or the proprietor, respectively.

(c) For a municipality, or a state, federal or other public agency: either a principal executive officer or ranking elected official. For the purposes of this paragraph, a principal executive officer of a federal agency includes the chief executive officer having responsibility for the overall operations of a principal geographic unit of the agency, for example, a regional administrator of EPA.

(d) The designated representative.

Permit contact person

Identify an individual who can function as the facility's primary contact for the department to request additional information concerning the air pollution sources during the permitting process. There are no restrictions on who can be chosen as permit contact person.

Facility NAICS code description

The North American Industry Classification System (NAICS) is used to identify the industrial sector which best characterizes a facility's products, services, and manufacturing processes. The facility's Standard Industrial Classification (SIC) may also be entered but is not required. For more help, consult the following webpages to identify which NAICS title best describes the facility: https://www.census.gov/naics/ and https://www.naics.com/search/

Facility identification (FID) number

Provide the facility identification (FID) number that appears on the annual emissions inventory reports. If the facility has never submitted such reports and does not have an FID, then leave this blank. The department will assign an FID to the facility.

Describe the facility and list all air pollution sources and include description.

Include a sentence on what the facility manufactures and what air pollution sources or process lines are at the facility. If control devices are used, list the control devices, the process lines they control and the pollutants controlled by them. If needed, attach the facility description, emission calculations and any other documents relevant to the facility's qualifications for this permit.

Ex.1. The facility is an aluminum foundry. Process lines include melting using an electric arc furnace, pouring, cooling, shakeout, molding making, sand handling, grinding and finishing. The facility uses baghouses to control particulate matter from melting, sand handling, shakeout operations, and grinding and finishing operations, and an afterburner for VOC and CO control. *Ex.2.* The facility has one 3500 kW portable diesel generator that was constructed in 2008 and has no control devices. *Ex.3.* The facility is a vegetable cannery. The emission units are a 30 mmBTU/hr boiler and a 42 mmBTU/hr boiler constructed in 1966 and 1991, respectively. Both units fire natural gas with propane as a backup fuel. Emissions are uncontrolled.

Section 2: Eligibility Questions

Answer each of the 10 questions carefully. More information about each question is described in the Registration Permit Application Guide – Guide for Assisting Facilities in Applying for Type A Registration Permits (AM-539) linked in the Supplemental Materials section at the beginning of this form. Refer to the Registration Permit application checklist (AM-555) linked in the Supplemental Materials section at the beginning of this form Be sure to include emission calculations with the application. The application will not be complete until calculations have been received. For additional questions, contact the registration permit program coordinator at (608) 266-7718 or email at DNRamROPSairpermit@wisconsin.gov.

Insignificant Emission Units: *Insignificant emission units and general ventilation stacks are not subject to the stack requirements listed in section I.B.1 of the registration permit. The following table is a list of emission units considered insignificant for purposes of the Type A Registration Permit.*

EMISSION UNITS NOT SUBJECT TO CERTAIN REGISTRATION PERMIT REQUIREMENTS

1. Convenience space heating units with heat input capacity of less than 5 million Btu per hour that burn gaseous fuels, liquid fuels or wood.
2. Convenience water heating.
3. Maintenance of grounds, equipment and buildings, including lawn care, pest control, grinding, cutting, welding, painting, woodworking, general repairs and cleaning, but not including use of organic compounds as clean–up solvents.
4. Boiler, turbine, generator, heating and air conditioning maintenance.
5. Pollution control equipment maintenance.
6. Internal combustion engines used for warehousing and material transport, forklifts and courier vehicles, front end loaders, graders and trucks, carts and maintenance trucks.
7. Fire control equipment.
8. Janitorial activities.
9. Office activities.
10. Fuel oil storage tanks with a capacity of 10,000 gallons or less.
11. Stockpiled contaminated soils.
12. Demineralization and oxygen scavenging of water for boilers.
13. Purging of natural gas lines.
14. Any emission unit, operation, or activity that has, for each air contaminant, maximum controlled emissions that are less than the level specified in Table 3 of ch. NR 407, Wis. Adm. Code. Multiple emissions units, operations, or activities that perform identical or similar functions shall be combined for the purposes of this determination.
15. If the maximum controlled emissions of any air contaminants listed in Table 3 of ch. NR 407, Wis. Adm. Code, from all emission units, operations or activities at a facility are less than 5 times the level specified in Table 3 of ch. NR 407, Wis. Adm. Code, for those air contaminants, any emission unit operation or activity that emits only those air contaminants.

ALLOWABLE NEW SOURCE PERFORMANCE STANDARDS (NSPS)

Sources covered under this permit may not be subject to any NSPS, other than those listed below.

1. 40 CFR part 60, subpart Dc - Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units (s. NR 440.207, Wis. Adm. Code).
2. 40 CFR part 60, subpart I - Standards of Performance for Hot Mix Asphalt Facilities (s. NR 440.25, Wis. Adm. Code).
3. 40 CFR part 60, subpart K - Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction or Modification Commenced After June 11, 1973 and Prior to May 19, 1978 (s. NR 440.27, Wis. Adm. Code).
4. 40 CFR part 60, subpart Ka - Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction or Modification Commenced After May 18, 1978 and Prior to July 23, 1984 (s. NR 440.28, Wis. Adm. Code).
5. 40 CFR part 60, subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Storage Vessels) for Which Construction, Reconstruction or Modification Commenced After July 23, 1984 (s. NR 440.285, Wis. Adm. Code).
6. 40 CFR part 60, subpart DD - Standards of Performance for Grain Elevators (s. NR 440.47, Wis. Adm. Code).
7. 40 CFR part 60, subpart EE - Standards of Performance for Surface Coating of Metal Furniture (s. NR 440.48, Wis. Adm. Code).
8. 40 CFR part 60, subpart SS - Standards of Performance for Industrial Surface Coating: Large Appliances (s. NR 440.57, Wis. Adm. Code).
9. 40 CFR part 60, subpart JJJ - Standards of Performance for Petroleum Dry Cleaners (s. NR 440.68, Wis. Adm. Code).
10. 40 CFR part 60, subpart OOO - Standards of Performance for Nonmetallic Mineral Processors (s. NR 440.688, Wis. Adm. Code).
11. 40 CFR part 60, subpart TTT - Standards of Performance for Industrial Surface Coating of Plastic Parts for Business Machines (s. NR 440.72, Wis. Adm. Code).
12. 40 CFR part 60, subpart JJJJ - Standards of Performance for spark ignition internal combustion engines - allowed only for the owner/operator of manufacturer-certified affected engines.
13. 40 CFR part 60, subpart IIII - Standards of Performance for compression ignition internal combustion engines - allowed only for the owner/ operator of manufacturer certified affected engines that are 2007 model year or later with displacements less than 30 liters per cylinder.
14. Any New Source Performance Standard where the facility or process is only subject to recordkeeping or notification requirements of that standard.

ALLOWABLE NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)

Sources covered under this permit may not be subject to any NESHAP other than those listed below.

1. 40 CFR part 63, subpart N - National Emission Standards for chromium emissions from hard and decorative chromium electroplating and chromium anodizing tanks - allowed only for units that are area sources or located at area sources and which are any of the following:
   - Any decorative chromium electroplating operation or chromium anodizing operation that uses fume suppressants as an emission reduction technology.
   - Any decorative chromium electroplating operation that uses a trivalent chromium bath that incorporates a wetting agent as a bath ingredient.

ALLOWABLE NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)

Sources covered under this permit may not be subject to any NESHAP other than those listed below.

2. Any New Source Performance Standard or National Emissions Standards for Hazardous Air Pollutants where the facility or process is only subject to recordkeeping or notification requirements of that standard.
3. Any National Emission Standard for Hazardous Air Pollutants for Area Sources under Section 112(d)(5)[1] or (r) of the Clean Air Act that does not require the source to obtain a Part 70 permit. This includes:
   - 40 CFR 63, Subpart HH - Oil and Natural Gas Production
   - 40 CFR 63, Subpart ZZZZ - Reciprocating internal Combustion Engines
   - 40 CFR 63, Subpart WWWWW - Hospitals: Ethylene Oxide Sterilizers
   - 40 CFR 63, Subpart YYYYY - Electric Arc Furnace Steelmaking Facilities
   - 40 CFR 63, Subpart ZZZZZ - Iron and Steel Foundries
   - 40 CFR 63, Subpart BBBBBB (6B) - Gasoline Distribution Bulk Terminals, Bulk Plants and Pipeline Facilities
   - 40 CFR 63, Subpart CCCCCC (6C) - Gasoline Dispensing Facilities
   - 40 CFR 63, Subpart DDDDDD (6D) - Polyvinyl Chloride and Copolymers Production
   - 40 CFR 63, Subpart EEEEEE (6E) - Primary Copper Smelting
   - 40 CFR 63, Subpart FFFFFF (6F) - Secondary Copper Smelting
   - 40 CFR 63, Subpart GGGGGG (6G) - Primary Nonferrous Metals - Zinc, Cadmium and Beryllium
   - 40 CFR 63, Subpart HHHHHH (6H) - Paint Stripping and Miscellaneous Surface Coating Operations
   - 40 CFR 63, Subpart JJJJJJ (6J) - Industrial, Commercial and Institutional Boilers
   - 40 CFR 63, Subpart LLLLLL (6L) - Acrylic/Modacrylic Fiber
   - 40 CFR 63, Subpart MMMMMM (6M) - Carbon Black Production
   - 40 CFR 63, Subpart NNNNNN (6N) - Chromium Compounds
   - 40 CFR 63, Subpart OOOOOO (6-O) - Flexible Polyurethane Foam Production and Fabrication
   - 40 CFR 63, Subpart PPPPPP (6P) - Lead Acid Battery Manufacturing
   - 40 CFR 63, Subpart QQQQQQ (6Q) - Wood Preserving
   - 40 CFR 63, Subpart RRRRRR (6R) - Clay Ceramics Manufacturing
   - 40 CFR 63, Subpart TTTTTT (6T) - Secondary Nonferrous Metals Processing (Brass, Bronze, Magnesium and Zinc)
   - 40 CFR 63, Subpart WWWWWW (6W) - Plating and Polishing Operations
   - 40 CFR 63, Subpart XXXXXX (6X) - Metal Fabrication and Finishing Source Nine Categories
   - 40 CFR 63, Subpart YYYYYY (6Y) - Ferroalloys Production
   - 40 CFR 63, Subpart ZZZZZZ (6Z) - Nonferrous Foundries: Aluminum, Copper and Other
   - 40 CFR 63, Subpart BBBBBBB (7B) - Chemical Preparations Industry
   - 40 CFR 63, Subpart EEEEEEE (7E) - Gold Mine Ore Processing and Production

Before submitting the form, review the Registration Permit application checklist (AM-555) linked in the Supplemental Materials section at the beginning of this form to be sure all required elements are included. For additional questions, contact the registration permit program coordinator at (608) 266-7718 or email at DNRamROPSairpermit@wisconsin.gov.

[1]Sec. 112(d)(5) of the Clean Air Act refers to National Emissions Standards for Hazardous Air Pollutants (NESHAP) for area sources, commonly referred to as Generally Available Control Technology (GACT) standards.

Appendix C

Air Pollution Control Registration Construction and Operating Permit Modeling Assessment Attachment (4530-156A)

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Note: In order to fill and save this form electronically, it must be opened using Adobe Reader or Acrobat software. Save a copy of the file, open Adobe Reader, select File > Open and browse for the file you saved.

State of Wisconsin
Department of Natural Resources
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

Air Pollution Control Registration Construction and Operating Permit Modeling Assessment Attachment

Form 4530-156A (R 10/22)

Notice: Pursuant to ss. NR 406.17(4)(a), and 407.105(4)(a), Wis. Adm. Code, completion of this form is required to apply for coverage under the Registration Operation Permits (ROP) or to report changes made to ROP sources that triggered modeling requirements. Failure to submit complete information as required on the form shall be grounds for denial of the application. Personal information collected will be used for administrative purposes and may be provided to requesters to the extent required by Wisconsin's Public Record Law [ss. 19.31 - 19.39, Wis. Stats.].

Facility Information		
Facility Name Waupaca AD1	Facility Identification Number (FID) 469068930	Permit Number
Facility Physical Address N1757 County Road A		
○ City ◉ Town ○ Village of: Lind	County Waupaca	
Permit Contact Person Name Libby McDonald	Title Development Manager	
Phone (include area code) (617) 571-0323	Email development@vanguardrenewables.com	

INSTRUCTIONS: Complete **Part 1** AND **Part 2** of this form to report the results of an air dispersion modeling analysis to the department. If the facility meets the prescribed stack configuration below and is requesting the department to perform the modeling analysis, only complete **Part 1**. Tables 1 and 2 list the emission threshold of each pollutant to be included in the air dispersion modeling analysis for each type of registration permit. Consult the ROP Application Guidebooks for details.

ROP Stacks Configuration:
A facility meets the prescribed stack configuration if all stacks at the facility, other than stacks that are general building ventilation or stacks venting emission units excluded from modeling as listed in the ROP, can meet all the following:

a) The stacks at the facility must be taller than all buildings on which they are located and all buildings that could significantly influence the stacks' emissions as they spread out from their exhaust points into the surrounding area. A building is considered to influence a stack's emissions if the stack is located within five building heights of that building.

b) All stacks at the facility must discharge upwards (within 10 degrees of vertical).

c) All stacks at the facility must discharge to the atmosphere without alteration of flow due to an obstruction (e.g., rain hat) while the process they serve is operating.

Table 1. Facility that meets the prescribed stack configuration. [1,2]

Pollutant	ROP-A	ROP-B	ROP-C	ROP-G
PM_{10}	> 5 TPY of PM	> 5 TPY of PM_{10}	> 5 TPY of PM_{10}	5 TPY of PM_{10}
NO_x	N/A	> 25 TPY	N/A	> 25 TPY
SO_2	N/A	> 25 TPY	N/A	> 25 TPY
CO	N/A	N/A	N/A	> 50 TPY
Pb	> 0.2 TPY	> 0.2 TPY	> 0.2 TPY	> 0.2 TPY

Table 2. Facility that DOES NOT meet the prescribed stack configuration.

Pollutant	ROP-A	ROP-B	ROP-C	ROP-G
PM_{10}	> 5 TPY of PM	> 5 TPY of PM_{10}	> 5 TPY of PM_{10}	5 TPY of PM_{10}
NO_x	> 5 TPY	> 5 TPY	N/A	> 5 TPY
SO_2	> 5 TPY	> 5 TPY	N/A	> 5 TPY
CO	N/A	N/A	N/A	> 5 TPY
Pb	> 0.2 TPY	> 0.2 TPY	> 0.2 TPY	> 0.2 TPY

[1] Use the **maximum controlled emission rate** to compare against each annual emission threshold. Multiply the maximum controlled hourly emissions by 8,760 hours per year to obtain the annual emission rate. If it is not physically possible to operate 8,760 hours per year, the facility is allowed to take into consideration realistic operating scenarios.

[2] Modeling of hazardous air contaminants may be required to demonstrate compliance with ss. NR 445.07(1)-(3), Wis. Adm. Code.

PART 1 - DISPERSION MODELING PARAMETERS

Note: The department only performs dispersion modeling for facilities that meet the prescribed stack configuration of registration operation permits. If any stacks at the facility do not meet the stack requirements, perform air dispersion modeling for the facility and provide the results of air dispersion modeling analysis or make modification to the stacks so that they do meet the prescribed stack configuration.

Instructions:

- DO NOT COMBINE STACKS: Each stack that vents externally should be listed separately. Add rows as necessary. Do not include stacks used only for general ventilation and stacks venting only exempt emissions units listed in the registration permit.
- ATTACH to this form a scaled facility plot plan (blueprint, plan view, annotated aerial photograph, or graphic submitted for land use zoning approvals). Ensure the following information is on the plot plan:
  - true north
  - a scale (e.g. 1 in = 100 ft)
  - clearly marked structures and structure heights
  - all externally vented stacks
  - any fences, roadways and physical obstructions to plant property
  - property line
- Complete the following table and only include the maximum controlled emission rate of each pollutant exceeding the emission thresholds listed in Table 1 or 2 above.

Stack ID	Process No.	Stack Height Above Ground	Stack Diameter or Dimensions	Stack Obstructed	Stack Orientation	Normal Exhaust Temperature	Normal Exhaust Flow	Maximum Controlled Emission Rate (lb/hr)				
(e.g. S01)	e.g. P01)	(ft)	(ft)	Y/N	Vert, Horiz, or Down	(°F)	(acfm)	PM_{10}	SO_2	NO_x	CO	Pb
S01	P01	35.00	10.00	No	Vertical	1,400.00	112,500.00		6.38	3.04		
S03	B01	25.00	1.00	No	Vertical	91.00	2,000.00		0.00	0.20		
S04	B02	25.00	1.00	No	Vertical	91.00	2,000.00		0.00	0.20		
S10	P08	31.60	0.53	No	Vertical	70.00	521.00		0.27	0.13		
				No								
				No								

PART 2 – RESULTS OF DISPERSION MODELING ANALYSIS

Note: Air quality modeling analysis should be conducted according to the current Wisconsin Air Dispersion Modeling Guidelines. Copy of the modeling files shall be kept in the facility's records and available to the department upon request. If the facility is conducting the dispersion modeling analysis after the initial coverage under a registration operation permit was granted, the results shall be attached to the next annual compliance certification.

Use the following table to indicate the impact of each pollutant as indicated in Table 1 or 2 above:

Pollutant	PM_{10}	SO_2		NO_2	CO		Pb
	24-hr	1-hr	3-hr	Annual	1-hr	8-hr	3-month
Total of the facility impacts from the dispersion modeling results plus the background concentrations for your county (in micrograms per cubic meter).		111.7	99.6	52.2			
Air quality standards (in micrograms per cubic meter).	150	196	1,300	100	40,000	10,000	0.15

[3] Background concentrations are available at DNR's Air Modeling website.

Appendix D

Facility Plot Plan

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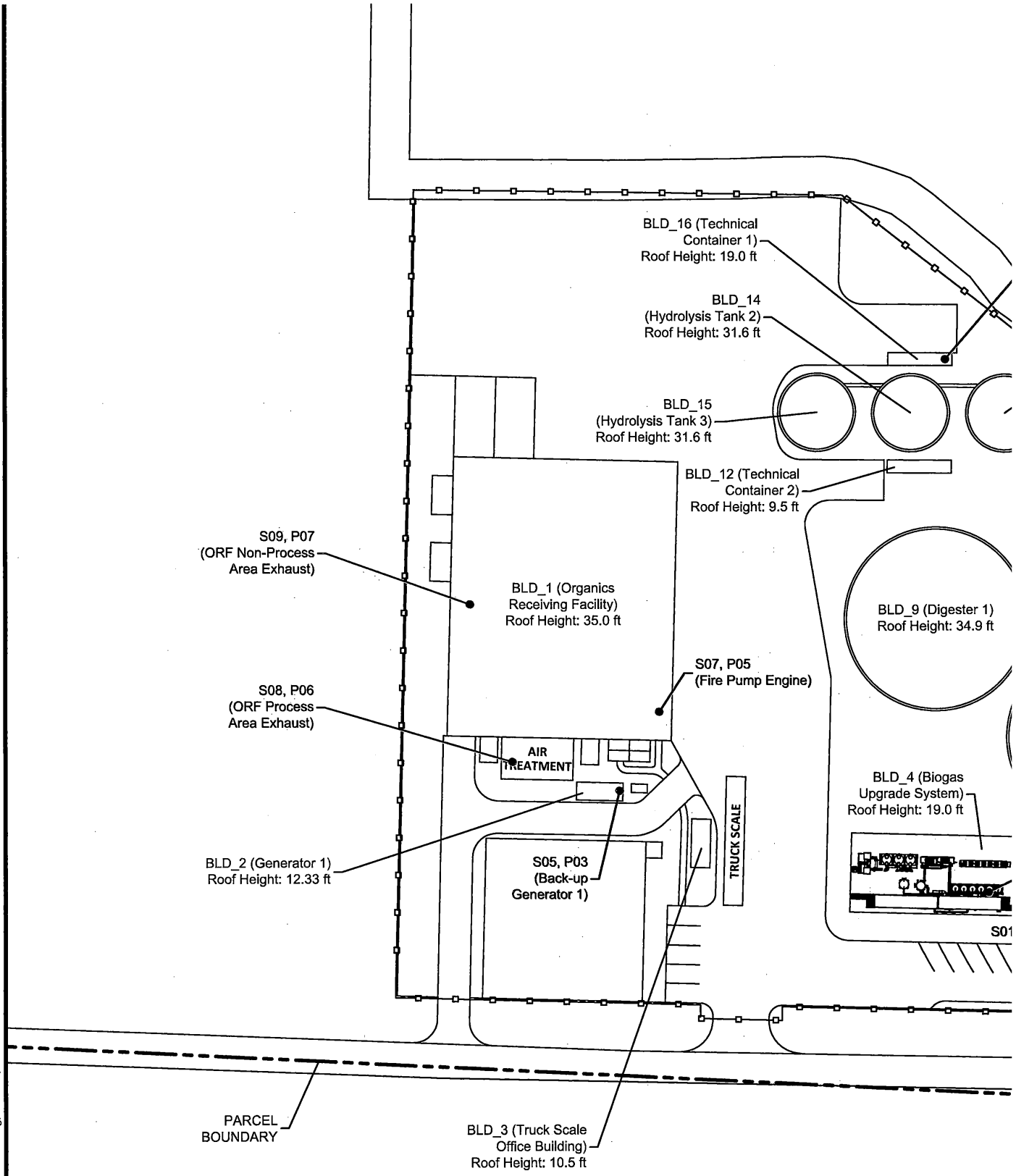
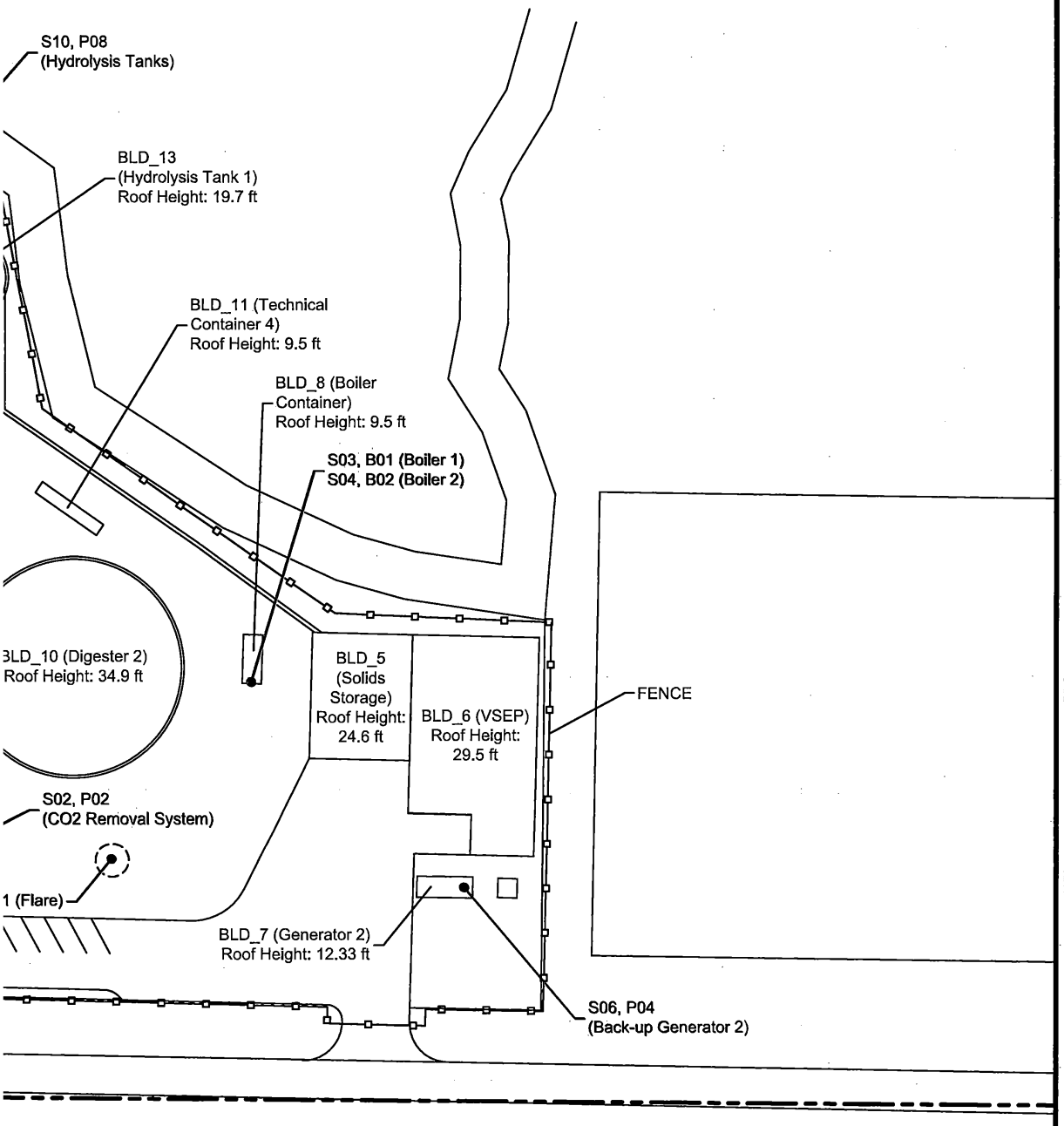


F:\2022\B2202402_01\CAD\B2202402-01.dwg,Plot Plan,2/17/2023 11:12:52 AM



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braunintertec.com

Drawing Information

Project No:	B2202402.01
Drawing No:	B2202402-01
Drawn By:	BJB
Date Drawn:	2/8/23
Checked By:	JC
Last Modified:	2/17/23

Project Information

Waupaca AD1

N1757 County Road A

Waupaca, Wisconsin

Plot Plan

Figure 1

Appendix E

Maximum Theoretical Emissions (MTE), Potential to Emit (PTE) Calculations, and Estimated Actual Emissions Calculations

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Waupaca AD1
Maximum Theoretical Emissions Calculations

Maximum Theoretical Emissions Summary

	Hourly Emission Rate Summary										
Emission Source (Unit ID Number)	P01	P02	B01	B02	P03	P04	P05	P06	P07	P08	Facility Total
Stack (Stack ID Number)	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	
Emission Source Description	Flare	CO_2 Removal System	Boiler 1	Boiler 2	Back-up Generator 1	Back-up Generator 2	Fire Pump Engine	ORA Process Area Exhaust	ORA Non-Process Area Exhaust	Hydrolysis Tanks	
Pollutant	Maximum Theoretical Emissions (lb/hr)	Maximum Theoretical Emissions (lb/hr)	Maximum Theoretical Emissions (lb/hr)	Maximum Theoretical Emissions (lb/hr)	Maximum Theoretical Emissions (lb/hr)	Maximum Theoretical Emissions (lb/hr)	Maximum Theoretical Emissions (lb/hr)	Maximum Theoretical Emissions (lb/hr)	Maximum Theoretical Emissions (lb/hr)	Maximum Theoretical Emissions (lb/hr)	Maximum Theoretical Emisisons (lb/hr)
Criteria Pollutants											
NO_x	3.04E+00	---	1.96E-01	1.96E-01	1.71E+01	1.71E+01	1.93E+00	---	---	1.27E-01	**3.96E+01**
CO	3.59E+00	---	3.29E-01	3.29E-01	2.80E+01	2.80E+01	4.17E-01	---	---	---	**6.06E+01**
PM	5.93E-01	---	2.98E-02	2.98E-02	1.46E-01	1.46E-01	1.36E-01	---	---	---	**1.08E+00**
PM_{10}	5.93E-01	---	2.98E-02	2.98E-02	1.46E-01	1.46E-01	1.36E-01	---	---	---	**1.08E+00**
$PM_{2.5}$	5.93E-01	---	2.98E-02	2.98E-02	1.46E-01	1.46E-01	1.36E-01	---	---	---	**1.08E+00**
SO_2	6.38E+00	---	2.35E-03	2.35E-03	4.42E-03	4.42E-03	6.64E-04	---	---	2.74E-01	**6.67E+00**
VOC	4.29E-01	8.67E-01	2.16E-02	2.16E-02	2.23E-01	2.23E-01	1.53E-01	---	---	---	**1.94E+00**
Lead	3.90E-05	---	1.96E-06	1.96E-06	---	---	---	---	---	---	**4.29E-05**
Greenhouse Gases											
CO_2	9.31E+03	4.35E+03	4.30E+02	4.30E+02	8.27E+02	8.27E+02	7.15E+01	---	---	---	**1.62E+04**
CH_4	1.75E-01	---	8.10E-03	8.10E-03	1.73E+00	1.73E+00	2.90E-03	---	---	---	**3.65E+00**
N_2O	1.75E-02	---	8.10E-04	8.10E-04	1.66E-03	1.66E-03	5.80E-04	---	---	---	**2.31E-02**
CO_2e	9.32E+03	4.35E+03	4.30E+02	4.30E+02	8.71E+02	8.71E+02	7.17E+01	---	---	---	**1.63E+04**
Hazardous Air Pollutants											
Benzene (71-43-2)	1.64E-04	---	8.24E-06	8.24E-06	1.19E-02	1.19E-02	4.09E-04	---	---	---	**2.43E-02**
1,4-Dichlorobenzene (106-46-7)	9.36E-05	---	4.71E-06	4.71E-06	---	---	---	---	---	---	**1.03E-04**
Formaldehyde (50-00-0)	5.85E-03	---	2.94E-04	2.94E-04	1.54E-01	1.54E-01	5.17E-04	---	---	---	**3.15E-01**
n-Hexane (110-54-3)	1.40E-01	---	7.06E-03	7.06E-03	---	---	---	---	---	---	**1.55E-01**
Toluene (108-88-3)	2.65E-04	---	1.33E-05	1.33E-05	4.20E-03	4.20E-03	1.79E-04	---	---	---	**8.86E-03**
Polycyclic Organic Matter (POM)	5.45E-05	---	2.74E-06	2.74E-06	1.79E-03	1.79E-03	7.37E-05	---	---	---	**3.71E-03**
Naphthalene (91-20-3) [1]	4.76E-05	---	2.39E-06	2.39E-06	7.30E-04	7.30E-04	3.72E-05	---	---	---	**1.55E-03**
1,1,2,2-Tetrachloroethane (79-34-5)	---	---	---	---	1.90E-04	1.90E-04	---	---	---	---	**3.80E-04**
1,1,2-Trichloroethane (79-00-5)	---	---	---	---	1.15E-04	1.15E-04	---	---	---	---	**2.30E-04**
1,3-Butadiene (106-99-0)	---	---	---	---	4.98E-03	4.98E-03	1.71E-05	---	---	---	**9.99E-03**
1,3-Dichloropropene (542-75-6)	---	---	---	---	9.55E-05	9.55E-05	---	---	---	---	**1.91E-04**
Acetaldehyde (75-07-0)	---	---	---	---	2.10E-02	2.10E-02	---	---	---	---	**4.20E-02**
Acrolein (107-02-8)	---	---	---	---	1.98E-02	1.98E-02	---	---	---	---	**3.95E-02**
Carbon Tetrachloride (56-23-5)	---	---	---	---	1.33E-04	1.33E-04	---	---	---	---	**2.66E-04**
Chlorobenzene (108-90-7)	---	---	---	---	9.70E-05	9.70E-05	---	---	---	---	**1.94E-04**
Chloroform (67-66-3)	---	---	---	---	1.03E-04	1.03E-04	---	---	---	---	**2.06E-04**
Dichloromethane (methylene chloride) (75-09-2)	---	---	---	---	3.10E-04	3.10E-04	---	---	---	---	**6.20E-04**
Ethyl benzene (100-41-4)	---	---	---	---	1.86E-04	1.86E-04	---	---	---	---	**3.73E-04**
Ethylene Dibromide (106-93-4)	---	---	---	---	1.60E-04	1.60E-04	---	---	---	---	**3.20E-04**
Methanol (67-56-1)	---	---	---	---	2.30E-02	2.30E-02	---	---	---	---	**4.60E-02**
Styrene (100-42-5)	---	---	---	---	8.95E-05	8.95E-05	---	---	---	---	**1.79E-04**
Vinyl Chloride (75-01-4)	---	---	---	---	4.20E-03	4.20E-03	---	---	---	---	**8.39E-03**
Xylenes (1330-20-7)	---	---	---	---	5.40E-05	5.40E-05	---	---	---	---	**1.08E-04**
Arsenic (7440-38-2)	1.56E-05	---	7.84E-07	7.84E-07	---	---	---	---	---	---	**1.72E-05**
Beryllium (7440-41-7)	9.36E-07	---	4.71E-08	4.71E-08	---	---	---	---	---	---	**1.03E-06**
Cadmium (7440-43-9)	8.58E-05	---	4.31E-06	4.31E-06	---	---	---	---	---	---	**9.45E-05**
Chromium (7440-47-3)	1.09E-04	---	5.49E-06	5.49E-06	---	---	---	---	---	---	**1.20E-04**
Cobalt (7440-48-4)	6.55E-06	---	3.29E-07	3.29E-07	---	---	---	---	---	---	**7.21E-06**
Lead (7439-92-1)	3.90E-05	---	1.96E-06	1.96E-06	---	---	---	---	---	---	**4.29E-05**
Manganese (7439-96-5)	2.97E-05	---	1.49E-06	1.49E-06	---	---	---	---	---	---	**3.26E-05**
Mercury (7439-97-6)	2.03E-05	---	1.02E-06	1.02E-06	---	---	---	---	---	---	**2.23E-05**
Nickel (7440-02-0)	1.64E-04	---	8.24E-06	8.24E-06	---	---	---	---	---	---	**1.80E-04**
Selenium (7782-49-2)	1.87E-06	---	9.41E-08	9.41E-08	---	---	---	---	---	---	**2.06E-06**
Total HAPs	1.47E-01	---	7.41E-03	7.41E-03	2.44E-01	2.44E-01	1.70E-03	---	---	---	**6.51E-01**
Hazardous Air Contaminants											
Benz(a)anthracene (56-55-3)	1.40E-07	---	7.06E-09	7.06E-09	---	---	7.37E-07	---	---	---	**8.91E-07**
Benzo(a)pyrene (50-32-8)	9.36E-08	---	4.71E-09	4.71E-09	---	---	8.24E-08	---	---	---	**1.85E-07**
Benzo(b)fluoranthene (205-99-2)	1.40E-07	---	7.06E-09	7.06E-09	---	---	4.35E-08	---	---	---	**1.98E-07**
Benzo(k)fluoranthene (207-08-9)	1.40E-07	---	7.06E-09	7.06E-09	---	---	6.80E-08	---	---	---	**2.23E-07**
Dibenzo(a,h)anthracene (53-70-3)	9.36E-08	---	4.71E-09	4.71E-09	---	---	2.56E-07	---	---	---	**3.59E-07**
Indeno(1,2,3-cd)pyrene (193-39-5)	1.40E-07	---	7.06E-09	7.06E-09	---	---	1.64E-07	---	---	---	**3.19E-07**
Ammonia (7664-41-7) [2]	1.71E-01	---	---	---	---	---	---	1.21E+00	1.12E-02	1.19E-01	**1.51E+00**
Hydrogen Sulfide (7783-06-4) [2]	3.40E+00	---	---	---	---	---	---	2.04E+00	2.24E-02	1.46E-01	**5.61E+00**

[1] Naphthalene is also included in polycyclic organic matter total. Hazardous air pollutants total does not double-count naphthalene emissions

[2] Hydrogen sulfide and ammonia emissions are from agricultural waste and are exempt from the requirements of NR 445.08 as specified at NR 445.08(6)(d).

Maximum Theoretical Emissions Summary

	Annual Emissions Summary										
Emission Source (Unit ID Number)	**P01**	**P02**	**B01**	**B02**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**Facility Total**
Stack (Stack ID Number)	**S01**	**S02**	**S03**	**S04**	**S05**	**S06**	**S07**	**S08**	**S09**	**S10**	
Emission Source Description	**Flare**	**CO_2 Removal System**	**Boiler 1**	**Boiler 2**	**Back-up Generator 1**	**Back-up Generator 2**	**Fire Pump Engine**	**ORA Process Area Exhaust**	**ORA Non-Process Area Exhaust**	**Hydrolysis Tanks**	
Pollutant	**Maximum Theoretical Emissions (lbs/year)**	**Maximum Theoretical Emissions (lbs/year)**	**Maximum Theoretical Emissions (lbs/year)**	**Maximum Theoretical Emissions (lbs/year)**	**Maximum Theoretical Emissions (lbs/year)**	**Maximum Theoretical Emissions (lbs/year)**	**Maximum Theoretical Emissions (lbs/year)**	**Maximum Theoretical Emissions (lbs/year)**	**Maximum Theoretical Emissions (lbs/year)**	**Maximum Theoretical Emissions (lbs/year)**	**Maximum Theoretical Emissions (lbs/year)**
Criteria Pollutants											
NO_x	2.67E+04	---	1.72E+03	1.72E+03	8.53E+03	8.53E+03	9.67E+02	---	---	1.12E+03	**4.92E+04**
CO	3.14E+04	---	2.89E+03	2.89E+03	1.40E+04	1.40E+04	2.08E+02	---	---	---	**6.54E+04**
PM	5.19E+03	---	2.61E+02	2.61E+02	7.30E+01	7.30E+01	6.80E+01	---	---	---	**5.93E+03**
PM_{10}	5.19E+03	---	2.61E+02	2.61E+02	7.30E+01	7.30E+01	6.80E+01	---	---	---	**5.93E+03**
$PM_{2.5}$	5.19E+03	---	2.61E+02	2.61E+02	7.30E+01	7.30E+01	6.80E+01	---	---	---	**5.93E+03**
SO_2	5.59E+04	---	2.06E+01	2.06E+01	2.21E+00	2.21E+00	3.32E-01	---	---	2.40E+03	**5.83E+04**
VOC	3.76E+03	3.11E+03	1.89E+02	1.89E+02	1.11E+02	1.11E+02	7.67E+01	---	---	---	**7.54E+03**
Lead	3.42E-01	---	1.72E-02	1.72E-02	---	---	---	---	---	---	**3.76E-01**
Greenhouse Gases											
CO_2	8.16E+07	1.50E+07	3.76E+06	3.76E+06	4.14E+05	4.14E+05	3.57E+04	---	---	---	**1.05E+08**
CH_4	1.54E+03	---	7.10E+01	7.10E+01	8.65E+02	8.65E+02	1.45E+00	---	---	---	**3.41E+03**
N_2O	1.54E+02	---	7.10E+00	7.10E+00	8.29E-01	8.29E-01	2.90E-01	---	---	---	**1.70E+02**
CO_2e	8.16E+07	1.50E+07	3.77E+06	3.77E+06	4.35E+05	4.35E+05	3.59E+04	---	---	---	**1.05E+08**
Hazardous Air Pollutants											
Benzene (71-43-2)	1.44E+00	---	7.21E-02	7.21E-02	5.94E+00	5.94E+00	2.05E-01	---	---	---	**1.37E+01**
1,4-Dichlorobenzene (106-46-7)	8.20E-01	---	4.12E-02	4.12E-02	---	---	---	---	---	---	**9.03E-01**
Formaldehyde (50-00-0)	5.13E+01	---	2.58E+00	2.58E+00	7.71E+01	7.71E+01	2.59E-01	---	---	---	**2.11E+02**
n-Hexane (110-54-3)	1.23E+03	---	6.18E+01	6.18E+01	---	---	---	---	---	---	**1.35E+03**
Toluene (108-88-3)	2.32E+00	---	1.17E-01	1.17E-01	2.10E+00	2.10E+00	8.97E-02	---	---	---	**6.84E+00**
Polycyclic Organic Matter (POM)	4.77E-01	---	2.40E-02	2.40E-02	8.95E-01	8.95E-01	3.68E-02	---	---	---	**2.35E+00**
Naphthalene (91-20-3) [1]	4.17E-01	---	2.10E-02	2.10E-02	3.65E-01	3.65E-01	1.86E-02	---	---	---	**1.21E+00**
1,1,2,2-Tetrachloroethane (79-34-5)	---	---	---	---	9.51E-02	9.51E-02	---	---	---	---	**1.90E-01**
1,1,2-Trichloroethane (79-00-5)	---	---	---	---	5.75E-02	5.75E-02	---	---	---	---	**1.15E-01**
1,3-Butadiene (106-99-0)	---	---	---	---	2.49E+00	2.49E+00	8.57E-03	---	---	---	**4.99E+00**
1,3-Dichloropropene (542-75-6)	---	---	---	---	4.77E-02	4.77E-02	---	---	---	---	**9.55E-02**
Acetaldehyde (75-07-0)	---	---	---	---	1.05E+01	1.05E+01	---	---	---	---	**2.10E+01**
Acrolein (107-02-8)	---	---	---	---	9.89E+00	9.89E+00	---	---	---	---	**1.98E+01**
Carbon Tetrachloride (56-23-5)	---	---	---	---	6.65E-02	6.65E-02	---	---	---	---	**1.33E-01**
Chlorobenzene (108-90-7)	---	---	---	---	4.85E-02	4.85E-02	---	---	---	---	**9.70E-02**
Chloroform (67-66-3)	---	---	---	---	5.15E-02	5.15E-02	---	---	---	---	**1.03E-01**
Dichloromethane (methylene chloride) (75-09-2)	---	---	---	---	1.55E-01	1.55E-01	---	---	---	---	**3.10E-01**
Ethyl benzene (100-41-4)	---	---	---	---	9.32E-02	9.32E-02	---	---	---	---	**1.86E-01**
Ethylene Dibromide (106-93-4)	---	---	---	---	8.01E-02	8.01E-02	---	---	---	---	**1.60E-01**
Methanol (67-56-1)	---	---	---	---	1.15E+01	1.15E+01	---	---	---	---	**2.30E+01**
Styrene (100-42-5)	---	---	---	---	4.47E-02	4.47E-02	---	---	---	---	**8.95E-02**
Vinyl Chloride (75-01-4)	---	---	---	---	2.10E+00	2.10E+00	---	---	---	---	**4.20E+00**
Xylenes (1330-20-7)	---	---	---	---	2.70E-02	2.70E-02	---	---	---	---	**5.40E-02**
Arsenic (7440-38-2)	1.37E-01	---	6.87E-03	6.87E-03	---	---	---	---	---	---	**1.50E-01**
Beryllium (7440-41-7)	8.20E-03	---	4.12E-04	4.12E-04	---	---	---	---	---	---	**9.03E-03**
Cadmium (7440-43-9)	7.52E-01	---	3.78E-02	3.78E-02	---	---	---	---	---	---	**8.27E-01**
Chromium (7440-47-3)	9.57E-01	---	4.81E-02	4.81E-02	---	---	---	---	---	---	**1.05E+00**
Cobalt (7440-48-4)	5.74E-02	---	2.89E-03	2.89E-03	---	---	---	---	---	---	**6.32E-02**
Lead (7439-92-1)	3.42E-01	---	1.72E-02	1.72E-02	---	---	---	---	---	---	**3.76E-01**
Manganese (7439-96-5)	2.60E-01	---	1.31E-02	1.31E-02	---	---	---	---	---	---	**2.86E-01**
Mercury (7439-97-6)	1.78E-01	---	8.93E-03	8.93E-03	---	---	---	---	---	---	**1.96E-01**
Nickel (7440-02-0)	1.44E+00	---	7.21E-02	7.21E-02	---	---	---	---	---	---	**1.58E+00**
Selenium (7782-49-2)	1.64E-02	---	8.24E-04	8.24E-04	---	---	---	---	---	---	**1.81E-02**
Total HAPs	1.29E+03	---	6.49E+01	6.49E+01	1.22E+02	1.22E+02	8.49E-01	---	---	---	**1.67E+03**
Hazardous Air Contaminants											
Benz[a]anthracene (56-55-3)	1.23E-03	---	6.18E-05	6.18E-05	---	---	3.68E-04	---	---	---	**1.72E-03**
Benzo[a]pyrene (50-32-8)	8.20E-04	---	4.12E-05	4.12E-05	---	---	4.12E-05	---	---	---	**9.44E-04**
Benzo[b]fluoranthene (205-99-2)	1.23E-03	---	6.18E-05	6.18E-05	---	---	2.17E-05	---	---	---	**1.38E-03**
Benzo[k]fluoranthene (207-08-9)	1.23E-03	---	6.18E-05	6.18E-05	---	---	3.40E-05	---	---	---	**1.39E-03**
Dibenzo[a,h]anthracene (53-70-3)	8.20E-04	---	4.12E-05	4.12E-05	---	---	1.28E-04	---	---	---	**1.03E-03**
Indeno(1,2,3-cd)pyrene (193-39-5)	1.23E-03	---	6.18E-05	6.18E-05	---	---	8.22E-05	---	---	---	**1.44E-03**
Ammonia (7664-41-7) [2]	1.50E+03	---	---	---	---	---	---	1.06E+04	9.82E+01	1.04E+03	**1.32E+04**
Hydrogen Sulfide (7783-06-4) [2]	2.97E+04	---	---	---	---	---	---	1.79E+04	1.96E+02	1.28E+03	**4.91E+04**

Maximum Theoretical Emissions Summary

	Annual Emissions Summary (continued)										
Emission Source (Unit ID Number)	**P01**	**P02**	**B01**	**B02**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**Facility Total**
Stack (Stack ID Number)	**S01**	**S02**	**S03**	**S04**	**S05**	**S06**	**S07**	**S08**	**S09**	**S10**	
Emission Source Description	**Flare**	**CO_2 Removal System**	**Boiler 1**	**Boiler 2**	**Back-up Generator 1**	**Back-up Generator 2**	**Fire Pump Engine**	**ORA Process Area Exhaust**	**ORA Non-Process Area Exhaust**	**Hydrolysis Tanks**	
Pollutant	**Maximum Theoretical Emissions (tons/year)**	**Maximum Theoretical Emissions (tons/year)**	**Maximum Theoretical Emissions (tons/year)**	**Maximum Theoretical Emissions (tons/year)**	**Maximum Theoretical Emissions (tons/year)**	**Maximum Theoretical Emissions (tons/year)**	**Maximum Theoretical Emissions (tons/year)**	**Maximum Theoretical Emissions (tons/year)**	**Maximum Theoretical Emissions (tons/year)**	**Maximum Theoretical Emissions (tons/year)**	**Maximum Theoretical Emissions (tons/year)**
Criteria Pollutants											
NO_X	1.33E+01	---	8.59E-01	8.59E-01	4.27E+00	4.27E+00	4.83E-01	---	---	5.58E-01	**2.46E+01**
CO	1.57E+01	---	1.44E+00	1.44E+00	6.99E+00	6.99E+00	1.04E-01	---	---	---	**3.27E+01**
PM	2.60E+00	---	1.31E-01	1.31E-01	3.65E-02	3.65E-02	3.40E-02	---	---	---	**2.97E+00**
PM_{10}	2.60E+00	---	1.31E-01	1.31E-01	3.65E-02	3.65E-02	3.40E-02	---	---	---	**2.97E+00**
$PM_{2.5}$	2.60E+00	---	1.31E-01	1.31E-01	3.65E-02	3.65E-02	3.40E-02	---	---	---	**2.97E+00**
SO_2	2.80E+01	---	1.03E-02	1.03E-02	1.11E-03	1.11E-03	1.66E-04	---	---	1.20E+00	**2.92E+01**
VOC	1.88E+00	1.55E+00	9.45E-02	9.45E-02	5.56E-02	5.56E-02	3.84E-02	---	---	---	**3.77E+00**
Lead	1.71E-04	---	8.59E-06	8.59E-06	---	---	---	---	---	---	**1.88E-04**
Greenhouse Gases											
CO_2	4.08E+04	7.50E+03	1.88E+03	1.88E+03	2.07E+02	2.07E+02	1.79E+01	---	---	---	**5.25E+04**
CH_4	7.69E-01	---	3.55E-02	3.55E-02	4.32E-01	4.32E-01	7.25E-04	---	---	---	**1.70E+00**
N_2O	7.69E-02	---	3.55E-03	3.55E-03	4.14E-04	4.14E-04	1.45E-04	---	---	---	**8.49E-02**
CO_2e	4.08E+04	7.50E+03	1.88E+03	1.88E+03	2.18E+02	2.18E+02	1.79E+01	---	---	---	**5.25E+04**
Hazardous Air Pollutants											
Benzene (71-43-2)	7.18E-04	---	3.61E-05	3.61E-05	2.97E-03	2.97E-03	1.02E-04	---	---	---	**6.83E-03**
1,4-Dichlorobenzene (106-46-7)	4.10E-04	---	2.06E-05	2.06E-05	---	---	---	---	---	---	**4.51E-04**
Formaldehyde (50-00-0)	2.56E-02	---	1.29E-03	1.29E-03	3.85E-02	3.85E-02	1.29E-04	---	---	---	**1.05E-01**
n-Hexane (110-54-3)	6.15E-01	---	3.09E-02	3.09E-02	---	---	---	---	---	---	**6.77E-01**
Toluene (108-88-3)	1.16E-03	---	5.84E-05	5.84E-05	1.05E-03	1.05E-03	4.48E-05	---	---	---	**3.42E-03**
Polycyclic Organic Matter (POM)	2.39E-04	---	1.20E-05	1.20E-05	4.48E-04	4.48E-04	1.84E-05	---	---	---	**1.18E-03**
Naphthalene (91-20-3) [1]	2.08E-04	---	1.05E-05	1.05E-05	1.83E-04	1.83E-04	9.30E-06	---	---	---	**6.04E-04**
1,1,2,2-Tetrachloroethane (79-34-5)	---	---	---	---	4.76E-05	4.76E-05	---	---	---	---	**9.51E-05**
1,1,2-Trichloroethane (79-00-5)	---	---	---	---	2.88E-05	2.88E-05	---	---	---	---	**5.75E-05**
1,3-Butadiene (106-99-0)	---	---	---	---	1.25E-03	1.25E-03	4.29E-06	---	---	---	**2.50E-03**
1,3-Dichloropropene (542-75-6)	---	---	---	---	2.39E-05	2.39E-05	---	---	---	---	**4.77E-05**
Acetaldehyde (75-07-0)	---	---	---	---	5.24E-03	5.24E-03	---	---	---	---	**1.05E-02**
Acrolein (107-02-8)	---	---	---	---	4.94E-03	4.94E-03	---	---	---	---	**9.89E-03**
Carbon Tetrachloride (56-23-5)	---	---	---	---	3.33E-05	3.33E-05	---	---	---	---	**6.65E-05**
Chlorobenzene (108-90-7)	---	---	---	---	2.42E-05	2.42E-05	---	---	---	---	**4.85E-05**
Chloroform (67-66-3)	---	---	---	---	2.58E-05	2.58E-05	---	---	---	---	**5.15E-05**
Dichloromethane (methylene chloride) (75-09-2)	---	---	---	---	7.74E-05	7.74E-05	---	---	---	---	**1.55E-04**
Ethyl benzene (100-41-4)	---	---	---	---	4.66E-05	4.66E-05	---	---	---	---	**9.32E-05**
Ethylene Dibromide (106-93-4)	---	---	---	---	4.00E-05	4.00E-05	---	---	---	---	**8.01E-05**
Methanol (67-56-1)	---	---	---	---	5.75E-03	5.75E-03	---	---	---	---	**1.15E-02**
Styrene (100-42-5)	---	---	---	---	2.24E-05	2.24E-05	---	---	---	---	**4.47E-05**
Vinyl Chloride (75-01-4)	---	---	---	---	1.05E-03	1.05E-03	---	---	---	---	**2.10E-03**
Xylenes (1330-20-7)	---	---	---	---	1.35E-05	1.35E-05	---	---	---	---	**2.70E-05**
Arsenic (7440-38-2)	6.84E-05	---	3.44E-06	3.44E-06	---	---	---	---	---	---	**7.52E-05**
Beryllium (7440-41-7)	4.10E-06	---	2.06E-07	2.06E-07	---	---	---	---	---	---	**4.51E-06**
Cadmium (7440-43-9)	3.76E-04	---	1.89E-05	1.89E-05	---	---	---	---	---	---	**4.14E-04**
Chromium (7440-47-3)	4.78E-04	---	2.40E-05	2.40E-05	---	---	---	---	---	---	**5.27E-04**
Cobalt (7440-48-4)	2.87E-05	---	1.44E-06	1.44E-06	---	---	---	---	---	---	**3.16E-05**
Lead (7439-92-1)	1.71E-04	---	8.59E-06	8.59E-06	---	---	---	---	---	---	**1.88E-04**
Manganese (7439-96-5)	1.30E-04	---	6.53E-06	6.53E-06	---	---	---	---	---	---	**1.43E-04**
Mercury (7439-97-6)	8.89E-05	---	4.47E-06	4.47E-06	---	---	---	---	---	---	**9.78E-05**
Nickel (7440-02-0)	7.18E-04	---	3.61E-05	3.61E-05	---	---	---	---	---	---	**7.90E-04**
Selenium (7782-49-2)	8.20E-06	---	4.12E-07	4.12E-07	---	---	---	---	---	---	**9.03E-06**
Total HAPs	6.45E-01	---	3.24E-02	3.24E-02	6.09E-02	6.09E-02	4.25E-04	---	---	---	**8.33E-01**
Hazardous Air Contaminants											
Benz(a)anthracene (56-55-3)	6.15E-07	---	3.09E-08	3.09E-08	---	---	1.84E-07	---	---	---	**8.61E-07**
Benzo(a)pyrene (50-32-8)	4.10E-07	---	2.06E-08	2.06E-08	---	---	2.06E-08	---	---	---	**4.72E-07**
Benzo(b)fluoranthene (205-99-2)	6.15E-07	---	3.09E-08	3.09E-08	---	---	1.09E-08	---	---	---	**6.88E-07**
Benzo(k)fluoranthene (207-08-9)	6.15E-07	---	3.09E-08	3.09E-08	---	---	1.70E-08	---	---	---	**6.94E-07**
Dibenzo(a,h)anthracene (53-70-3)	4.10E-07	---	2.06E-08	2.06E-08	---	---	6.39E-08	---	---	---	**5.15E-07**
Indeno(1,2,3-cd)pyrene (193-39-5)	6.15E-07	---	3.09E-08	3.09E-08	---	---	4.11E-08	---	---	---	**7.18E-07**
Ammonia (7664-41-7) [2]	7.51E-01	---	---	---	---	---	---	5.29E+00	4.91E-02	5.22E-01	**6.61E+00**
Hydrogen Sulfide (7783-06-4) [2]	1.49E+01	---	---	---	---	---	---	8.95E+00	9.82E-02	6.38E-01	**2.46E+01**

Waupaca AD1
Maximum Theoretical Emissions Calculations

Flare Maximum Theoretical Emissions

Pilot Light Capacity	0.5 cfm	Annual Emergency Flaring Hours	8,760 hours
Flaring Capacity	1300 cfm	Maximum Biogas H2S Content (sent to flare)	500 ppm
Natural Gas Heating Value	1020 Btu/scf		

				Pilot Light		Emergency Flaring		Total	
Pollutant	Emission Factor	Units	Reference	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Criteria Pollutants									
NOx	39	lb/mmscf	[1]	1.17E-03	5.12E-03	3.04E+00	1.33E+01	3.04E+00	1.33E+01
CO	46	lb/mmscf	[1]	1.38E-03	6.04E-03	3.59E+00	1.57E+01	3.59E+00	1.57E+01
PM	7.6	lb/mmscf	[2]	2.28E-04	9.99E-04	5.93E-01	2.60E+00	5.93E-01	2.60E+00
PM_{10}	7.6	lb/mmscf	[2],[3]	2.28E-04	9.99E-04	5.93E-01	2.60E+00	5.93E-01	2.60E+00
$PM_{2.5}$	7.6	lb/mmscf	[2],[3]	2.28E-04	9.99E-04	5.93E-01	2.60E+00	5.93E-01	2.60E+00
SO_2	0.6	lb/mmscf	[2],[6]	1.80E-05	7.88E-05	6.38E+00	2.80E+01	6.38E+00	2.80E+01
VOC	5.5	lb/mmscf	[2]	1.65E-04	7.23E-04	4.29E-01	1.88E+00	4.29E-01	1.88E+00
Lead	5.00E-04	lb/mmscf	[3]	1.50E-08	6.57E-08	3.90E-05	1.71E-04	3.90E-05	1.71E-04
Greenhouse Gases									
CO_2	116.97608	lb/MMBtu	[5],[7]	3.58E+00	1.57E+01	9.31E+03	4.08E+04	9.31E+03	4.08E+04
CH_4	2.20E-03	lb/MMBtu	[5]	6.75E-05	2.95E-04	1.75E-01	7.68E-01	1.75E-01	7.69E-01
N_2O	2.20E-04	lb/MMBtu	[5]	6.75E-06	2.95E-05	1.75E-02	7.68E-02	1.75E-02	7.69E-02
CO_2e	na	na	[5]	3.58E+00	1.57E+01	9.32E+03	4.08E+04	9.32E+03	4.08E+04
Hazardous Air Pollutants									
Benzene (71-43-2)	2.10E-03	lb/mmscf	[4]	6.30E-08	2.76E-07	1.64E-04	7.17E-04	1.64E-04	7.18E-04
1,4-Dichlorobenzene (106-46-7)	1.20E-03	lb/mmscf	[4]	3.60E-08	1.58E-07	9.36E-05	4.10E-04	9.36E-05	4.10E-04
Formaldehyde (50-00-0)	7.50E-02	lb/mmscf	[4]	2.25E-06	9.86E-06	5.85E-03	2.56E-02	5.85E-03	2.56E-02
n-Hexane (110-54-3)	1.80E+00	lb/mmscf	[4]	5.40E-05	2.37E-04	1.40E-01	6.15E-01	1.40E-01	6.15E-01
Toluene (108-88-3)	3.40E-03	lb/mmscf	[4]	1.02E-07	4.47E-07	2.65E-04	1.16E-03	2.65E-04	1.16E-03
Polycyclic Organic Matter (POM)	6.98E-04	lb/mmscf	[4]	2.09E-08	9.17E-08	5.45E-05	2.39E-04	5.45E-05	2.39E-04
2-Methylnaphthalene	*2.40E-05*	*lb/mmscf*	[4]	*7.20E-10*	*3.15E-09*	*1.87E-06*	*8.20E-06*	*1.87E-06*	*8.20E-06*
3-Methylcholanthrene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
7,12- Dimethylbenz(a)anthracene	*1.60E-05*	*lb/mmscf*	[4]	*4.80E-10*	*2.10E-09*	*1.25E-06*	*5.47E-06*	*1.25E-06*	*5.47E-06*
Acenaphthene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
Acenaphthylene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
Anthracene	*2.40E-06*	*lb/mmscf*	[4]	*7.20E-11*	*3.15E-10*	*1.87E-07*	*8.20E-07*	*1.87E-07*	*8.20E-07*
Benz(a)anthracene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
Benzo(a)pyrene	*1.20E-06*	*lb/mmscf*	[4]	*3.60E-11*	*1.58E-10*	*9.36E-08*	*4.10E-07*	*9.36E-08*	*4.10E-07*
Benzo(b)fluoranthene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
Benzo(g,h,i)perylene	*1.20E-06*	*lb/mmscf*	[4]	*3.60E-11*	*1.58E-10*	*9.36E-08*	*4.10E-07*	*9.36E-08*	*4.10E-07*
Benzo(k)fluoranthene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
Chrysene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
Dibenzo(a,h)anthracene	*1.20E-06*	*lb/mmscf*	[4]	*3.60E-11*	*1.58E-10*	*9.36E-08*	*4.10E-07*	*9.36E-08*	*4.10E-07*
Fluoranthene	*3.00E-06*	*lb/mmscf*	[4]	*9.00E-11*	*3.94E-10*	*2.34E-07*	*1.02E-06*	*2.34E-07*	*1.03E-06*
Fluorene	*2.80E-06*	*lb/mmscf*	[4]	*8.40E-11*	*3.68E-10*	*2.18E-07*	*9.57E-07*	*2.18E-07*	*9.57E-07*
Indeno(1,2,3-cd)pyrene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
Naphthalene (91-20-3)	6.10E-04	lb/mmscf	[4]	*1.83E-08*	*8.02E-08*	*4.76E-05*	*2.08E-04*	*4.76E-05*	*2.08E-04*
Phenanathrene	*1.70E-05*	*lb/mmscf*	[4]	*5.10E-10*	*2.23E-09*	*1.33E-06*	*5.81E-06*	*1.33E-06*	*5.81E-06*
Pyrene	*5.00E-06*	*lb/mmscf*	[4]	*1.50E-10*	*6.57E-10*	*3.90E-07*	*1.71E-06*	*3.90E-07*	*1.71E-06*
Arsenic (7440-38-2)	2.00E-04	lb/mmscf	[4]	6.00E-09	2.63E-08	1.56E-05	6.83E-05	1.56E-05	6.84E-05
Beryllium (7440-41-7)	1.20E-05	lb/mmscf	[4]	3.60E-10	1.58E-09	9.36E-07	4.10E-06	9.36E-07	4.10E-06
Cadmium (7440-43-9)	1.10E-03	lb/mmscf	[4]	3.30E-08	1.45E-07	8.58E-05	3.76E-04	8.58E-05	3.76E-04
Chromium (7440-47-3)	1.40E-03	lb/mmscf	[4]	4.20E-08	1.84E-07	1.09E-04	4.78E-04	1.09E-04	4.78E-04
Cobalt (7440-48-4)	8.40E-05	lb/mmscf	[4]	2.52E-09	1.10E-08	6.55E-06	2.87E-05	6.55E-06	2.87E-05
Lead (7439-92-1)	5.00E-04	lb/mmscf	[3]	1.50E-08	6.57E-08	3.90E-05	1.71E-04	3.90E-05	1.71E-04
Manganese (7439-96-5)	3.80E-04	lb/mmscf	[4]	1.14E-08	4.99E-08	2.96E-05	1.30E-04	2.97E-05	1.30E-04
Mercury (7439-97-6)	2.60E-04	lb/mmscf	[4]	7.80E-09	3.42E-08	2.03E-05	8.88E-05	2.03E-05	8.89E-05
Nickel (7440-02-0)	2.10E-03	lb/mmscf	[4]	6.30E-08	2.76E-07	1.64E-04	7.17E-04	1.64E-04	7.18E-04
Selenium (7782-49-2)	2.40E-05	lb/mmscf	[4]	7.20E-10	3.15E-09	1.87E-06	8.20E-06	1.87E-06	8.20E-06
Total HAPs				5.67E-05	2.48E-04	1.47E-01	6.45E-01	1.47E-01	6.45E-01
Hazardous Air Contaminants									
Ammonia (7664-41-7)			[8]	0.00E+00	0.00E+00	1.71E-01	7.51E-01	1.71E-01	7.51E-01
Hydrogen Sulfide (7783-06-4)			[9]	0.00E+00	0.00E+00	3.40E+00	1.49E+01	3.40E+00	1.49E+01

Flare Maximum Theoretical Emissions

[1] Draft AP-42, Section 2.4 "Municipal Solid Waste Landfills" (10/08) Table 2.4-4

[2] AP-42 Section 1.4 "Natural Gas Combustion" (7/98) Table 1.4-2

[3] Assume PM = PM10 = PM2.5

[4] AP-42 Section 1.4 "Natural Gas Combustion" (7/98) Table 1.4-2

[5] 40 CFR Part 98, Subpart C, Tables C-1 and C-2

CO2e emission rate calculated based on Global Warming Potential (GWP) from Table A-1 to Subpart A of Part 98

GHG Pollutant	GWP	Mass EF (kg/MMBtu)	Mass EF (lb/MMBtu)
CO2	1	5.31E+01	1.17E+02
CH_4	25	1.00E-03	2.20E-03
N_2O	298	1.00E-04	2.20E-04

Conversion factor: 2.2046 lb/kg

[6] SO2 from combusting biogas based on H2S content of gas

Flaring can occur prior to H2S removal, after H2S removal, after dehydration/polishing, or after CO2 removal.

Worst case H2S concentration from these three streams is anticipated to be 500 ppm

SO2 emission rate conservatively based on a 500 ppm maximum concentration of hydrogen sulfide in the biogas sent to the flare assuming all hydrogen sulfide is converted to sulfur dioxide.

$2H_2S + 3O_2 \rightarrow 2SO_2 + 2H_2O$

Universal Gas Constant R =	0.08206	L*atm*mol-1*K-1	
P=	1	atm	
T =	298	K	
V/n = Molar Volume = RT/P	24.45388	L/g-mole	
Conversion Factor	28.317	L/cf	
Conversion Factor	453.6	g/lb	
Molar emission rate of H2S	9.96E-02	lbmol H2S/hr	(3.40E+00 lb H2S/hr)

Molar Emission Rate of H2S - Example Calculation: 1300 scfm biogas * 500 cf H2S/ 10^6 cf biogas * 1 g-mole H2s/24.45 L H2S * 28.317 L/cf * 1 lb/453 g * 60 min/hr

SO2 Emission rate	6.38E+00	lb SO2/hr

Mass Emission Rate of SO2 - Example Calculation: 0.1 lb-mol H2S/hr * 2 mol SO2/2 mol H2S * 64.1 lb SO2/lb-mol SO2

[7] CO2 from the digester is not included in this calculation because it is accounted for in the emissions calculations for the CO2 removal process which assumes all CO2 in the biogas is emitted

[8] Ammonia emission rate assumes no ammonia is combusted in the flare.

Worst case NH3 concentration is anticipated to be 20 ppm

Universal Gas Constant R =	0.08206	L*atm*mol-1*K-1	
P=	1	atm	
T =	298	K	
V/n = Molar Volume = RT/P	24.45388	L/g-mole	
Conversion Factor	28.317	L/cf	
Conversion Factor	453.6	g/lb	
Molar emission rate of NH3	3.98E-03	lbmol NH3/hr	(1.71E-01 lb NH3/hr)

[9] Hydrogen sulfide emission rate assumes no hydrogen sulfide is combusted in the flare.

Worst case H2S concentration is anticipated to be 500 ppm

Universal Gas Constant R =	0.08206	L*atm*mol-1*K-1	
P=	1	atm	
T =	298	K	
V/n = Molar Volume = RT/P	24.45388	L/g-mole	
Conversion Factor	28.317	L/cf	
Conversion Factor	453.6	g/lb	
Molar emission rate of H2S	9.96E-02	lbmol H2S/hr	(3.40E+00 lb H2S/hr)

CO_2 Removal System Maximum Theoretical Emissions

Inlet Stream Data from Biogas Upgrader System Specification Sheets

	Nominal Value	Maximum Value	Units
Gas Flow:	631	1157	SCFM

	Nominal Value	Maximum Value	Units
Gas Composition:			
CH_4	60.0	70.0	% by volume
CO_2	39.7	55	% by volume
O_2	0.1	0.2	% by volume
N_2	0.2	1.2	% by volume
H_2O	Saturated		
H_2S	500	2500	ppmv
VOC	150	200	mg/m^3
NH_3	10	20	ppmv

Potential hourly emission rates are calculated based on maximum gas flow rate and maximum design pollutant concentrations, which are reflective of non-steady-state operation.
Potential annual emissions are calculated based on nominal gas flow rate and nominal design pollutant concentrations which are reflective of steady-state operation.

CO_2 Potential Emissions

R Constant 0.73024 $ft^3*atm*R^{-1}*lb\text{-}mol^{-1}$
lb CO_2/lb mol 44

Potential Hourly CO2 Emission Rate
Conservatively assume all CO_2 in inlet stream is emitted, at the maximum flow rate and CO_2 concentration
Assume mole % = volume %
1157 scfm * molar concentration* 1 atm / (0.73024 ft^3*atm*R-1*lb-mol-1 * (68+460.67)R) = lb mol/min
1.65 lb mol/min
4,352 lb/hr CO_2

Potential Annual CO2 Emissions
Conservatively assume all CO_2 in inlet stream is emitted, at the nomial flow rate and CO_2 concentration
Assume mole % = volume %
631 scfm * molar concentration* 1 atm / (0.73024 ft^3*atm*R-1*lb-mol-1 * (68+460.67)R) = lb mol/min
0.65 lb mol/min
1,713 lb/hr CO_2
7,503 tpy CO_2

VOC Potential Emissions

Potential Hourly VOC Emission Rate
Conservatively assume all VOC in inlet stream is emitted, at the maximum flow rate and VOC concentration
1157 scfm * (60 min/hour) * (1 m^3/35.315 ft^3) * concentration (mg/m^3) * (1 g/1000 mg) * (1 lb/453.592 g) = lb/hr
0.867 lb/hr VOC

Potential Annual VOC Emissions
Conservatively assume all VOC in inlet stream is emitted, at the nominal flow rate and VOC concentration
631 scfm * (60 min/hour) * (1 m^3/35.315 ft^3) * concentration (mg/m^3) * (1 g/1000 mg) * (1 lb/453.592 g) = lb/hr
0.355 lb/hr VOC
1.55 tpy VOC

Note: Although ammonia and hydrogen sulfide may be present in low quantities in the gases emitted from the CO2 removal system, emissions of these pollutants are already accounted for in the flare emissions calculations.

Waupaca AD1
Maximum Theoretical Emissions Calculations

Boiler 1 Maximum Theoretical Emissions

Fuel Type:	Natural Gas	
Maximum Fuel Consumption Rate:	3,922	scf/hr
Higher Heating Value:	1,020	Btu/scf
Estimated Heat Input Rate:	4.0	MMBtu/hr
Annual Hours of Operation:	8,760	hours
Fuel Sulfur Content:	---	---

	Natural Gas				
Pollutant	**Emission Factor**	**Emission Factor Units**	**Emission Factor Source**	**Hourly Emission Rate (lb/hr)**	**Annual Emissions (ton/year)**
Criteria Pollutants					
NO_X	50	lb/mmscf	1	0.196	0.86
CO	84	lb/mmscf	1	0.329	1.44
PM	7.6	lb/mmscf	1	0.0298	0.131
PM10	7.6	lb/mmscf	1	0.0298	0.131
PM2.5	7.6	lb/mmscf	1	0.0298	0.131
SO_2	0.6	lb/mmscf	1	2.35E-03	0.0103
VOC	5.5	lb/mmscf	1	0.0216	0.0945
Lead	5.00E-04	lb/mmscf	1	1.96E-06	8.59E-06
Greenhouse Gases					
CO_2	107	lb/MMBtu	2	430	1,882
CH_4	2.03E-03	lb/MMBtu	2	0.0081	0.035
N_2O	2.03E-04	lb/MMBtu	2	8.10E-04	3.55E-03
CO_2e				430	1,883
Hazardous Air Pollutants					
Benzene	2.10E-03	lb/mmscf	1	8.24E-06	3.61E-05
Dichlorobenzene	1.20E-03	lb/mmscf	1	4.71E-06	2.06E-05
Formaldehyde	7.50E-02	lb/mmscf	1	2.94E-04	1.29E-03
Hexane	1.80E+00	lb/mmscf	1	7.06E-03	0.0309
Toluene	3.40E-03	lb/mmscf	1	1.33E-05	5.84E-05

Waupaca AD1

Maximum Theoretical Emissions Calculations

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Hourly Emission Rate (lb/hr)	Annual Emissions (ton/year)
Polycyclic Organic Matter (POM)	6.98E-04	lb/mmscf	1	2.74E-06	1.20E-05
2-Methylnaphthalene	*2.40E-05*	*lb/mmscf*	1	9.41E-08	4.12E-07
3-Methylcholanthrene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
7,12- Dimethylbenz(a)anthracene	*1.60E-05*	*lb/mmscf*	1	6.27E-08	2.75E-07
Acenaphthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Acenaphthylene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Anthracene	*2.40E-06*	*lb/mmscf*	1	9.41E-09	4.12E-08
Benz(a)anthracene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Benzo(a)pyrene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Benzo(b)fluoranthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Benzo(g,h,i)perylene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Benzo(k)fluoranthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Chrysene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Dibenzo(a,h)anthracene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Fluoranthene	*3.00E-06*	*lb/mmscf*	1	1.18E-08	5.15E-08
Fluorene	*2.80E-06*	*lb/mmscf*	1	1.10E-08	4.81E-08
Indeno(1,2,3-cd)pyrene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Naphthalene	*6.10E-04*	*lb/mmscf*	1	2.39E-06	1.05E-05
Phenanathrene	*1.70E-05*	*lb/mmscf*	1	6.67E-08	2.92E-07
Pyrene	*5.00E-06*	*lb/mmscf*	1	1.96E-08	8.59E-08
Arsenic	2.00E-04	lb/mmscf	1	7.84E-07	3.44E-06
Beryllium	1.20E-05	lb/mmscf	1	4.71E-08	2.06E-07
Cadmium	1.10E-03	lb/mmscf	1	4.31E-06	1.89E-05
Chromium	1.40E-03	lb/mmscf	1	5.49E-06	2.40E-05
Cobalt	8.40E-05	lb/mmscf	1	3.29E-07	1.44E-06
Lead	5.00E-04	lb/mmscf	1	1.96E-06	8.59E-06
Manganese	3.80E-04	lb/mmscf	1	1.49E-06	6.53E-06
Mercury	2.60E-04	lb/mmscf	1	1.02E-06	4.47E-06
Nickel	2.10E-03	lb/mmscf	1	8.24E-06	3.61E-05
Selenium	2.40E-05	lb/mmscf	1	9.41E-08	4.12E-07
Total HAPs				**7.41E-03**	**3.24E-02**

Waupaca AD1

Maximum Theoretical Emissions Calculations

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Hourly Emission Rate (lb/hr)	Annual Emissions (ton/year)

Sources	Source#
AP-42 Chapter 1.4 (Small Boilers, Low-NO_X burners)	1
40 CFR pt. 98, Tables A-1, C-1, and C-2	2

Waupaca AD1
Maximum Theoretical Emissions Calculations

Boiler 2 Maximum Theoretical Emissions

Fuel Type:	Natural Gas	
Maximum Fuel Consumption Rate:	3,922	scf/hr
Higher Heating Value:	1,020	Btu/scf
Estimated Heat Input Rate:	4.0	MMBtu/hr
Annual Hours of Operation:	8,760	hours
Fuel Sulfur Content:	---	---

	Natural Gas				
Pollutant	**Emission Factor**	**Emission Factor Units**	**Emission Factor Source**	**Hourly Emission Rate (lb/hr)**	**Annual Emissions (ton/year)**
Criteria Pollutants					
NO_X	50	lb/mmscf	1	0.196	0.86
CO	84	lb/mmscf	1	0.329	1.44
PM	7.6	lb/mmscf	1	0.0298	0.131
PM10	7.6	lb/mmscf	1	0.0298	0.131
PM2.5	7.6	lb/mmscf	1	0.0298	0.131
SO_2	0.6	lb/mmscf	1	2.35E-03	0.0103
VOC	5.5	lb/mmscf	1	0.0216	0.0945
Lead	5.00E-04	lb/mmscf	1	1.96E-06	8.59E-06
Greenhouse Gases					
CO_2	107	lb/MMBtu	2	430	1,882
CH_4	2.03E-03	lb/MMBtu	2	0.0081	0.035
N_2O	2.03E-04	lb/MMBtu	2	8.10E-04	3.55E-03
CO_2e				430	1,883
Hazardous Air Pollutants					
Benzene	2.10E-03	lb/mmscf	1	8.24E-06	3.61E-05
Dichlorobenzene	1.20E-03	lb/mmscf	1	4.71E-06	2.06E-05
Formaldehyde	7.50E-02	lb/mmscf	1	2.94E-04	1.29E-03
Hexane	1.80E+00	lb/mmscf	1	7.06E-03	0.0309
Toluene	3.40E-03	lb/mmscf	1	1.33E-05	5.84E-05

Waupaca AD1

Maximum Theoretical Emissions Calculations

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Hourly Emission Rate (lb/hr)	Annual Emissions (ton/year)
Polycyclic Organic Matter (POM)	6.98E-04	lb/mmscf	1	2.74E-06	1.20E-05
2-Methylnaphthalene	*2.40E-05*	*lb/mmscf*	1	9.41E-08	4.12E-07
3-Methylcholanthrene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
7,12- Dimethylbenz(a)anthracene	*1.60E-05*	*lb/mmscf*	1	6.27E-08	2.75E-07
Acenaphthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Acenaphthylene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Anthracene	*2.40E-06*	*lb/mmscf*	1	9.41E-09	4.12E-08
Benz(a)anthracene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Benzo(a)pyrene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Benzo(b)fluoranthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Benzo(g,h,i)perylene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Benzo(k)fluoranthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Chrysene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Dibenzo(a,h)anthracene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Fluoranthene	*3.00E-06*	*lb/mmscf*	1	1.18E-08	5.15E-08
Fluorene	*2.80E-06*	*lb/mmscf*	1	1.10E-08	4.81E-08
Indeno(1,2,3-cd)pyrene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Naphthalene	*6.10E-04*	*lb/mmscf*	1	2.39E-06	1.05E-05
Phenanathrene	*1.70E-05*	*lb/mmscf*	1	6.67E-08	2.92E-07
Pyrene	*5.00E-06*	*lb/mmscf*	1	1.96E-08	8.59E-08
Arsenic	2.00E-04	lb/mmscf	1	7.84E-07	3.44E-06
Beryllium	1.20E-05	lb/mmscf	1	4.71E-08	2.06E-07
Cadmium	1.10E-03	lb/mmscf	1	4.31E-06	1.89E-05
Chromium	1.40E-03	lb/mmscf	1	5.49E-06	2.40E-05
Cobalt	8.40E-05	lb/mmscf	1	3.29E-07	1.44E-06
Lead	5.00E-04	lb/mmscf	1	1.96E-06	8.59E-06
Manganese	3.80E-04	lb/mmscf	1	1.49E-06	6.53E-06
Mercury	2.60E-04	lb/mmscf	1	1.02E-06	4.47E-06
Nickel	2.10E-03	lb/mmscf	1	8.24E-06	3.61E-05
Selenium	2.40E-05	lb/mmscf	1	9.41E-08	4.12E-07
Total HAPs				**7.41E-03**	**3.24E-02**

Waupaca AD1

Maximum Theoretical Emissions Calculations

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Hourly Emission Rate (lb/hr)	Annual Emissions (ton/year)

Sources	Source#
AP-42 Chapter 1.4 (Small Boilers, Low-NO_X burners)	1
40 CFR pt. 98, Tables A-1, C-1, and C-2	2

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Maximum Theoretical Emissions Calculations

Backup Generator 1 Maximum Theoretical Emissions

Assumptions:	
Rated Capacity, kW	750
Brake Horsepower, bhp	1,114
Natural Gas Rated Capacity, MMBtu/hr	7.5
Hours of Operation	500
Fuel	Natural Gas
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
Btu/MMBtu	1,000,000
hr/yr	8,760

	Pollutant	EPA Pollutant Type	CAS Number	AP-42 Emission Factors[1] (lb/MMBtu)	Natural Gas Hourly Emissions (lb/hr)	Natural Gas Annual Emissions (TPY)
	Criteria Pollutants					
	NO_X	criteria	NA	2.27	17.1	4.27
	CO	criteria	NA	3.72	28.0	6.99
	PM	criteria	NA	0.0194	0.146	0.0365
	PM10	criteria	NA	0.0194	0.146	0.0365
	PM2.5	criteria	NA	0.0194	0.146	0.0365
	SO_2	criteria	NA	5.88E-04	4.42E-03	1.11E-03
	VOC	criteria	NA	0.0296	0.223	0.0556
	Greenhouse Gases					
	CO_2e	GHG	NA	115.8	871	217.70
	CO_2	GHG	NA	110.0	827	206.77
	CH4	GHG	NA	0.230	1.73	0.432
2	N2O	GHG	NA	2.20E-04	1.66E-03	4.14E-04
	Hazardous Air Pollutants					
	1,1,2,2-Tetrachloroethane	HAP	79345	2.53E-05	1.90E-04	4.76E-05
	1,1,2-Trichloroethane	HAP	79005	1.53E-05	1.15E-04	2.88E-05
	1,3-Butadiene	HAP	106990	6.63E-04	4.98E-03	1.25E-03
	1,3-Dichloropropene	HAP	542756	1.27E-05	9.55E-05	2.39E-05
	Acetaldehyde	HAP	75070	2.79E-03	2.10E-02	5.24E-03
	Acrolein	HAP	107028	2.63E-03	1.98E-02	4.94E-03
	Benzene	HAP	71432	1.58E-03	1.19E-02	2.97E-03
	Carbon Tetrachloride	HAP	56235	1.77E-05	1.33E-04	3.33E-05
	Chlorobenzene	HAP	108907	1.29E-05	9.70E-05	2.42E-05
	Chloroform	HAP	67663	1.37E-05	1.03E-04	2.58E-05
	Dichloromethane (methylene chloride)	HAP	75092	4.12E-05	3.10E-04	7.74E-05
	Ethyl benzene	HAP	100414	2.48E-05	1.86E-04	4.66E-05
	Ethylene Dibromide	HAP	106934	2.13E-05	1.60E-04	4.00E-05
	Formaldehyde	HAP	50000	2.05E-02	1.54E-01	3.85E-02
	Methanol	HAP	67561	3.06E-03	2.30E-02	5.75E-03
	Naphthalene	HAP (POM)	91203	9.71E-05	7.30E-04	1.83E-04
	PAH	HAP (POM)	various	1.41E-04	1.06E-03	2.65E-04
	Styrene	HAP	100425	1.19E-05	8.95E-05	2.24E-05
	Toluene	HAP	108883	5.58E-04	4.20E-03	1.05E-03
	Vinyl Chloride	HAP	75014	7.18E-06	5.40E-05	1.35E-05
	Xylenes	HAP	1330207	1.95E-04	1.47E-03	3.67E-04
3	Total POMs	HAP	00017	2.38E-04	1.79E-03	4.48E-04
	Total HAPs				2.44E-01	6.09E-02

1 AP-42 emission factors are based on natural gas and LPG, AP-42 Chapter 3.2 Natural Gas-fired Reciprocating Engines, Table 3.2-3 (4-Stroke Rich-Burn Engines), July 2000.
2 N2O emission factors from 40 CFR 98 Subpart C, Table C-2, (N2O = 1.0 x 10^-4 kg N2O/MMBtu), November 29, 2013.
3 Individual polycyclic organic matter (POMs) are listed separately, but only counted in the Total HAPs as Total POMs. POMs include polycyclic aromatic hydrocarbon compounds (PAHs).

Waupaca AD1
Maximum Theoretical Emissions Calculations

Backup Generator 2 Maximum Theoretical Emissions

Assumptions:	
Rated Capacity, kW	750
Brake Horsepower, bhp	1,114
Natural Gas Rated Capacity, MMBtu/hr	7.5
Hours of Operation	500
Fuel	Natural Gas
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
Btu/MMBtu	1,000,000
hr/yr	8,760

	Pollutant	EPA Pollutant Type	CAS Number	AP-42 Emission Factors[1] (lb/MMBtu)	Natural Gas Hourly Emissions (lb/hr)	Natural Gas Annual Emissions (TPY)
	Criteria Pollutants					
	NO_X	criteria	NA	2.27	17.1	4.27
	CO	criteria	NA	3.72	28.0	6.99
	PM	criteria	NA	0.0194	0.146	0.0365
	PM10	criteria	NA	0.0194	0.146	0.0365
	PM2.5	criteria	NA	0.0194	0.146	0.0365
	SO_2	criteria	NA	5.88E-04	4.42E-03	1.11E-03
	VOC	criteria	NA	0.0296	0.223	0.0556
	Greenhouse Gases					
	CO_2e	GHG	NA	115.8	871	217.70
	CO_2	GHG	NA	110.0	827	206.77
	CH4	GHG	NA	0.230	1.73	0.432
2	N2O	GHG	NA	2.20E-04	1.66E-03	4.14E-04
	Hazardous Air Pollutants					
	1,1,2,2-Tetrachloroethane	HAP	79345	2.53E-05	1.90E-04	4.76E-05
	1,1,2-Trichloroethane	HAP	79005	1.53E-05	1.15E-04	2.88E-05
	1,3-Butadiene	HAP	106990	6.63E-04	4.98E-03	1.25E-03
	1,3-Dichloropropene	HAP	542756	1.27E-05	9.55E-05	2.39E-05
	Acetaldehyde	HAP	75070	2.79E-03	2.10E-02	5.24E-03
	Acrolein	HAP	107028	2.63E-03	1.98E-02	4.94E-03
	Benzene	HAP	71432	1.58E-03	1.19E-02	2.97E-03
	Carbon Tetrachloride	HAP	56235	1.77E-05	1.33E-04	3.33E-05
	Chlorobenzene	HAP	108907	1.29E-05	9.70E-05	2.42E-05
	Chloroform	HAP	67663	1.37E-05	1.03E-04	2.58E-05
	Dichloromethane (methylene chloride)	HAP	75092	4.12E-05	3.10E-04	7.74E-05
	Ethyl benzene	HAP	100414	2.48E-05	1.86E-04	4.66E-05
	Ethylene Dibromide	HAP	106934	2.13E-05	1.60E-04	4.00E-05
	Formaldehyde	HAP	50000	2.05E-02	1.54E-01	3.85E-02
	Methanol	HAP	67561	3.06E-03	2.30E-02	5.75E-03
	Naphthalene	HAP (POM)	91203	9.71E-05	7.30E-04	1.83E-04
	PAH	HAP (POM)	various	1.41E-04	1.06E-03	2.65E-04
	Styrene	HAP	100425	1.19E-05	8.95E-05	2.24E-05
	Toluene	HAP	108883	5.58E-04	4.20E-03	1.05E-03
	Vinyl Chloride	HAP	75014	7.18E-06	5.40E-05	1.35E-05
	Xylenes	HAP	1330207	1.95E-04	1.47E-03	3.67E-04
3	Total POMs	HAP	00017	2.38E-04	1.79E-03	4.48E-04
	Total HAPs				2.44E-01	6.09E-02

1 AP-42 emission factors are based on natural gas and LPG, AP-42 Chapter 3.2 Natural Gas-fired Reciprocating Engines, Table 3.2-3 (4-Stroke Rich-Burn Engines), July 2000.
2 N2O emission factors from 40 CFR 98 Subpart C, Table C-2, (N2O = 1.0 x 10^-4 kg N2O/MMBtu), November 29, 2013.
3 Individual polycyclic organic matter (POMs) are listed separately, but only counted in the Total HAPs as Total POMs. POMs include polycyclic aromatic hydrocarbon compounds (PAHs).

Fire Pump Maximum Theoretical Emissions

Assumptions:	
Rated Capacity, Horsepower (HP)	106
Diesel Fuel Consumption Rate, gal/hr	3.2
Rated Capacity, MMBtu/hr	0.44
Fuel Sulfur Content (%)	0.0015
Hours of Operation	500
Diesel Average Heating Value (Btu/lb) [4]	19,300
Diesel Density (lb/gal) [4]	7.1
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
lb/g	0.002204
kW to HP	1.34
Btu/MMBtu	1,000,000
hr/yr	8,760

Pollutant	EPA Pollutant Type	CAS Number	Emission Factors[1,2,3] (lb/MMBtu)	Hourly Emissions (lb/hr)	Annual Emissions (TPY)
Criteria Pollutants					
NO_X	criteria	NA	4.41	1.93	0.483
CO	criteria	NA	0.95	0.417	0.104
PM	criteria	NA	0.31	0.136	0.0340
PM10	criteria	NA	0.31	0.136	0.0340
PM2.5	criteria	NA	0.31	0.136	0.0340
SO_2	criteria	NA	1.52E-03	6.64E-04	1.66E-04
VOC	criteria	NA	0.350	0.153	0.0384
Greenhouse Gases					
CO_2e	GHG	NA	163.1	71.5	17.9
CO_2	GHG	NA	6.61E-03	2.90E-03	7.25E-04
CH4	GHG	NA	1.32E-03	5.80E-04	1.45E-04
N2O	GHG	NA	---	71.7	17.9
Hazardous Air Pollutants					
1,3-Butadiene	HAP	106990	3.91E-05	1.71E-05	4.29E-06
Acenaphthene	HAP (POM)	83329	1.42E-06	6.23E-07	1.56E-07
Acenaphthylene	HAP (POM)	208968	5.06E-06	2.22E-06	5.55E-07
Acetaldehyde	HAP	75070	7.67E-04	3.36E-04	8.41E-05
Acrolein	HAP	107028	9.25E-05	4.06E-05	1.01E-05
Anthracene	HAP (POM)	120127	1.87E-06	8.20E-07	2.05E-07
Benzene	HAP	71432	9.33E-04	4.09E-04	1.02E-04
Benzo(a)anthracene	HAP (POM)	56553	1.68E-06	7.37E-07	1.84E-07
Benzo(a)pyrene	HAP (POM)	50328	1.88E-07	8.24E-08	2.06E-08
Benzo(b)fluoranthene	HAP (POM)	205992	9.91E-08	4.35E-08	1.09E-08
Benzo(g,h,i)perylene	HAP (POM)	191242	4.89E-07	2.14E-07	5.36E-08
Benzo(k)fluoranthene	HAP (POM)	207089	1.55E-07	6.80E-08	1.70E-08
Chrysene	HAP (POM)	218019	3.53E-07	1.55E-07	3.87E-08
Dibenzo(a,h)anthracene	HAP (POM)	53703	5.83E-07	2.56E-07	6.39E-08
Fluoranthene	HAP (POM)	206440	7.61E-06	3.34E-06	8.34E-07
Fluorene	HAP (POM)	86737	2.92E-05	1.28E-05	3.20E-06
Formaldehyde	HAP	50000	1.18E-03	5.17E-04	1.29E-04
Indeno(1,2,3-cd)pyrene	HAP (POM)	193395	3.75E-07	1.64E-07	4.11E-08
Naphthalene	HAP (POM)	91203	8.48E-05	3.72E-05	9.30E-06
Phenanthrene	HAP (POM)	85018	2.94E-05	1.29E-05	3.22E-06
Pyrene	HAP (POM)	129000	4.78E-06	2.10E-06	5.24E-07
Toluene	HAP	108883	4.09E-04	1.79E-04	4.48E-05
Xylenes	HAP	1330207	2.85E-04	1.25E-04	3.12E-05
Total POM [3]	HAP	00017	1.68E-04	7.37E-05	1.84E-05
Total HAPs				1.70E-03	4.25E-04

1 Emission factors for NOx, CO, PM, PM10, PM2.5, and VOC are based on diesel fuel, AP-42 Chapter 3.3 Gasoline And Diesel Industrial Engines, Tables 3.3-1 and 3.3-2, October 1996. Non-methane hydrocarbons are assumed to equal total hydrocarbons. PM, PM10, and PM2.5 are assumed to be equivalent. SO2 emission factor based on diesel fuel, AP-42 Chapter 3.4 Large Stationary Diesel And All Stationary Dual-fuel Engines, Table 3.4-1, October 1996.

2 Individual polycyclic organic matter (POM) are listed separately, but only counted in the Total HAPs as Total POM. POM include polycyclic aromatic hydrocarbon compounds (PAHs).

3 Greenhouse Gas (GHG) emission factors based on 40 CFR pt. 98, Table C-1 and C-2. Assume Distillate Fuel Oil No. 2 factors for diesel.

ORA Building and Hydrolysis Tanks Maximum Theoretical Emissions

Exhaust Stream Data from System Specification Sheets

Exhaust Stream	ORA Building (Process Area)		ORA Building (Non-Process Area)	Hydrolysis Tanks	
Description	ColdOX System Inlet	ColdOX System Outlet	Rooftop Unit Exhaust	DEO Unit Inlet	DEO Unit Outlet
Volumetric Flow (ft^3/h)	3,023,392	3,023,392	51,240	31,255	31,255
Volumetric Flow (m^3/h)	85,613	85,613	1,452	855	855
Hazardous Air Contaminants					
Average NH_3 (ppm)	9	1	5	87	4
Average NH_3 (mg/m^3)	6	1	4	61	3
Total NH_3 (mg/h)	547,444	54,744	5,084	54,022	2,701
Total NH_3 (g/h)	547	55	5	54	3
Average H_2S (ppm)	8	1	5	53	3
Average H_2S (mg/m3)	11	1	7	75	4
Total H_2S (mg/h)	926,888	92,689	10,167	66,045	3,302
Total H_2S (g/h)	927	93	10	66	3
NH_3 (lb/hr) [1]	1.21	*0.121*	0.0112	0.119	*0.00595*
NH_3 (tpy) [1]	5.29	*0.529*	0.0491	0.522	*0.0261*
H_2S (lb/hr) [2]	2.04	*0.204*	0.0224	0.146	*0.00728*
H_2S (tpy) [2]	8.95	*0.895*	0.0982	0.638	*0.0319*
NH_3 Removal Efficiency (%)	90		N/A	95	
H_2S Removal Efficiency (%)	90		N/A	95	
Criteria Pollutants					
NO_X (lb/hr) [3]	---	---	---	---	0.127
NO_X (tpy)	---	---	---	---	0.558
SO_2 (lb/hr) [4]	---	---	---	---	0.274
SO_2 (tpy)	---	---	---	---	1.20

[1] As a worst-case assumption, NH_3 emissions are calculated assuming 0% removal by the odor control system

[2] As a worst-case assumption, H_2S emissions are calculated assuming 0% removal by the odor control system

Note: The ColdOx system is a low temperature air treatment, so it will not create NO_X, but mainly convert NH_3 and H_2S to ammonium sulfate salt and similar compounds, which are water soluble. The DEO system uses elevated temperature and oxygen to destroy H_2S, forming some NO_X and SO_2 in the process.

[3] Emissions of NO_X estimated assuming that all NH_3 is converted to NO_2 by the DEO odor control system

$4NH_3 + 7O_2 \rightarrow 4NO_2 + 6H_2O$

NH_3 Molecular Weight (lb/lbmol) 43.03

NO_2 Molecular Weight (lb/lbmol) 46.01

Mass emission rate of NO2 - Example Calculation: (0.12 lb NH3/hr) * (1 lbmol NH3/43.03 lb H2S) * (4 lbmol NH3/4 lbmol NO2) * (46.01 lb NO2/lbmol NO2) = 0.13 lb NO2/hr

[4] Emissions of SO_2 estimated assuming that all H_2S is converted to SO_2 by the DEO odor control system

$2H_2S + 3O_2 \rightarrow 2SO_2 + 2H_2O$

H_2S Molecular Weight (lb/lbmol) 34.10

SO_2 Molecular Weight (lb/lbmol) 64.07

Mass emission rate of SO2 - Example Calculation: (0.15 lb H2S/hr) * (1 lbmol H2S/34.10 lb H2S) * (2 lbmol H2S/2 lbmol SO2) * (64.07 lb SO2/lbmol SO2) = 0.27 lb SO2/hr

Waupaca AD1
Maximum Theoretical Emissions Calculations

Comparison of Hazardous Air Contaminant (HAC) Maximum Theoretical Emissions to the HAC Emission Rates in Table A of NR 445.07

Hazardous Air Contaminant[1]	MTE (lb/hr)	MTE (lb/yr)	Theshold[2]	Theshold Units
Benz(a)anthracene (56-55-3)	8.91E-07	1.72E-03	16.2	lb/yr
Benzo(a)pyrene (50-32-8)	1.85E-07	9.44E-04	1.62	lb/yr
Benzo(b)fluoranthene (205-99-2)	1.98E-07	1.38E-03	2.43	lb/yr
Benzo(k)fluoranthene (207-08-9)	2.23E-07	1.39E-03	2.43	lb/yr
Dibenzo(a,h)anthracene (53-70-3)	3.59E-07	1.03E-03	1.48	lb/yr
Indeno(1,2,3-cd)pyrene (193-39-5)	3.19E-07	1.44E-03	16.2	lb/yr
Naphthalene (91-20-3)	1.55E-03	1.21E+00	2.82	lb/hr
Arsenic (7440-38-2)	1.72E-05	1.50E-01	0.43	lb/yr
Benzene (71-43-2)	2.43E-02	1.37E+01	228	lb/yr
Beryllium (7440-41-7)	1.03E-06	9.03E-03	0.74	lb/yr
Cadmium (7440-43-9)	9.45E-05	8.27E-01	0.987	lb/yr
Chromium (7440-47-3)	1.20E-04	1.05E+00	0.0269	lb/hr
Cobalt (7440-48-4)	7.21E-06	6.32E-02	0.00107	lb/hr
1,4-Dichlorobenzene (106-46-7)	1.03E-04	9.03E-01	162	lb/yr
Formaldehyde (50-00-0)	3.15E-01	2.11E+02	137	lb/yr
n-Hexane (110-54-3)	1.55E-01	1.35E+03	35,538/ 9.47	lb/yr/ lb/hr
Manganese (7439-96-5)	3.26E-05	2.86E-01	0.0107	lb/hr
Mercury (7439-97-6)	2.23E-05	1.96E-01	0.000537	lb/hr
Nickel (7440-02-0)	1.80E-04	1.58E+00	6.83	lb/yr
Selenium (7782-49-2)	2.06E-06	1.81E-02	0.0107	lb/hr
Ammonia (7664-41-7)[4]	1.51E+00	1.32E+04	17,769/ 0.935	lb/yr/ lb/hr
Hydrogen Sulfide[3,4] (7783-06-4)	5.61E+00	4.91E+04	N/A[4]	

[1] Only pollutants listed in Table A of NR 445.07 are included

[2] Most stringent threshold listed in Table A of NR 445.07

[3] It is expected that most of the H_2S is converted to SO_2 in the flare, this H_2S emission rate conservatively assumes that no H_2S is converted to SO_2

[4] Hydrogen sulfide and ammonia emissions are from agricultural waste and are exempt from the requirements of NR 445.08 as specified at NR 445.08(6)(d).

Waupaca AD1
Potential to Emit Calculations

Potential to Emit Summary

	Hourly Emission Rate Summary										
Emission Source (Unit ID Number)	P01	P02	B01	B02	P03	P04	P05	P06	P07	P08	Facility Total
Stack (Stack ID Number)	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	
Emission Source Description	Flare	CO_2 Removal System	Boiler 1	Boiler 2	Back-up Generator 1	Back-up Generator 2	Fire Pump Engine	ORA Process Area Exhaust	ORA Non-Process Area Exhaust	Hydrolysis Tanks	
Pollutant	Potential to Emit (lb/hr)	Potential to Emit (lb/hr)	Potential to Emit (lb/hr)	Potential to Emit (lb/hr)	Potential to Emit (lb/hr)	Potential to Emit (lb/hr)	Potential to Emit (lb/hr)	Potential to Emit (lb/hr)	Potential to Emit (lb/hr)	Potential to Emit (lb/hr)	Potential to Emit (lb/hr)
Criteria Pollutants											
NO_x	3.04E+00	—	1.96E-01	1.96E-01	1.71E+01	1.71E+01	1.93E+00	—	—	1.27E-01	**3.96E+01**
CO	3.59E+00	—	3.29E-01	3.29E-01	2.80E+01	2.80E+01	4.17E-01	—	—	—	**6.06E+01**
PM	5.93E-01	—	2.98E-02	2.98E-02	1.46E-01	1.46E-01	1.36E-01	—	—	—	**1.08E+00**
PM_{10}	5.93E-01	—	2.98E-02	2.98E-02	1.46E-01	1.46E-01	1.36E-01	—	—	—	**1.08E+00**
$PM_{2.5}$	5.93E-01	—	2.98E-02	2.98E-02	1.46E-01	1.46E-01	1.36E-01	—	—	—	**1.08E+00**
SO_2	6.38E+00	—	2.35E-03	2.35E-03	4.42E-03	4.42E-03	6.64E-04	—	—	2.74E-01	**6.67E+00**
VOC	4.29E-01	8.67E-01	2.16E-02	2.16E-02	2.23E-01	2.23E-01	1.53E-01	—	—	—	**1.94E+00**
Lead	3.90E-05	—	1.96E-06	1.96E-06	—	—	—	—	—	—	**4.29E-05**
Greenhouse Gases											
CO_2	9.31E+03	4.35E+03	4.30E+02	4.30E+02	8.27E+02	8.27E+02	7.15E+01	—	—	—	**1.62E+04**
CH_4	1.75E-01	—	8.10E-03	8.10E-03	1.73E+00	1.73E+00	2.90E-03	—	—	—	**3.65E+00**
N_2O	1.75E-02	—	8.10E-04	8.10E-04	1.66E-03	1.66E-03	5.80E-04	—	—	—	**2.31E-02**
CO_2e	9.32E+03	4.35E+03	4.30E+02	4.30E+02	8.71E+02	8.71E+02	7.17E+01	—	—	—	**1.63E+04**
Hazardous Air Pollutants											
Benzene (71-43-2)	1.64E-04	—	8.24E-06	8.24E-06	1.19E-02	1.19E-02	4.09E-04	—	—	—	**2.43E-02**
1,4-Dichlorobenzene (106-46-7)	9.36E-05	—	4.71E-06	4.71E-06	—	—	—	—	—	—	**1.03E-04**
Formaldehyde (50-00-0)	5.85E-03	—	2.94E-04	2.94E-04	1.54E-01	1.54E-01	5.17E-04	—	—	—	**3.15E-01**
n-Hexane (110-54-3)	1.40E-01	—	7.06E-03	7.06E-03	—	—	—	—	—	—	**1.55E-01**
Toluene (108-88-3)	2.65E-04	—	1.33E-05	1.33E-05	4.20E-03	4.20E-03	1.79E-04	—	—	—	**8.86E-03**
Polycyclic Organic Matter (POM)	5.45E-05	—	2.74E-06	2.74E-06	1.79E-03	1.79E-03	7.37E-05	—	—	—	**3.71E-03**
Naphthalene (91-20-3) [1]	4.76E-05	—	2.39E-06	2.39E-06	7.30E-04	7.30E-04	3.72E-05	—	—	—	**1.55E-03**
1,1,2,2-Tetrachloroethane (79-34-5)	—	—	—	—	1.90E-04	1.90E-04	—	—	—	—	**3.80E-04**
1,1,2-Trichloroethane (79-00-5)	—	—	—	—	1.15E-04	1.15E-04	—	—	—	—	**2.30E-04**
1,3-Butadiene (106-99-0)	—	—	—	—	4.98E-03	4.98E-03	1.71E-05	—	—	—	**9.99E-03**
1,3-Dichloropropene (542-75-6)	—	—	—	—	9.55E-05	9.55E-05	—	—	—	—	**1.91E-04**
Acetaldehyde (75-07-0)	—	—	—	—	2.10E-02	2.10E-02	—	—	—	—	**4.20E-02**
Acrolein (107-02-8)	—	—	—	—	1.98E-02	1.98E-02	—	—	—	—	**3.95E-02**
Carbon Tetrachloride (56-23-5)	—	—	—	—	1.33E-04	1.33E-04	—	—	—	—	**2.66E-04**
Chlorobenzene (108-90-7)	—	—	—	—	9.70E-05	9.70E-05	—	—	—	—	**1.94E-04**
Chloroform (67-66-3)	—	—	—	—	1.03E-04	1.03E-04	—	—	—	—	**2.06E-04**
Dichloromethane (methylene chloride) (75-09-2)	—	—	—	—	3.10E-04	3.10E-04	—	—	—	—	**6.20E-04**
Ethyl benzene (100-41-4)	—	—	—	—	1.86E-04	1.86E-04	—	—	—	—	**3.73E-04**
Ethylene Dibromide (106-93-4)	—	—	—	—	1.60E-04	1.60E-04	—	—	—	—	**3.20E-04**
Methanol (67-56-1)	—	—	—	—	2.30E-02	2.30E-02	—	—	—	—	**4.60E-02**
Styrene (100-42-5)	—	—	—	—	8.95E-05	8.95E-05	—	—	—	—	**1.79E-04**
Vinyl Chloride (75-01-4)	—	—	—	—	4.20E-03	4.20E-03	—	—	—	—	**8.39E-03**
Xylenes (1330-20-7)	—	—	—	—	5.40E-05	5.40E-05	—	—	—	—	**1.08E-04**
Arsenic (7440-38-2)	1.56E-05	—	7.84E-07	7.84E-07	—	—	—	—	—	—	**1.72E-05**
Beryllium (7440-41-7)	9.36E-07	—	4.71E-08	4.71E-08	—	—	—	—	—	—	**1.03E-06**
Cadmium (7440-43-9)	8.58E-05	—	4.31E-06	4.31E-06	—	—	—	—	—	—	**9.45E-05**
Chromium (7440-47-3)	1.09E-04	—	5.49E-06	5.49E-06	—	—	—	—	—	—	**1.20E-04**
Cobalt (7440-48-4)	6.55E-06	—	3.29E-07	3.29E-07	—	—	—	—	—	—	**7.21E-06**
Lead (7439-92-1)	3.90E-05	—	1.96E-06	1.96E-06	—	—	—	—	—	—	**4.29E-05**
Manganese (7439-96-5)	2.97E-05	—	1.49E-06	1.49E-06	—	—	—	—	—	—	**3.26E-05**
Mercury (7439-97-6)	2.03E-05	—	1.02E-06	1.02E-06	—	—	—	—	—	—	**2.23E-05**
Nickel (7440-02-0)	1.64E-04	—	8.24E-06	8.24E-06	—	—	—	—	—	—	**1.80E-04**
Selenium (7782-49-2)	1.87E-06	—	9.41E-08	9.41E-08	—	—	—	—	—	—	**2.06E-06**
Total HAPs	1.47E-01	—	7.41E-03	7.41E-03	2.44E-01	2.44E-01	1.70E-03	—	—	—	**6.51E-01**
Hazardous Air Contaminants											
Benz(a)anthracene (56-55-3)	1.40E-07	—	7.06E-09	7.06E-09	—	—	7.37E-07	—	—	—	**8.91E-07**
Benzo(a)pyrene (50-32-8)	9.36E-08	—	4.71E-09	4.71E-09	—	—	8.24E-08	—	—	—	**1.85E-07**
Benzo(b)fluoranthene (205-99-2)	1.40E-07	—	7.06E-09	7.06E-09	—	—	4.35E-08	—	—	—	**1.98E-07**
Benzo(k)fluoranthene (207-08-9)	1.40E-07	—	7.06E-09	7.06E-09	—	—	6.80E-08	—	—	—	**2.23E-07**
Dibenzo(a,h)anthracene (53-70-3)	9.36E-08	—	4.71E-09	4.71E-09	—	—	2.56E-07	—	—	—	**3.59E-07**
Indeno(1,2,3-cd)pyrene (193-39-5)	1.40E-07	—	7.06E-09	7.06E-09	—	—	1.64E-07	—	—	—	**3.19E-07**
Ammonia (7664-41-7) [2]	1.71E-01	—	—	—	—	—	—	1.21E+00	1.12E-02	1.19E-01	**1.51E+00**
Hydrogen Sulfide (7783-06-4) [2]	3.40E+00	—	—	—	—	—	—	2.04E+00	2.24E-02	1.46E-01	**5.61E+00**

[1] Naphthalene is also included in polycyclic organic matter total. Hazardous air pollutants total does not double-count naphthalene emissions

[2] Hydrogen sulfide and ammonia emissions are from agricultural waste and are exempt from the requirements of NR 445.08 as specified at NR 445.08(6)(d).

Waupaca AD1
Potential to Emit Calculations

Potential to Emit Summary

	Annual Emissions Summary										
Emission Source (Unit ID Number)	**P01**	**P02**	**B01**	**B02**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**Facility Total**
Stack (Stack ID Number)	**S01**	**S02**	**S03**	**S04**	**S05**	**S06**	**S07**	**S08**	**S09**	**S10**	
Emission Source Description	**Flare**	**CO_2 Removal System**	**Boiler 1**	**Boiler 2**	**Back-up Generator 1**	**Back-up Generator 2**	**Fire Pump Engine**	**ORA Process Area Exhaust**	**ORA Non-Process Area Exhaust**	**Hydrolysis Tanks**	
Pollutant	**Potential to Emit (lbs/year)**	**Potential to Emit (lbs/year)**	**Potential to Emit (lbs/year)**	**Potential to Emit (lbs/year)**	**Potential to Emit (lbs/year)**	**Potential to Emit (lbs/year)**	**Potential to Emit (lbs/year)**	**Potential to Emit (lbs/year)**	**Potential to Emit (lbs/year)**	**Potential to Emit (lbs/year)**	**Potential to Emit (lbs/year)**
Criteria Pollutants											
NO_x	2.67E+04	—	1.72E+03	1.72E+03	8.53E+03	8.53E+03	9.67E+02	—	—	1.12E+03	**4.92E+04**
CO	3.14E+04	—	2.89E+03	2.89E+03	1.40E+04	1.40E+04	2.08E+02	—	—	—	**6.54E+04**
PM	5.19E+03	—	2.61E+02	2.61E+02	7.30E+01	7.30E+01	6.80E+01	—	—	—	**5.93E+03**
PM_{10}	5.19E+03	—	2.61E+02	2.61E+02	7.30E+01	7.30E+01	6.80E+01	—	—	—	**5.93E+03**
$PM_{2.5}$	5.19E+03	—	2.61E+02	2.61E+02	7.30E+01	7.30E+01	6.80E+01	—	—	—	**5.93E+03**
SO_2	5.59E+04	—	2.06E+01	2.06E+01	2.21E+00	2.21E+00	3.32E-01	—	—	2.40E+03	**5.83E+04**
VOC	3.76E+03	3.11E+03	1.89E+02	1.89E+02	1.11E+02	1.11E+02	7.67E+01	—	—	—	**7.54E+03**
Lead	3.42E-01	—	1.72E-02	1.72E-02	—	—	—	—	—	—	**3.76E-01**
Greenhouse Gases											
CO_2	8.16E+07	1.50E+07	3.76E+06	3.76E+06	4.14E+05	4.14E+05	3.57E+04	—	—	—	**1.05E+08**
CH_4	1.54E+03	—	7.10E+01	7.10E+01	8.65E+02	8.65E+02	1.45E+00	—	—	—	**3.41E+03**
N_2O	1.54E+02	—	7.10E+00	7.10E+00	8.29E-01	8.29E-01	2.90E-01	—	—	—	**1.70E+02**
CO_2e	8.16E+07	1.50E+07	3.77E+06	3.77E+06	4.35E+05	4.35E+05	3.59E+04	—	—	—	**1.05E+08**
Hazardous Air Pollutants											
Benzene (71-43-2)	1.44E+00	—	7.21E-02	7.21E-02	5.94E+00	5.94E+00	2.05E-01	—	—	—	**1.37E+01**
1,4-Dichlorobenzene (106-46-7)	8.20E-01	—	4.12E-02	4.12E-02	—	—	—	—	—	—	**9.03E-01**
Formaldehyde (50-00-0)	5.13E+01	—	2.58E+00	2.58E+00	7.71E+01	7.71E+01	2.59E-01	—	—	—	**2.11E+02**
n-Hexane (110-54-3)	1.23E+03	—	6.18E+01	6.18E+01	—	—	—	—	—	—	**1.35E+03**
Toluene (108-88-3)	2.32E+00	—	1.17E-01	1.17E-01	2.10E+00	2.10E+00	8.97E-02	—	—	—	**6.84E+00**
Polycyclic Organic Matter (POM)	4.77E-01	—	2.40E-02	2.40E-02	8.95E-01	8.95E-01	3.68E-02	—	—	—	**2.35E+00**
Naphthalene (91-20-3) [1]	4.17E-01	—	2.10E-02	2.10E-02	3.65E-01	3.65E-01	1.86E-02	—	—	—	**1.21E+00**
1,1,2,2-Tetrachloroethane (79-34-5)	—	—	—	—	9.51E-02	9.51E-02	—	—	—	—	**1.90E-01**
1,1,2-Trichloroethane (79-00-5)	—	—	—	—	5.75E-02	5.75E-02	—	—	—	—	**1.15E-01**
1,3-Butadiene (106-99-0)	—	—	—	—	2.49E+00	2.49E+00	8.57E-03	—	—	—	**4.99E+00**
1,3-Dichloropropene (542-75-6)	—	—	—	—	4.77E-02	4.77E-02	—	—	—	—	**9.55E-02**
Acetaldehyde (75-07-0)	—	—	—	—	1.05E+01	1.05E+01	—	—	—	—	**2.10E+01**
Acrolein (107-02-8)	—	—	—	—	9.89E+00	9.89E+00	—	—	—	—	**1.98E+01**
Carbon Tetrachloride (56-23-5)	—	—	—	—	6.65E-02	6.65E-02	—	—	—	—	**1.33E-01**
Chlorobenzene (108-90-7)	—	—	—	—	4.85E-02	4.85E-02	—	—	—	—	**9.70E-02**
Chloroform (67-66-3)	—	—	—	—	5.15E-02	5.15E-02	—	—	—	—	**1.03E-01**
Dichloromethane (methylene chloride) (75-09-2)	—	—	—	—	1.55E-01	1.55E-01	—	—	—	—	**3.10E-01**
Ethyl benzene (100-41-4)	—	—	—	—	9.32E-02	9.32E-02	—	—	—	—	**1.86E-01**
Ethylene Dibromide (106-93-4)	—	—	—	—	8.01E-02	8.01E-02	—	—	—	—	**1.60E-01**
Methanol (67-56-1)	—	—	—	—	1.15E+01	1.15E+01	—	—	—	—	**2.30E+01**
Styrene (100-42-5)	—	—	—	—	4.47E-02	4.47E-02	—	—	—	—	**8.95E-02**
Vinyl Chloride (75-01-4)	—	—	—	—	2.10E+00	2.10E+00	—	—	—	—	**4.20E+00**
Xylenes (1330-20-7)	—	—	—	—	2.70E-02	2.70E-02	—	—	—	—	**5.40E-02**
Arsenic (7440-38-2)	1.37E-01	—	6.87E-03	6.87E-03	—	—	—	—	—	—	**1.50E-01**
Beryllium (7440-41-7)	8.20E-03	—	4.12E-04	4.12E-04	—	—	—	—	—	—	**9.03E-03**
Cadmium (7440-43-9)	7.52E-01	—	3.78E-02	3.78E-02	—	—	—	—	—	—	**8.27E-01**
Chromium (7440-47-3)	9.57E-01	—	4.81E-02	4.81E-02	—	—	—	—	—	—	**1.05E+00**
Cobalt (7440-48-4)	5.74E-02	—	2.89E-03	2.89E-03	—	—	—	—	—	—	**6.32E-02**
Lead (7439-92-1)	3.42E-01	—	1.72E-02	1.72E-02	—	—	—	—	—	—	**3.76E-01**
Manganese (7439-96-5)	2.60E-01	—	1.31E-02	1.31E-02	—	—	—	—	—	—	**2.86E-01**
Mercury (7439-97-6)	1.78E-01	—	8.93E-03	8.93E-03	—	—	—	—	—	—	**1.96E-01**
Nickel (7440-02-0)	1.44E+00	—	7.21E-02	7.21E-02	—	—	—	—	—	—	**1.58E+00**
Selenium (7782-49-2)	1.64E-02	—	8.24E-04	8.24E-04	—	—	—	—	—	—	**1.81E-02**
Total HAPs	1.29E+03	—	6.49E+01	6.49E+01	1.22E+02	1.22E+02	8.49E-01	—	—	—	**1.67E+03**
Hazardous Air Contaminants											
Benz(a)anthracene (56-55-3)	1.23E-03	—	6.18E-05	6.18E-05	—	—	3.68E-04	—	—	—	**1.72E-03**
Benzo(a)pyrene (50-32-8)	8.20E-04	—	4.12E-05	4.12E-05	—	—	4.12E-05	—	—	—	**9.44E-04**
Benzo(b)fluoranthene (205-99-2)	1.23E-03	—	6.18E-05	6.18E-05	—	—	2.17E-05	—	—	—	**1.38E-03**
Benzo(k)fluoranthene (207-08-9)	1.23E-03	—	6.18E-05	6.18E-05	—	—	3.40E-05	—	—	—	**1.39E-03**
Dibenzo(a,h)anthracene (53-70-3)	8.20E-04	—	4.12E-05	4.12E-05	—	—	1.28E-04	—	—	—	**1.03E-03**
Indeno(1,2,3-cd)pyrene (193-39-5)	1.23E-03	—	6.18E-05	6.18E-05	—	—	8.22E-05	—	—	—	**1.44E-03**
Ammonia (7664-41-7) [2]	1.50E+03	—	—	—	—	—	—	1.06E+04	9.82E+01	1.04E+03	**1.32E+04**
Hydrogen Sulfide (7783-06-4) [2]	2.97E+04	—	—	—	—	—	—	1.79E+04	1.96E+02	1.28E+03	**4.91E+04**

Potential to Emit Summary

	Annual Emissions Summary (continued)										
Emission Source (Unit ID Number)	**P01**	**P02**	**B01**	**B02**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**Facility Total**
Stack (Stack ID Number)	**S01**	**S02**	**S03**	**S04**	**S05**	**S06**	**S07**	**S08**	**S09**	**S10**	
Emission Source Description	**Flare**	**CO_2 Removal System**	**Boiler 1**	**Boiler 2**	**Back-up Generator 1**	**Back-up Generator 2**	**Fire Pump Engine**	**ORA Process Area Exhaust**	**ORA Non-Process Area Exhaust**	**Hydrolysis Tanks**	
Pollutant	**Potential to Emit (tons/year)**	**Potential to Emit (tons/year)**	**Potential to Emit (tons/year)**	**Potential to Emit (tons/year)**	**Potential to Emit (tons/year)**	**Potential to Emit (tons/year)**	**Potential to Emit (tons/year)**	**Potential to Emit (tons/year)**	**Potential to Emit (tons/year)**	**Potential to Emit (tons/year)**	**Potential to Emit (tons/year)**
Criteria Pollutants											
NO_x	1.33E+01	—	8.59E-01	8.59E-01	4.27E+00	4.27E+00	4.83E-01	—	—	5.58E-01	**2.46E+01**
CO	1.57E+01	—	1.44E+00	1.44E+00	6.99E+00	6.99E+00	1.04E-01	—	—	—	**3.27E+01**
PM	2.60E+00	—	1.31E-01	1.31E-01	3.65E-02	3.65E-02	3.40E-02	—	—	—	**2.97E+00**
PM_{10}	2.60E+00	—	1.31E-01	1.31E-01	3.65E-02	3.65E-02	3.40E-02	—	—	—	**2.97E+00**
$PM_{2.5}$	2.60E+00	—	1.31E-01	1.31E-01	3.65E-02	3.65E-02	3.40E-02	—	—	—	**2.97E+00**
SO_2	2.80E+01	—	1.03E-02	1.03E-02	1.11E-03	1.11E-03	1.66E-04	—	—	1.20E+00	**2.92E+01**
VOC	1.88E+00	1.55E+00	9.45E-02	9.45E-02	5.56E-02	5.56E-02	3.84E-02	—	—	—	**3.77E+00**
Lead	1.71E-04	—	8.59E-06	8.59E-06	—	—	—	—	—	—	**1.88E-04**
Greenhouse Gases											
CO_2	4.08E+04	7.50E+03	1.88E+03	1.88E+03	2.07E+02	2.07E+02	1.79E+01	—	—	—	**5.25E+04**
CH_4	7.69E-01	—	3.55E-02	3.55E-02	4.32E-01	4.32E-01	7.25E-04	—	—	—	**1.70E+00**
N_2O	7.69E-02	—	3.55E-03	3.55E-03	4.14E-04	4.14E-04	1.45E-04	—	—	—	**8.49E-02**
CO_2e	4.08E+04	7.50E+03	1.88E+03	1.88E+03	2.18E+02	2.18E+02	1.79E+01	—	—	—	**5.25E+04**
Hazardous Air Pollutants											
Benzene (71-43-2)	7.18E-04	—	3.61E-05	3.61E-05	2.97E-03	2.97E-03	1.02E-04	—	—	—	**6.83E-03**
1,4-Dichlorobenzene (106-46-7)	4.10E-04	—	2.06E-05	2.06E-05	—	—	—	—	—	—	**4.51E-04**
Formaldehyde (50-00-0)	2.56E-02	—	1.29E-03	1.29E-03	3.85E-02	3.85E-02	1.29E-04	—	—	—	**1.05E-01**
n-Hexane (110-54-3)	6.15E-01	—	3.09E-02	3.09E-02	—	—	—	—	—	—	**6.77E-01**
Toluene (108-88-3)	1.16E-03	—	5.84E-05	5.84E-05	1.05E-03	1.05E-03	4.48E-05	—	—	—	**3.42E-03**
Polycyclic Organic Matter (POM)	2.39E-04	—	1.20E-05	1.20E-05	4.48E-04	4.48E-04	1.84E-05	—	—	—	**1.18E-03**
Naphthalene (91-20-3) [1]	2.08E-04	—	1.05E-05	1.05E-05	1.83E-04	1.83E-04	9.30E-06	—	—	—	**6.04E-04**
1,1,2,2-Tetrachloroethane (79-34-5)	—	—	—	—	4.76E-05	4.76E-05	—	—	—	—	**9.51E-05**
1,1,2-Trichloroethane (79-00-5)	—	—	—	—	2.88E-05	2.88E-05	—	—	—	—	**5.75E-05**
1,3-Butadiene (106-99-0)	—	—	—	—	1.25E-03	1.25E-03	4.29E-06	—	—	—	**2.50E-03**
1,3-Dichloropropene (542-75-6)	—	—	—	—	2.39E-05	2.39E-05	—	—	—	—	**4.77E-05**
Acetaldehyde (75-07-0)	—	—	—	—	5.24E-03	5.24E-03	—	—	—	—	**1.05E-02**
Acrolein (107-02-8)	—	—	—	—	4.94E-03	4.94E-03	—	—	—	—	**9.89E-03**
Carbon Tetrachloride (56-23-5)	—	—	—	—	3.33E-05	3.33E-05	—	—	—	—	**6.65E-05**
Chlorobenzene (108-90-7)	—	—	—	—	2.42E-05	2.42E-05	—	—	—	—	**4.85E-05**
Chloroform (67-66-3)	—	—	—	—	2.58E-05	2.58E-05	—	—	—	—	**5.15E-05**
Dichloromethane (methylene chloride) (75-09-2)	—	—	—	—	7.74E-05	7.74E-05	—	—	—	—	**1.55E-04**
Ethyl benzene (100-41-4)	—	—	—	—	4.66E-05	4.66E-05	—	—	—	—	**9.32E-05**
Ethylene Dibromide (106-93-4)	—	—	—	—	4.00E-05	4.00E-05	—	—	—	—	**8.01E-05**
Methanol (67-56-1)	—	—	—	—	5.75E-03	5.75E-03	—	—	—	—	**1.15E-02**
Styrene (100-42-5)	—	—	—	—	2.24E-05	2.24E-05	—	—	—	—	**4.47E-05**
Vinyl Chloride (75-01-4)	—	—	—	—	1.05E-03	1.05E-03	—	—	—	—	**2.10E-03**
Xylenes (1330-20-7)	—	—	—	—	1.35E-05	1.35E-05	—	—	—	—	**2.70E-05**
Arsenic (7440-38-2)	6.84E-05	—	3.44E-06	3.44E-06	—	—	—	—	—	—	**7.52E-05**
Beryllium (7440-41-7)	4.10E-06	—	2.06E-07	2.06E-07	—	—	—	—	—	—	**4.51E-06**
Cadmium (7440-43-9)	3.76E-04	—	1.89E-05	1.89E-05	—	—	—	—	—	—	**4.14E-04**
Chromium (7440-47-3)	4.78E-04	—	2.40E-05	2.40E-05	—	—	—	—	—	—	**5.27E-04**
Cobalt (7440-48-4)	2.87E-05	—	1.44E-06	1.44E-06	—	—	—	—	—	—	**3.16E-05**
Lead (7439-92-1)	1.71E-04	—	8.59E-06	8.59E-06	—	—	—	—	—	—	**1.88E-04**
Manganese (7439-96-5)	1.30E-04	—	6.53E-06	6.53E-06	—	—	—	—	—	—	**1.43E-04**
Mercury (7439-97-6)	8.89E-05	—	4.47E-06	4.47E-06	—	—	—	—	—	—	**9.78E-05**
Nickel (7440-02-0)	7.18E-04	—	3.61E-05	3.61E-05	—	—	—	—	—	—	**7.90E-04**
Selenium (7782-49-2)	8.20E-06	—	4.12E-07	4.12E-07	—	—	—	—	—	—	**9.03E-06**
Total HAPs	6.45E-01	—	3.24E-02	3.24E-02	6.09E-02	6.09E-02	4.25E-04	—	—	—	**8.33E-01**
Hazardous Air Contaminants											
Benz(a)anthracene (56-55-3)	6.15E-07	—	3.09E-08	3.09E-08	—	—	1.84E-07	—	—	—	**8.61E-07**
Benzo(a)pyrene (50-32-8)	4.10E-07	—	2.06E-08	2.06E-08	—	—	2.06E-08	—	—	—	**4.72E-07**
Benzo(b)fluoranthene (205-99-2)	6.15E-07	—	3.09E-08	3.09E-08	—	—	1.09E-08	—	—	—	**6.88E-07**
Benzo(k)fluoranthene (207-08-9)	6.15E-07	—	3.09E-08	3.09E-08	—	—	1.70E-08	—	—	—	**6.94E-07**
Dibenzo(a,h)anthracene (53-70-3)	4.10E-07	—	2.06E-08	2.06E-08	—	—	6.39E-08	—	—	—	**5.15E-07**
Indeno(1,2,3-cd)pyrene (193-39-5)	6.15E-07	—	3.09E-08	3.09E-08	—	—	4.11E-08	—	—	—	**7.18E-07**
Ammonia (7664-41-7) [2]	7.51E-01	—	—	—	—	—	—	5.29E+00	4.91E-02	5.22E-01	**6.61E+00**
Hydrogen Sulfide (7783-06-4) [2]	1.49E+01	—	—	—	—	—	—	8.95E+00	9.82E-02	6.38E-01	**2.46E+01**

Waupaca AD1
Potential to Emit Calculations

Flare Potential Emissions

Pilot Light Capacity	0.5 cfm	Annual Emergency Flaring Hours	8,760 hours
Flaring Capacity	1300 cfm	Maximum Biogas H2S Content (sent to flare)	500 ppm
Natural Gas Heating Value	1020 Btu/scf		

				Pilot Light		Emergency Flaring		Total	
Pollutant	Emission Factor	Units	Reference	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Criteria Pollutants									
NOx	39	lb/mmscf	[1]	1.17E-03	5.12E-03	3.04E+00	1.33E+01	3.04E+00	1.33E+01
CO	46	lb/mmscf	[1]	1.38E-03	6.04E-03	3.59E+00	1.57E+01	3.59E+00	1.57E+01
PM	7.6	lb/mmscf	[2]	2.28E-04	9.99E-04	5.93E-01	2.60E+00	5.93E-01	2.60E+00
PM_{10}	7.6	lb/mmscf	[2],[3]	2.28E-04	9.99E-04	5.93E-01	2.60E+00	5.93E-01	2.60E+00
$PM_{2.5}$	7.6	lb/mmscf	[2],[3]	2.28E-04	9.99E-04	5.93E-01	2.60E+00	5.93E-01	2.60E+00
SO_2	0.6	lb/mmscf	[2],[6]	1.80E-05	7.88E-05	6.38E+00	2.80E+01	6.38E+00	2.80E+01
VOC	5.5	lb/mmscf	[2]	1.65E-04	7.23E-04	4.29E-01	1.88E+00	4.29E-01	1.88E+00
Lead	5.00E-04	lb/mmscf	[3]	1.50E-08	6.57E-08	3.90E-05	1.71E-04	3.90E-05	1.71E-04
Greenhouse Gases									
CO_2	116.97608	lb/MMBtu	[5],[7]	3.58E+00	1.57E+01	9.31E+03	4.08E+04	9.31E+03	4.08E+04
CH_4	2.20E-03	lb/MMBtu	[5]	6.75E-05	2.95E-04	1.75E-01	7.68E-01	1.75E-01	7.69E-01
N_2O	2.20E-04	lb/MMBtu	[5]	6.75E-06	2.95E-05	1.75E-02	7.68E-02	1.75E-02	7.69E-02
CO_2e	na	na	[5]	3.58E+00	1.57E+01	9.32E+03	4.08E+04	9.32E+03	4.08E+04
Hazardous Air Pollutants									
Benzene (71-43-2)	2.10E-03	lb/mmscf	[4]	6.30E-08	2.76E-07	1.64E-04	7.17E-04	1.64E-04	7.18E-04
1,4-Dichlorobenzene (106-46-7)	1.20E-03	lb/mmscf	[4]	3.60E-08	1.58E-07	9.36E-05	4.10E-04	9.36E-05	4.10E-04
Formaldehyde (50-00-0)	7.50E-02	lb/mmscf	[4]	2.25E-06	9.86E-06	5.85E-03	2.56E-02	5.85E-03	2.56E-02
n-Hexane (110-54-3)	1.80E+00	lb/mmscf	[4]	5.40E-05	2.37E-04	1.40E-01	6.15E-01	1.40E-01	6.15E-01
Toluene (108-88-3)	3.40E-03	lb/mmscf	[4]	1.02E-07	4.47E-07	2.65E-04	1.16E-03	2.65E-04	1.16E-03
Polycyclic Organic Matter (POM)	6.98E-04	lb/mmscf	[4]	2.09E-08	9.17E-08	5.45E-05	2.39E-04	5.45E-05	2.39E-04
2-Methylnaphthalene	*2.40E-05*	*/b/mmscf*	[4]	*7.20E-10*	*3.15E-09*	*1.87E-06*	*8.20E-06*	*1.87E-06*	*8.20E-06*
3-Methylcholanthrene	*1.80E-06*	*/b/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
7,12- Dimethylbenz(a)anthracene	*1.60E-05*	*/b/mmscf*	[4]	*4.80E-10*	*2.10E-09*	*1.25E-06*	*5.47E-06*	*1.25E-06*	*5.47E-06*
Acenaphthene	*1.80E-06*	*/b/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
Acenaphthylene	*1.80E-06*	*/b/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
Anthracene	*2.40E-06*	*/b/mmscf*	[4]	*7.20E-11*	*3.15E-10*	*1.87E-07*	*8.20E-07*	*1.87E-07*	*8.20E-07*
Benz(a)anthracene	*1.80E-06*	*/b/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
Benzo(a)pyrene	*1.20E-06*	*/b/mmscf*	[4]	*3.60E-11*	*1.58E-10*	*9.36E-08*	*4.10E-07*	*9.36E-08*	*4.10E-07*
Benzo(b)fluoranthene	*1.80E-06*	*/b/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
Benzo(g,h,i)perylene	*1.20E-06*	*/b/mmscf*	[4]	*3.60E-11*	*1.58E-10*	*9.36E-08*	*4.10E-07*	*9.36E-08*	*4.10E-07*
Benzo(k)fluoranthene	*1.80E-06*	*/b/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
Chrysene	*1.80E-06*	*/b/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
Dibenzo(a,h)anthracene	*1.20E-06*	*/b/mmscf*	[4]	*3.60E-11*	*1.58E-10*	*9.36E-08*	*4.10E-07*	*9.36E-08*	*4.10E-07*
Fluoranthene	*3.00E-06*	*/b/mmscf*	[4]	*9.00E-11*	*3.94E-10*	*2.34E-07*	*1.02E-06*	*2.34E-07*	*1.03E-06*
Fluorene	*2.80E-06*	*/b/mmscf*	[4]	*8.40E-11*	*3.68E-10*	*2.18E-07*	*9.57E-07*	*2.18E-07*	*9.57E-07*
Indeno(1,2,3-cd)pyrene	*1.80E-06*	*/b/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.15E-07*	*1.40E-07*	*6.15E-07*
Naphthalene (91-20-3)	6.10E-04	lb/mmscf	[4]	*1.83E-08*	*8.02E-08*	*4.76E-05*	*2.08E-04*	*4.76E-05*	*2.08E-04*
Phenanathrene	*1.70E-05*	*/b/mmscf*	[4]	*5.10E-10*	*2.23E-09*	*1.33E-06*	*5.81E-06*	*1.33E-06*	*5.81E-06*
Pyrene	*5.00E-06*	*/b/mmscf*	[4]	*1.50E-10*	*6.57E-10*	*3.90E-07*	*1.71E-06*	*3.90E-07*	*1.71E-06*
Arsenic (7440-38-2)	2.00E-04	lb/mmscf	[4]	6.00E-09	2.63E-08	1.56E-05	6.83E-05	1.56E-05	6.84E-05
Beryllium (7440-41-7)	1.20E-05	lb/mmscf	[4]	3.60E-10	1.58E-09	9.36E-07	4.10E-06	9.36E-07	4.10E-06
Cadmium (7440-43-9)	1.10E-03	lb/mmscf	[4]	3.30E-08	1.45E-07	8.58E-05	3.76E-04	8.58E-05	3.76E-04
Chromium (7440-47-3)	1.40E-03	lb/mmscf	[4]	4.20E-08	1.84E-07	1.09E-04	4.78E-04	1.09E-04	4.78E-04
Cobalt (7440-48-4)	8.40E-05	lb/mmscf	[4]	2.52E-09	1.10E-08	6.55E-06	2.87E-05	6.55E-06	2.87E-05
Lead (7439-92-1)	5.00E-04	lb/mmscf	[3]	1.50E-08	6.57E-08	3.90E-05	1.71E-04	3.90E-05	1.71E-04
Manganese (7439-96-5)	3.80E-04	lb/mmscf	[4]	1.14E-08	4.99E-08	2.96E-05	1.30E-04	2.97E-05	1.30E-04
Mercury (7439-97-6)	2.60E-04	lb/mmscf	[4]	7.80E-09	3.42E-08	2.03E-05	8.88E-05	2.03E-05	8.89E-05
Nickel (7440-02-0)	2.10E-03	lb/mmscf	[4]	6.30E-08	2.76E-07	1.64E-04	7.17E-04	1.64E-04	7.18E-04
Selenium (7782-49-2)	2.40E-05	lb/mmscf	[4]	7.20E-10	3.15E-09	1.87E-06	8.20E-06	1.87E-06	8.20E-06
Total HAPs				5.67E-05	2.48E-04	1.47E-01	6.45E-01	1.47E-01	6.45E-01
Hazardous Air Contaminants									
Ammonia (7664-41-7)			[8]	0.00E+00	0.00E+00	1.71E-01	7.51E-01	1.71E-01	7.51E-01
Hydrogen Sulfide (7783-06-4)			[9]	0.00E+00	0.00E+00	3.40E+00	1.49E+01	3.40E+00	1.49E+01

[1] Draft AP-42, Section 2.4 "Municipal Solid Waste Landfills" (10/08) Table 2.4-4

Flare Potential Emissions

[2] AP-42 Section 1.4 "Natural Gas Combustion" (7/98) Table 1.4-2

[3] Assume PM = PM10 = PM2.5

[4] AP-42 Section 1.4 "Natural Gas Combustion" (7/98) Table 1.4-2

[5] 40 CFR Part 98, Subpart C, Tables C-1 and C-2

CO2e emission rate calculated based on Global Warming Potential (GWP) from Table A-1 to Subpart A of Part 98

GHG Pollutant	GWP	Mass EF (kg/MMBtu)	Mass EF (lb/MMBtu)	
CO2	1	5.31E+01	1.17E+02	Conversion factor:
CH_4	25	1.00E-03	2.20E-03	2.2046 lb/kg
N_2O	298	1.00E-04	2.20E-04	

[6] SO2 from combusting biogas based on H2S content of gas

Flaring can occur prior to H2S removal, after H2S removal, after dehydration/polishing, or after CO2 removal.

Worst case H2S concentration from these three streams is anticipated to be 500 ppm

SO2 emission rate conservatively based on a 500 ppm maximum concentration of hydrogen sulfide in the biogas sent to the flare assuming all hydrogen sulfide is converted to sulfur dioxide.

$2H_2S + 3O_2 \rightarrow 2SO_2 + 2H_2O$

Universal Gas Constant R =	0.08206	L*atm*mol-1*K-1	(	
P=	1	atm		
T =	298	K		
V/n = Molar Volume = RT/P	24.45388	L/g-mole		
Conversion Factor	28.317	L/cf		
Conversion Factor	453.6	g/lb		
Molar emission rate of H2S	9.96E-02	lbmol H2S/hr	(3.40E+00	lb H2S/hr)

Molar Emission Rate of H2S - Example Calculation: 1300 scfm biogas * 500 cf H2S/ 10^6 cf biogas * 1 g-mole H2s/24.45 L H2S * 28.317 L/cf * 1 lb/453 g * 60 min/hr

SO2 Emission rate	6.38E+00	lb SO2/hr		

Mass Emission Rate of SO2 - Example Calculation: 0.1 lb-mol H2S/hr * 2 mol SO2/2 mol H2S * 64.1 lb SO2/lb-mol SO2

[7] CO2 from the digester is not included in this calculation because it is accounted for in the emissions calculations for the CO2 removal process which assumes all CO2 in the biogas is emitted

[8] Ammonia emission rate assumes no ammonia is combusted in the flare.

Worst case NH3 concentration is anticipated to be 20 ppm

Universal Gas Constant R =	0.08206	L*atm*mol-1*K-1		
P=	1	atm		
T =	298	K		
V/n = Molar Volume = RT/P	24.45388	L/g-mole		
Conversion Factor	28.317	L/cf		
Conversion Factor	453.6	g/lb		
Molar emission rate of NH3	3.98E-03	lbmol NH3/hr	(1.71E-01	lb NH3/hr)

[9] Hydrogen sulfide emission rate assumes no hydrogen sulfide is combusted in the flare.

Worst case H2S concentration is anticipated to be 500 ppm

Universal Gas Constant R =	0.08206	L*atm*mol-1*K-1		
P=	1	atm		
T =	298	K		
V/n = Molar Volume = RT/P	24.45388	L/g-mole		
Conversion Factor	28.317	L/cf		
Conversion Factor	453.6	g/lb		
Molar emission rate of H2S	9.96E-02	lbmol H2S/hr	(3.40E+00	lb H2S/hr)

CO_2 Removal System Potential Emissions

Inlet Stream Data from Biogas Upgrader System Specification Sheets

	Nominal Value	Maximum Value	Units
Gas Flow:	631	1157	SCFM

	Nominal Value	Maximum Value	Units
Gas Composition:			
CH_4	60.0	70.0	% by volume
CO_2	39.7	55	% by volume
O_2	0.1	0.2	% by volume
N_2	0.2	1.2	% by volume
H_2O	Saturated		
H_2S	500	2500	ppmv
VOC	150	200	mg/m^3
NH_3	10	20	ppmv

Potential hourly emission rates are calculated based on maximum gas flow rate and maximum design pollutant concentrations, which are reflective of non-steady-state operation.
Potential annual emissions are calculated based on nominal gas flow rate and nominal design pollutant concentrations which are reflective of steady-state operation.

CO_2 Potential Emissions

R Constant 0.73024 $ft^3*atm*R^{-1}*lb\text{-}mol^{-1}$
lb CO_2/lb mol 44

Potential Hourly CO2 Emission Rate
Conservatively assume all CO_2 in inlet stream is emitted, at the maximum flow rate and CO_2 concentration
Assume mole % = volume %
1157 scfm * molar concentration* 1 atm / (0.73024 ft^3*atm*R-1*lb-mol-1 * (68+460.67)R) = lb mol/min
1.65 lb mol/min
4,352 lb/hr CO_2

Potential Annual CO2 Emissions
Conservatively assume all CO_2 in inlet stream is emitted, at the nomial flow rate and CO_2 concentration
Assume mole % = volume %
631 scfm * molar concentration* 1 atm / (0.73024 ft^3*atm*R-1*lb-mol-1 * (68+460.67)R) = lb mol/min
0.65 lb mol/min
1,713 lb/hr CO_2
7,503 tpy CO_2

VOC Potential Emissions

Potential Hourly VOC Emission Rate
Conservatively assume all VOC in inlet stream is emitted, at the maximum flow rate and VOC concentration
1157 scfm * (60 min/hour) * (1 m^3/35.315 ft^3) * concentration (mg/m^3) * (1 g/1000 mg) * (1 lb/453.592 g) = lb/hr
0.867 lb/hr VOC

Potential Annual VOC Emissions
Conservatively assume all VOC in inlet stream is emitted, at the nominal flow rate and VOC concentration
631 scfm * (60 min/hour) * (1 m^3/35.315 ft^3) * concentration (mg/m^3) * (1 g/1000 mg) * (1 lb/453.592 g) = lb/hr
0.355 lb/hr VOC
1.55 tpy VOC

Note: Although ammonia and hydrogen sulfide may be present in low quantities in the gases emitted from the CO2 removal system, emissions of these pollutants are already accounted for in the flare emissions calculations.

Waupaca AD1
Potential to Emit Calculations

Boiler 1 Potential Emissions

Fuel Type:	Natural Gas	
Maximum Fuel Consumption Rate:	3,922	scf/hr
Higher Heating Value:	1,020	Btu/scf
Estimated Heat Input Rate:	4.0	MMBtu/hr
Annual Hours of Operation:	8,760	hours
Fuel Sulfur Content:	---	---

	Natural Gas				
Pollutant	**Emission Factor**	**Emission Factor Units**	**Emission Factor Source**	**Hourly Emission Rate (lb/hr)**	**Annual Emissions (ton/year)**
Criteria Pollutants					
NO_X	50	lb/mmscf	1	0.196	0.86
CO	84	lb/mmscf	1	0.329	1.44
PM	7.6	lb/mmscf	1	0.0298	0.131
PM10	7.6	lb/mmscf	1	0.0298	0.131
PM2.5	7.6	lb/mmscf	1	0.0298	0.131
SO_2	0.6	lb/mmscf	1	2.35E-03	0.0103
VOC	5.5	lb/mmscf	1	0.0216	0.0945
Lead	5.00E-04	lb/mmscf	1	1.96E-06	8.59E-06
Greenhouse Gases					
CO_2	107	lb/MMBtu	2	430	1,882
CH_4	2.03E-03	lb/MMBtu	2	0.0081	0.035
N_2O	2.03E-04	lb/MMBtu	2	8.10E-04	3.55E-03
CO_2e				430	1,883
Hazardous Air Pollutants					
Benzene	2.10E-03	lb/mmscf	1	8.24E-06	3.61E-05
Dichlorobenzene	1.20E-03	lb/mmscf	1	4.71E-06	2.06E-05
Formaldehyde	7.50E-02	lb/mmscf	1	2.94E-04	1.29E-03
Hexane	1.80E+00	lb/mmscf	1	7.06E-03	0.0309
Toluene	3.40E-03	lb/mmscf	1	1.33E-05	5.84E-05

Waupaca AD1
Potential to Emit Calculations

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Hourly Emission Rate (lb/hr)	Annual Emissions (ton/year)
Polycyclic Organic Matter (POM)	6.98E-04	lb/mmscf	1	2.74E-06	1.20E-05
2-Methylnaphthalene	*2.40E-05*	*lb/mmscf*	1	9.41E-08	4.12E-07
3-Methylcholanthrene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
7,12- Dimethylbenz(a)anthracene	*1.60E-05*	*lb/mmscf*	1	6.27E-08	2.75E-07
Acenaphthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Acenaphthylene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Anthracene	*2.40E-06*	*lb/mmscf*	1	9.41E-09	4.12E-08
Benz(a)anthracene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Benzo(a)pyrene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Benzo(b)fluoranthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Benzo(g,h,i)perylene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Benzo(k)fluoranthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Chrysene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Dibenzo(a,h)anthracene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Fluoranthene	*3.00E-06*	*lb/mmscf*	1	1.18E-08	5.15E-08
Fluorene	*2.80E-06*	*lb/mmscf*	1	1.10E-08	4.81E-08
Indeno(1,2,3-cd)pyrene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Naphthalene	*6.10E-04*	*lb/mmscf*	1	2.39E-06	1.05E-05
Phenanathrene	*1.70E-05*	*lb/mmscf*	1	6.67E-08	2.92E-07
Pyrene	*5.00E-06*	*lb/mmscf*	1	1.96E-08	8.59E-08
Arsenic	2.00E-04	lb/mmscf	1	7.84E-07	3.44E-06
Beryllium	1.20E-05	lb/mmscf	1	4.71E-08	2.06E-07
Cadmium	1.10E-03	lb/mmscf	1	4.31E-06	1.89E-05
Chromium	1.40E-03	lb/mmscf	1	5.49E-06	2.40E-05
Cobalt	8.40E-05	lb/mmscf	1	3.29E-07	1.44E-06
Lead	5.00E-04	lb/mmscf	1	1.96E-06	8.59E-06
Manganese	3.80E-04	lb/mmscf	1	1.49E-06	6.53E-06
Mercury	2.60E-04	lb/mmscf	1	1.02E-06	4.47E-06
Nickel	2.10E-03	lb/mmscf	1	8.24E-06	3.61E-05
Selenium	2.40E-05	lb/mmscf	1	9.41E-08	4.12E-07
Total HAPs				**7.41E-03**	**3.24E-02**

Waupaca AD1
Potential to Emit Calculations

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Hourly Emission Rate (lb/hr)	Annual Emissions (ton/year)

Sources	Source#
AP-42 Chapter 1.4 (Small Boilers, Low-NO_X burners)	1
40 CFR pt. 98, Tables A-1, C-1, and C-2	2

Waupaca AD1
Potential to Emit Calculations

Boiler 2 Potential Emissions

Fuel Type:	Natural Gas	
Maximum Fuel Consumption Rate:	3,922	scf/hr
Higher Heating Value:	1,020	Btu/scf
Estimated Heat Input Rate:	4.0	MMBtu/hr
Annual Hours of Operation:	8,760	hours
Fuel Sulfur Content:	---	---

	Natural Gas				
Pollutant	**Emission Factor**	**Emission Factor Units**	**Emission Factor Source**	**Hourly Emission Rate (lb/hr)**	**Annual Emissions (ton/year)**
Criteria Pollutants					
NO_X	50	lb/mmscf	1	0.196	0.86
CO	84	lb/mmscf	1	0.329	1.44
PM	7.6	lb/mmscf	1	0.0298	0.131
PM10	7.6	lb/mmscf	1	0.0298	0.131
PM2.5	7.6	lb/mmscf	1	0.0298	0.131
SO_2	0.6	lb/mmscf	1	2.35E-03	0.0103
VOC	5.5	lb/mmscf	1	0.0216	0.0945
Lead	5.00E-04	lb/mmscf	1	1.96E-06	8.59E-06
Greenhouse Gases					
CO_2	107	lb/MMBtu	2	430	1,882
CH_4	2.03E-03	lb/MMBtu	2	0.0081	0.035
N_2O	2.03E-04	lb/MMBtu	2	8.10E-04	3.55E-03
CO_2e				430	1,883
Hazardous Air Pollutants					
Benzene	2.10E-03	lb/mmscf	1	8.24E-06	3.61E-05
Dichlorobenzene	1.20E-03	lb/mmscf	1	4.71E-06	2.06E-05
Formaldehyde	7.50E-02	lb/mmscf	1	2.94E-04	1.29E-03
Hexane	1.80E+00	lb/mmscf	1	7.06E-03	0.0309
Toluene	3.40E-03	lb/mmscf	1	1.33E-05	5.84E-05

Waupaca AD1
Potential to Emit Calculations

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Hourly Emission Rate (lb/hr)	Annual Emissions (ton/year)
Polycyclic Organic Matter (POM)	6.98E-04	lb/mmscf	1	2.74E-06	1.20E-05
2-Methylnaphthalene	*2.40E-05*	*lb/mmscf*	1	9.41E-08	4.12E-07
3-Methylcholanthrene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
7,12- Dimethylbenz(a)anthracene	*1.60E-05*	*lb/mmscf*	1	6.27E-08	2.75E-07
Acenaphthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Acenaphthylene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Anthracene	*2.40E-06*	*lb/mmscf*	1	9.41E-09	4.12E-08
Benz(a)anthracene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Benzo(a)pyrene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Benzo(b)fluoranthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Benzo(g,h,i)perylene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Benzo(k)fluoranthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Chrysene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Dibenzo(a,h)anthracene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Fluoranthene	*3.00E-06*	*lb/mmscf*	1	1.18E-08	5.15E-08
Fluorene	*2.80E-06*	*lb/mmscf*	1	1.10E-08	4.81E-08
Indeno(1,2,3-cd)pyrene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Naphthalene	*6.10E-04*	*lb/mmscf*	1	2.39E-06	1.05E-05
Phenanathrene	*1.70E-05*	*lb/mmscf*	1	6.67E-08	2.92E-07
Pyrene	*5.00E-06*	*lb/mmscf*	1	1.96E-08	8.59E-08
Arsenic	2.00E-04	lb/mmscf	1	7.84E-07	3.44E-06
Beryllium	1.20E-05	lb/mmscf	1	4.71E-08	2.06E-07
Cadmium	1.10E-03	lb/mmscf	1	4.31E-06	1.89E-05
Chromium	1.40E-03	lb/mmscf	1	5.49E-06	2.40E-05
Cobalt	8.40E-05	lb/mmscf	1	3.29E-07	1.44E-06
Lead	5.00E-04	lb/mmscf	1	1.96E-06	8.59E-06
Manganese	3.80E-04	lb/mmscf	1	1.49E-06	6.53E-06
Mercury	2.60E-04	lb/mmscf	1	1.02E-06	4.47E-06
Nickel	2.10E-03	lb/mmscf	1	8.24E-06	3.61E-05
Selenium	2.40E-05	lb/mmscf	1	9.41E-08	4.12E-07
Total HAPs				**7.41E-03**	**3.24E-02**

Waupaca AD1
Potential to Emit Calculations

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Hourly Emission Rate (lb/hr)	Annual Emissions (ton/year)

Sources	Source#
AP-42 Chapter 1.4 (Small Boilers, Low-NO_X burners)	1
40 CFR pt. 98, Tables A-1, C-1, and C-2	2

Waupaca AD1
Potential Emissions Calculations

Backup Generator 1 Potential Emissions

Assumptions:	
Rated Capacity, kW	750
Brake Horsepower, bhp	1,114
Natural Gas Rated Capacity, MMBtu/hr	7.5
Hours of Operation	500
Fuel	Natural Gas
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
Btu/MMBtu	1,000,000
hr/yr	8,760

	Pollutant	EPA Pollutant Type	CAS Number	AP-42 Emission Factors[1] (lb/MMBtu)	Natural Gas Hourly Emissions (lb/hr)	Natural Gas Annual Emissions (TPY)
	Criteria Pollutants					
	NO_X	criteria	NA	2.27	17.1	4.27
	CO	criteria	NA	3.72	28.0	6.99
	PM	criteria	NA	0.0194	0.146	0.0365
	PM10	criteria	NA	0.0194	0.146	0.0365
	PM2.5	criteria	NA	0.0194	0.146	0.0365
	SO_2	criteria	NA	5.88E-04	4.42E-03	1.11E-03
	VOC	criteria	NA	0.0296	0.223	0.0556
	Greenhouse Gases					
	CO_2e	GHG	NA	115.8	871	217.70
	CO_2	GHG	NA	110.0	827	206.77
	CH4	GHG	NA	0.230	1.73	0.432
2	N2O	GHG	NA	2.20E-04	1.66E-03	4.14E-04
	Hazardous Air Pollutants					
	1,1,2,2-Tetrachloroethane	HAP	79345	2.53E-05	1.90E-04	4.76E-05
	1,1,2-Trichloroethane	HAP	79005	1.53E-05	1.15E-04	2.88E-05
	1,3-Butadiene	HAP	106990	6.63E-04	4.98E-03	1.25E-03
	1,3-Dichloropropene	HAP	542756	1.27E-05	9.55E-05	2.39E-05
	Acetaldehyde	HAP	75070	2.79E-03	2.10E-02	5.24E-03
	Acrolein	HAP	107028	2.63E-03	1.98E-02	4.94E-03
	Benzene	HAP	71432	1.58E-03	1.19E-02	2.97E-03
	Carbon Tetrachloride	HAP	56235	1.77E-05	1.33E-04	3.33E-05
	Chlorobenzene	HAP	108907	1.29E-05	9.70E-05	2.42E-05
	Chloroform	HAP	67663	1.37E-05	1.03E-04	2.58E-05
	Dichloromethane (methylene chloride)	HAP	75092	4.12E-05	3.10E-04	7.74E-05
	Ethyl benzene	HAP	100414	2.48E-05	1.86E-04	4.66E-05
	Ethylene Dibromide	HAP	106934	2.13E-05	1.60E-04	4.00E-05
	Formaldehyde	HAP	50000	2.05E-02	1.54E-01	3.85E-02
	Methanol	HAP	67561	3.06E-03	2.30E-02	5.75E-03
	Naphthalene	HAP (POM)	91203	9.71E-05	7.30E-04	1.83E-04
	PAH	HAP (POM)	various	1.41E-04	1.06E-03	2.65E-04
	Styrene	HAP	100425	1.19E-05	8.95E-05	2.24E-05
	Toluene	HAP	108883	5.58E-04	4.20E-03	1.05E-03
	Vinyl Chloride	HAP	75014	7.18E-06	5.40E-05	1.35E-05
	Xylenes	HAP	1330207	1.95E-04	1.47E-03	3.67E-04
3	Total POMs	HAP	00017	2.38E-04	1.79E-03	4.48E-04
	Total HAPs				2.44E-01	6.09E-02

1 AP-42 emission factors are based on natural gas and LPG, AP-42 Chapter 3.2 Natural Gas-fired Reciprocating Engines, Table 3.2-3 (4-Stroke Rich-Burn Engines), July 2000.
2 N2O emission factors from 40 CFR 98 Subpart C, Table C-2, (N2O = 1.0 x 10^-4 kg N2O/MMBtu), November 29, 2013.
3 Individual polycyclic organic matter (POMs) are listed separately, but only counted in the Total HAPs as Total POMs. POMs include polycyclic aromatic hydrocarbon compounds (PAHs).

Waupaca AD1
Potential Emissions Calculations

Backup Generator 2 Potential Emissions

Assumptions:	
Rated Capacity, kW	750
Brake Horsepower, bhp	1,114
Natural Gas Rated Capacity, MMBtu/hr	7.5
Hours of Operation	500
Fuel	Natural Gas
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
Btu/MMBtu	1,000,000
hr/yr	8,760

	Pollutant	EPA Pollutant Type	CAS Number	AP-42 Emission Factors[1] (lb/MMBtu)	Natural Gas Hourly Emissions (lb/hr)	Natural Gas Annual Emissions (TPY)
	Criteria Pollutants					
	NO_x	criteria	NA	2.27	17.1	4.27
	CO	criteria	NA	3.72	28.0	6.99
	PM	criteria	NA	0.0194	0.146	0.0365
	PM10	criteria	NA	0.0194	0.146	0.0365
	PM2.5	criteria	NA	0.0194	0.146	0.0365
	SO_2	criteria	NA	5.88E-04	4.42E-03	1.11E-03
	VOC	criteria	NA	0.0296	0.223	0.0556
	Greenhouse Gases					
	CO_2e	GHG	NA	115.8	871	217.70
	CO_2	GHG	NA	110.0	827	206.77
	CH4	GHG	NA	0.230	1.73	0.432
2	N2O	GHG	NA	2.20E-04	1.66E-03	4.14E-04
	Hazardous Air Pollutants					
	1,1,2,2-Tetrachloroethane	HAP	79345	2.53E-05	1.90E-04	4.76E-05
	1,1,2-Trichloroethane	HAP	79005	1.53E-05	1.15E-04	2.88E-05
	1,3-Butadiene	HAP	106990	6.63E-04	4.98E-03	1.25E-03
	1,3-Dichloropropene	HAP	542756	1.27E-05	9.55E-05	2.39E-05
	Acetaldehyde	HAP	75070	2.79E-03	2.10E-02	5.24E-03
	Acrolein	HAP	107028	2.63E-03	1.98E-02	4.94E-03
	Benzene	HAP	71432	1.58E-03	1.19E-02	2.97E-03
	Carbon Tetrachloride	HAP	56235	1.77E-05	1.33E-04	3.33E-05
	Chlorobenzene	HAP	108907	1.29E-05	9.70E-05	2.42E-05
	Chloroform	HAP	67663	1.37E-05	1.03E-04	2.58E-05
	Dichloromethane (methylene chloride)	HAP	75092	4.12E-05	3.10E-04	7.74E-05
	Ethyl benzene	HAP	100414	2.48E-05	1.86E-04	4.66E-05
	Ethylene Dibromide	HAP	106934	2.13E-05	1.60E-04	4.00E-05
	Formaldehyde	HAP	50000	2.05E-02	1.54E-01	3.85E-02
	Methanol	HAP	67561	3.06E-03	2.30E-02	5.75E-03
	Naphthalene	HAP (POM)	91203	9.71E-05	7.30E-04	1.83E-04
	PAH	HAP (POM)	various	1.41E-04	1.06E-03	2.65E-04
	Styrene	HAP	100425	1.19E-05	8.95E-05	2.24E-05
	Toluene	HAP	108883	5.58E-04	4.20E-03	1.05E-03
	Vinyl Chloride	HAP	75014	7.18E-06	5.40E-05	1.35E-05
	Xylenes	HAP	1330207	1.95E-04	1.47E-03	3.67E-04
3	Total POMs	HAP	00017	2.38E-04	1.79E-03	4.48E-04
	Total HAPs				2.44E-01	6.09E-02

1 AP-42 emission factors are based on natural gas and LPG, AP-42 Chapter 3.2 Natural Gas-fired Reciprocating Engines, Table 3.2-3 (4-Stroke Rich-Burn Engines), July 2000.
2 N2O emission factors from 40 CFR 98 Subpart C, Table C-2, (N2O = 1.0 x 10^-4 kg N2O/MMBtu), November 29, 2013.
3 Individual polycyclic organic matter (POMs) are listed separately, but only counted in the Total HAPs as Total POMs. POMs include polycyclic aromatic hydrocarbon compounds (PAHs).

Waupaca AD1
Potential Emissions Calculations

Fire Pump Potential Emissions

Assumptions:	
Rated Capacity, Horsepower (HP)	106
Diesel Fuel Consumption Rate, gal/hr	3.2
Rated Capacity, MMBtu/hr	0.44
Fuel Sulfur Content (%)	0.0015
Hours of Operation	500
Diesel Average Heating Value (Btu/lb) [4]	19,300
Diesel Density (lb/gal) [4]	7.1
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
lb/g	0.002204
kW to HP	1.34
Btu/MMBtu	1,000,000
hr/yr	8,760

Pollutant	EPA Pollutant Type	CAS Number	Emission Factors[1,2,3] (lb/MMBtu)	Hourly Emissions (lb/hr)	Annual Emissions (TPY)
Criteria Pollutants					
NO_X	criteria	NA	4.41	1.93	0.483
CO	criteria	NA	0.95	0.417	0.104
PM	criteria	NA	0.31	0.136	0.0340
PM10	criteria	NA	0.31	0.136	0.0340
PM2.5	criteria	NA	0.31	0.136	0.0340
SO_2	criteria	NA	1.52E-03	6.64E-04	1.66E-04
VOC	criteria	NA	0.350	0.153	0.0384
Greenhouse Gases					
CO_2e	GHG	NA	163.1	71.5	17.9
CO_2	GHG	NA	6.61E-03	2.90E-03	7.25E-04
CH4	GHG	NA	1.32E-03	5.80E-04	1.45E-04
N2O	GHG	NA	---	71.7	17.9
Hazardous Air Pollutants					
1,3-Butadiene	HAP	106990	3.91E-05	1.71E-05	4.29E-06
Acenaphthene	HAP (POM)	83329	1.42E-06	6.23E-07	1.56E-07
Acenaphthylene	HAP (POM)	208968	5.06E-06	2.22E-06	5.55E-07
Acetaldehyde	HAP	75070	7.67E-04	3.36E-04	8.41E-05
Acrolein	HAP	107028	9.25E-05	4.06E-05	1.01E-05
Anthracene	HAP (POM)	120127	1.87E-06	8.20E-07	2.05E-07
Benzene	HAP	71432	9.33E-04	4.09E-04	1.02E-04
Benzo(a)anthracene	HAP (POM)	56553	1.68E-06	7.37E-07	1.84E-07
Benzo(a)pyrene	HAP (POM)	50328	1.88E-07	8.24E-08	2.06E-08
Benzo(b)fluoranthene	HAP (POM)	205992	9.91E-08	4.35E-08	1.09E-08
Benzo(g,h,i)perylene	HAP (POM)	191242	4.89E-07	2.14E-07	5.36E-08
Benzo(k)fluoranthene	HAP (POM)	207089	1.55E-07	6.80E-08	1.70E-08
Chrysene	HAP (POM)	218019	3.53E-07	1.55E-07	3.87E-08
Dibenzo(a,h)anthracene	HAP (POM)	53703	5.83E-07	2.56E-07	6.39E-08
Fluoranthene	HAP (POM)	206440	7.61E-06	3.34E-06	8.34E-07
Fluorene	HAP (POM)	86737	2.92E-05	1.28E-05	3.20E-06
Formaldehyde	HAP	50000	1.18E-03	5.17E-04	1.29E-04
Indeno(1,2,3-cd)pyrene	HAP (POM)	193395	3.75E-07	1.64E-07	4.11E-08
Naphthalene	HAP (POM)	91203	8.48E-05	3.72E-05	9.30E-06
Phenanthrene	HAP (POM)	85018	2.94E-05	1.29E-05	3.22E-06
Pyrene	HAP (POM)	129000	4.78E-06	2.10E-06	5.24E-07
Toluene	HAP	108883	4.09E-04	1.79E-04	4.48E-05
Xylenes	HAP	1330207	2.85E-04	1.25E-04	3.12E-05
Total POM [3]	HAP	00017	1.68E-04	7.37E-05	1.84E-05
Total HAPs				1.70E-03	4.25E-04

1 Emission factors for NOx, CO, PM, PM10, PM2.5, and VOC are based on diesel fuel, AP-42 Chapter 3.3 Gasoline And Diesel Industrial Engines, Tables 3.3-1 and 3.3-2, October 1996. Non-methane hydrocarbons are assumed to equal total hydrocarbons. PM, PM10, and PM2.5 are assumed to be equivalent. SO2 emission factor based on diesel fuel, AP-42 Chapter 3.4 Large Stationary Diesel And All Stationary Dual-fuel Engines, Table 3.4-1, October 1996.

2 Individual polycyclic organic matter (POM) are listed separately, but only counted in the Total HAPs as Total POM. POM include polycyclic aromatic hydrocarbon compounds (PAHs).

3 Greenhouse Gas (GHG) emission factors based on 40 CFR pt. 98, Table C-1 and C-2. Assume Distillate Fuel Oil No. 2 factors for diesel.

ORA Building and Hydrolysis Tanks Potential Emissions

Exhaust Stream Data from System Specification Sheets

Exhaust Stream	ORA Building (Process Area)		ORA Building (Non-Process Area)	Hydrolysis Tanks	
Description	ColdOX System Inlet	ColdOX System Outlet	Rooftop Unit Exhaust	DEO Unit Inlet	DEO Unit Outlet
Volumetric Flow (ft^3/h)	3,023,392	3,023,392	51,240	31,255	31,255
Volumetric Flow (m^3/h)	85,613	85,613	1,452	855	855
Hazardous Air Contaminants					
Average NH_3 (ppm)	9	1	5	87	4
Average NH_3 (mg/m^3)	6	1	4	61	3
Total NH_3 (mg/h)	547,444	54,744	5,084	54,022	2,701
Total NH_3 (g/h)	547	55	5	54	3
Average H_2S (ppm)	8	1	5	53	3
Average H_2S (mg/m3)	11	1	7	75	4
Total H_2S (mg/h)	926,888	92,689	10,167	66,045	3,302
Total H_2S (g/h)	927	93	10	66	3
NH_3 (lb/hr) [1]	1.21	*0.121*	0.0112	0.119	*0.00595*
NH_3 (tpy) [1]	5.29	*0.529*	0.0491	0.522	*0.0261*
H_2S (lb/hr) [2]	2.04	*0.204*	0.0224	0.146	*0.00728*
H_2S (tpy) [2]	8.95	*0.895*	0.0982	0.638	*0.0319*
NH_3 Removal Efficiency (%)	90		N/A	95	
H_2S Removal Efficiency (%)	90		N/A	95	
Criteria Pollutants					
NO_X (lb/hr) [3]	---	---	---	---	0.127
NO_X (tpy)	---	---	---	---	0.558
SO_2 (lb/hr) [4]	---	---	---	---	0.274
SO_2 (tpy)	---	---	---	---	1.20

[1] As a worst-case assumption, NH_3 emissions are calculated assuming 0% removal by the odor control system

[2] As a worst-case assumption, H_2S emissions are calculated assuming 0% removal by the odor control system

Note: The ColdOx system is a low temperature air treatment, so it will not create NO_X, but mainly convert NH_3 and H_2S to ammonium sulfate salt and similar compounds, which are water soluble. The DEO system uses elevated temperature and oxygen to destroy H_2S, forming some NO_x and SO_2 in the process.

[3] Emissions of NO_X estimated assuming that all NH_3 is converted to NO_2 by the DEO odor control system

$4NH_3 + 7O_2 \rightarrow 4NO_2 + 6H_2O$

NH_3 Molecular Weight (lb/lbmol) 43.03

NO_2 Molecular Weight (lb/lbmol) 46.01

Mass emission rate of NO2 - Example Calculation: (0.12 lb NH3/hr) * (1 lbmol NH3/43.03 lb H2S) * (4 lbmol NH3/4 lbmol NO2) * (46.01 lb NO2/lbmol NO2) = 0.13 lb NO2/hr

[4] Emissions of SO_2 estimated assuming that all H_2S is converted to SO_2 by the DEO odor control system

$2H_2S + 3O_2 \rightarrow 2SO_2 + 2H_2O$

H_2S Molecular Weight (lb/lbmol) 34.10

SO_2 Molecular Weight (lb/lbmol) 64.07

Mass emission rate of SO2 - Example Calculation: (0.15 lb H2S/hr) * (1 lbmol H2S/34.10 lb H2S) * (2 lbmol H2S/2 lbmol SO2) * (64.07 lb SO2/lbmol SO2) = 0.27 lb SO2/hr

Waupaca AD1
Estimated Actual Emissions Calculations

Estimated Actual Emissions Summary

	Hourly Emissions Summary										
Emission Source (Unit ID Number)	**P01**	**P02**	**B01**	**B02**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**Facility Total**
Stack (Stack ID Number)	**S01**	**S02**	**S03**	**S04**	**S05**	**S06**	**S07**	**S08**	**S09**	**S10**	
Emission Source Description	**Flare**	**CO_2 Removal System**	**Boiler 1**	**Boiler 2**	**Back-up Generator 1**	**Back-up Generator 2**	**Fire Pump Engine**	**ORA Process Area Exhaust**	**ORA Non-Process Area Exhaust**	**Hydrolysis Tanks**	
Pollutant	**Actual Emissions (lb/hr)**	**Actual Emissions (lb/hr)**	**Actual Emissions (lb/hr)**	**Actual Emissions (lb/hr)**	**Actual Emissions (lb/hr)**	**Actual Emissions (lb/hr)**	**Actual Emissions (lb/hr)**	**Actual Emissions (lb/hr)**	**Actual Emissions (lb/hr)**	**Actual Emissions (lb/hr)**	**Actual Emissions (lb/hr)**
Criteria Pollutants											
NO_x	3.04E+00	---	1.96E-01	1.96E-01	1.71E+01	1.71E+01	1.93E+00	---	---	1.27E-01	**3.96E+01**
CO	3.59E+00	---	3.29E-01	3.29E-01	2.80E+01	2.80E+01	4.17E-01	---	---	---	**6.06E+01**
PM	5.93E-01	---	2.98E-02	2.98E-02	1.46E-01	1.46E-01	1.36E-01	---	---	---	**1.08E+00**
PM_{10}	5.93E-01	---	2.98E-02	2.98E-02	1.46E-01	1.46E-01	1.36E-01	---	---	---	**1.08E+00**
$PM_{2.5}$	5.93E-01	---	2.98E-02	2.98E-02	1.46E-01	1.46E-01	1.36E-01	---	---	---	**1.08E+00**
SO_2	6.38E+00	---	2.35E-03	2.35E-03	4.42E-03	4.42E-03	6.64E-04	---	---	2.74E-01	**6.67E+00**
VOC	4.29E-01	8.67E-01	2.16E-02	2.16E-02	2.23E-01	2.23E-01	1.53E-01	---	---	---	**1.94E+00**
Lead	3.90E-05	---	1.96E-06	1.96E-06	---	---	---	---	---	---	**4.29E-05**
Greenhouse Gases											
CO_2	9.31E+03	4.35E+03	4.30E+02	4.30E+02	8.27E+02	8.27E+02	7.15E+01	---	---	---	**1.62E+04**
CH_4	1.75E-01	---	8.10E-03	8.10E-03	1.73E+00	1.73E+00	2.90E-03	---	---	---	**3.65E+00**
N_2O	1.75E-02	---	8.10E-04	8.10E-04	1.66E-03	1.66E-03	5.80E-04	---	---	---	**2.31E-02**
CO_2e	9.32E+03	4.35E+03	4.30E+02	4.30E+02	8.71E+02	8.71E+02	7.17E+01	---	---	---	**1.63E+04**
Hazardous Air Pollutants											
Benzene (71-43-2)	1.64E-04	---	8.24E-06	8.24E-06	1.19E-02	1.19E-02	4.09E-04	---	---	---	**2.43E-02**
1,4-Dichlorobenzene (106-46-7)	9.36E-05	---	4.71E-06	4.71E-06	---	---	---	---	---	---	**1.03E-04**
Formaldehyde (50-00-0)	5.85E-03	---	2.94E-04	2.94E-04	1.54E-01	1.54E-01	5.17E-04	---	---	---	**3.15E-01**
n-Hexane (110-54-3)	1.40E-01	---	7.06E-03	7.06E-03	---	---	---	---	---	---	**1.55E-01**
Toluene (108-88-3)	2.65E-04	---	1.33E-05	1.33E-05	4.20E-03	4.20E-03	1.79E-04	---	---	---	**8.86E-03**
Polycyclic Organic Matter (POM)	5.45E-05	---	2.74E-06	2.74E-06	1.79E-03	1.79E-03	7.37E-05	---	---	---	**3.71E-03**
Naphthalene (91-20-3) [1]	4.76E-05	---	2.39E-06	2.39E-06	7.30E-04	7.30E-04	3.72E-05	---	---	---	**1.55E-03**
1,1,2,2-Tetrachloroethane (79-34-5)	---	---	---	---	1.90E-04	1.90E-04	---	---	---	---	**3.80E-04**
1,1,2-Trichloroethane (79-00-5)	---	---	---	---	1.15E-04	1.15E-04	---	---	---	---	**2.30E-04**
1,3-Butadiene (106-99-0)	---	---	---	---	4.98E-03	4.98E-03	1.71E-05	---	---	---	**9.99E-03**
1,3-Dichloropropene (542-75-6)	---	---	---	---	9.55E-05	9.55E-05	---	---	---	---	**1.91E-04**
Acetaldehyde (75-07-0)	---	---	---	---	2.10E-02	2.10E-02	---	---	---	---	**4.20E-02**
Acrolein (107-02-8)	---	---	---	---	1.98E-02	1.98E-02	---	---	---	---	**3.95E-02**
Carbon Tetrachloride (56-23-5)	---	---	---	---	1.33E-04	1.33E-04	---	---	---	---	**2.66E-04**
Chlorobenzene (108-90-7)	---	---	---	---	9.70E-05	9.70E-05	---	---	---	---	**1.94E-04**
Chloroform (67-66-3)	---	---	---	---	1.03E-04	1.03E-04	---	---	---	---	**2.06E-04**
Dichloromethane (methylene chloride)	---	---	---	---	3.10E-04	3.10E-04	---	---	---	---	**6.20E-04**
Ethyl benzene (100-41-4)	---	---	---	---	1.86E-04	1.86E-04	---	---	---	---	**3.73E-04**
Ethylene Dibromide (106-93-4)	---	---	---	---	1.60E-04	1.60E-04	---	---	---	---	**3.20E-04**
Methanol (67-56-1)	---	---	---	---	2.30E-02	2.30E-02	---	---	---	---	**4.60E-02**
Styrene (100-42-5)	---	---	---	---	8.95E-05	8.95E-05	---	---	---	---	**1.79E-04**
Vinyl Chloride (75-01-4)	---	---	---	---	4.20E-03	4.20E-03	---	---	---	---	**8.39E-03**
Xylenes (1330-20-7)	---	---	---	---	5.40E-05	5.40E-05	---	---	---	---	**1.08E-04**
Arsenic (7440-38-2)	1.56E-05	---	7.84E-07	7.84E-07	---	---	---	---	---	---	**1.72E-05**
Beryllium (7440-41-7)	9.36E-07	---	4.71E-08	4.71E-08	---	---	---	---	---	---	**1.03E-06**
Cadmium (7440-43-9)	8.58E-05	---	4.31E-06	4.31E-06	---	---	---	---	---	---	**9.45E-05**
Chromium (7440-47-3)	1.09E-04	---	5.49E-06	5.49E-06	---	---	---	---	---	---	**1.20E-04**
Cobalt (7440-48-4)	6.55E-06	---	3.29E-07	3.29E-07	---	---	---	---	---	---	**7.21E-06**
Lead (7439-92-1)	3.90E-05	---	1.96E-06	1.96E-06	---	---	---	---	---	---	**4.29E-05**
Manganese (7439-96-5)	2.97E-05	---	1.49E-06	1.49E-06	---	---	---	---	---	---	**3.26E-05**
Mercury (7439-97-6)	2.03E-05	---	1.02E-06	1.02E-06	---	---	---	---	---	---	**2.23E-05**
Nickel (7440-02-0)	1.64E-04	---	8.24E-06	8.24E-06	---	---	---	---	---	---	**1.80E-04**
Selenium (7782-49-2)	1.87E-06	---	9.41E-08	9.41E-08	---	---	---	---	---	---	**2.06E-06**
Total HAPs	1.47E-01	---	7.41E-03	7.41E-03	2.44E-01	2.44E-01	1.70E-03	---	---	---	**6.51E-01**
Hazardous Air Contaminants											
Benz(a)anthracene (56-55-3)	1.40E-07	---	7.06E-09	7.06E-09	---	---	7.37E-07	---	---	---	**8.91E-07**
Benzo(a)pyrene (50-32-8)	9.36E-08	---	4.71E-09	4.71E-09	---	---	8.24E-08	---	---	---	**1.85E-07**
Benzo(b)fluoranthene (205-99-2)	1.40E-07	---	7.06E-09	7.06E-09	---	---	4.35E-08	---	---	---	**1.98E-07**
Benzo(k)fluoranthene (207-08-9)	1.40E-07	---	7.06E-09	7.06E-09	---	---	6.80E-08	---	---	---	**2.23E-07**
Dibenzo(a,h)anthracene (53-70-3)	9.36E-08	---	4.71E-09	4.71E-09	---	---	2.56E-07	---	---	---	**3.59E-07**
Indeno(1,2,3-cd)pyrene (193-39-5)	1.40E-07	---	7.06E-09	7.06E-09	---	---	1.64E-07	---	---	---	**3.19E-07**
Ammonia (7664-41-7) [2]	1.71E-01	---	---	---	---	---	---	1.21E+00	1.12E-02	1.19E-01	**1.51E+00**
Hydrogen Sulfide (7783-06-4) [2]	3.40E+00	---	---	---	---	---	---	2.04E+00	2.24E-02	1.46E-01	**5.61E+00**

[1] Naphthalene is also included in polycyclic organic matter total. Hazardous air pollutants total does not double-count naphthalene emissions

[2] Hydrogen sulfide and ammonia emissions are from agricultural waste and are exempt from the requirements of NR 445.08 as specified at NR 445.08(6)(d).

Waupaca AD1
Estimated Actual Emissions Calculations

Estimated Actual Emissions Summary

	Annual Emissions Summary										
Emission Source (Unit ID Number)	**P01**	**P02**	**B01**	**B02**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**Facility Total**
Stack (Stack ID Number)	**S01**	**S02**	**S03**	**S04**	**S05**	**S06**	**S07**	**S08**	**S09**	**S10**	
Emission Source Description	**Flare**	**CO_2 Removal System**	**Boiler 1**	**Boiler 2**	**Back-up Generator 1**	**Back-up Generator 2**	**Fire Pump Engine**	**ORA Process Area Exhaust**	**ORA Non-Process Area Exhaust**	**Hydrolysis Tanks**	
Pollutant	**Actual Emissions (lbs/month)**	**Actual Emissions (lbs/month)**	**Actual Emissions (lbs/month)**	**Actual Emissions (lbs/month)**	**Actual Emissions (lbs/month)**	**Actual Emissions (lbs/month)**	**Actual Emissions (lbs/month)**	**Actual Emissions (lbs/month)**	**Actual Emissions (lbs/month)**	**Actual Emissions (lbs/month)**	**Actual Emissions (lbs/month)**
Criteria Pollutants											
NO_X	2.28E+02	—	1.43E+02	1.43E+02	1.42E+02	1.42E+02	1.61E+01	—	—	9.30E+01	**9.08E+02**
CO	2.69E+02	—	2.40E+02	2.40E+02	2.33E+02	2.33E+02	3.47E+00	—	—	—	**1.22E+03**
PM	4.45E+01	—	2.18E+01	2.18E+01	1.22E+00	1.22E+00	1.13E+00	—	—	—	**9.16E+01**
PM_{10}	4.45E+01	—	2.18E+01	2.18E+01	1.22E+00	1.22E+00	1.13E+00	—	—	—	**9.16E+01**
$PM_{2.5}$	4.45E+01	—	2.18E+01	2.18E+01	1.22E+00	1.22E+00	1.13E+00	—	—	—	**9.16E+01**
SO_2	4.77E+02	—	1.72E+00	1.72E+00	3.68E-02	3.68E-02	5.54E-03	—	—	2.00E+02	**6.81E+02**
VOC	3.22E+01	—	1.57E+01	1.57E+01	1.85E+00	1.85E+00	1.28E+00	—	—	—	**6.87E+01**
Lead	2.93E-03	—	1.43E-03	1.43E-03	—	—	—	—	—	—	**5.79E-03**
Greenhouse Gases											
CO_2	6.99E+05	1.25E+06	3.14E+05	3.14E+05	6.89E+03	6.89E+03	5.96E+02	—	—	—	**2.59E+06**
CH_4	1.32E+01	—	5.91E+00	5.91E+00	1.44E+01	1.44E+01	2.42E-02	—	—	—	**5.38E+01**
N_2O	1.32E+00	—	5.91E-01	5.91E-01	1.38E-02	1.38E-02	4.83E-03	—	—	—	**2.53E+00**
CO_2e	6.99E+05	1.25E+06	3.14E+05	3.14E+05	7.26E+03	7.26E+03	5.98E+02	—	—	—	**2.59E+06**
Hazardous Air Pollutants											
Benzene (71-43-2)	1.23E-02	—	6.01E-03	6.01E-03	9.90E-02	9.90E-02	3.41E-03	—	—	—	**2.26E-01**
1,4-Dichlorobenzene (106-46-7)	7.03E-03	—	3.44E-03	3.44E-03	—	—	—	—	—	—	**1.39E-02**
Formaldehyde (50-00-0)	4.39E-01	—	2.15E-01	2.15E-01	1.28E+00	1.28E+00	4.31E-03	—	—	—	**3.44E+00**
n-Hexane (110-54-3)	1.05E+01	—	5.15E+00	5.15E+00	—	—	—	—	—	—	**2.08E+01**
Toluene (108-88-3)	1.99E-02	—	9.73E-03	9.73E-03	3.50E-02	3.50E-02	1.49E-03	—	—	—	**1.11E-01**
Polycyclic Organic Matter (POM)	4.09E-03	—	2.00E-03	2.00E-03	1.49E-02	1.49E-02	6.14E-04	—	—	—	**3.85E-02**
Naphthalene (91-20-3) [1]	3.57E-03	—	1.75E-03	1.75E-03	6.08E-03	6.08E-03	3.10E-04	—	—	—	**1.95E-02**
1,1,2,2-Tetrachloroethane (79-34-5)	—	—	—	—	1.59E-03	1.59E-03	—	—	—	—	**3.17E-03**
1,1,2-Trichloroethane (79-00-5)	—	—	—	—	9.59E-04	9.59E-04	—	—	—	—	**1.92E-03**
1,3-Butadiene (106-99-0)	—	—	—	—	4.15E-02	4.15E-02	1.43E-04	—	—	—	**8.32E-02**
1,3-Dichloropropene (542-75-6)	—	—	—	—	7.96E-04	7.96E-04	—	—	—	—	**1.59E-03**
Acetaldehyde (75-07-0)	—	—	—	—	1.75E-01	1.75E-01	—	—	—	—	**3.50E-01**
Acrolein (107-02-8)	—	—	—	—	1.65E-01	1.65E-01	—	—	—	—	**3.30E-01**
Carbon Tetrachloride (56-23-5)	—	—	—	—	1.11E-03	1.11E-03	—	—	—	—	**2.22E-03**
Chlorobenzene (108-90-7)	—	—	—	—	8.08E-04	8.08E-04	—	—	—	—	**1.62E-03**
Chloroform (67-66-3)	—	—	—	—	8.58E-04	8.58E-04	—	—	—	—	**1.72E-03**
Dichloromethane (methylene chloride)	—	—	—	—	2.58E-03	2.58E-03	—	—	—	—	**5.16E-03**
Ethyl benzene (100-41-4)	—	—	—	—	1.55E-03	1.55E-03	—	—	—	—	**3.11E-03**
Ethylene Dibromide (106-93-4)	—	—	—	—	1.33E-03	1.33E-03	—	—	—	—	**2.67E-03**
Methanol (67-56-1)	—	—	—	—	1.92E-01	1.92E-01	—	—	—	—	**3.83E-01**
Styrene (100-42-5)	—	—	—	—	7.46E-04	7.46E-04	—	—	—	—	**1.49E-03**
Vinyl Chloride (75-01-4)	—	—	—	—	3.50E-02	3.50E-02	—	—	—	—	**6.99E-02**
Xylenes (1330-20-7)	—	—	—	—	4.50E-04	4.50E-04	—	—	—	—	**9.00E-04**
Arsenic (7440-38-2)	1.17E-03	—	5.73E-04	5.73E-04	—	—	—	—	—	—	**2.32E-03**
Beryllium (7440-41-7)	7.03E-05	—	3.44E-05	3.44E-05	—	—	—	—	—	—	**1.39E-04**
Cadmium (7440-43-9)	6.44E-03	—	3.15E-03	3.15E-03	—	—	—	—	—	—	**1.27E-02**
Chromium (7440-47-3)	8.20E-03	—	4.01E-03	4.01E-03	—	—	—	—	—	—	**1.62E-02**
Cobalt (7440-48-4)	4.92E-04	—	2.40E-04	2.40E-04	—	—	—	—	—	—	**9.73E-04**
Lead (7439-92-1)	2.93E-03	—	1.43E-03	1.43E-03	—	—	—	—	—	—	**5.79E-03**
Manganese (7439-96-5)	2.22E-03	—	1.09E-03	1.09E-03	—	—	—	—	—	—	**4.40E-03**
Mercury (7439-97-6)	1.52E-03	—	7.44E-04	7.44E-04	—	—	—	—	—	—	**3.01E-03**
Nickel (7440-02-0)	1.23E-02	—	6.01E-03	6.01E-03	—	—	—	—	—	—	**2.43E-02**
Selenium (7782-49-2)	1.41E-04	—	6.87E-05	6.87E-05	—	—	—	—	—	—	**2.78E-04**
Total HAPs	1.11E+01	—	5.41E+00	5.41E+00	2.03E+00	2.03E+00	1.42E-02	—	—	—	**2.59E+01**
Hazardous Air Contaminants											
Benz(a)anthracene (56-55-3)	1.05E-05	—	5.15E-06	5.15E-06	—	—	6.14E-06	—	—	—	**2.70E-05**
Benzo(a)pyrene (50-32-8)	7.03E-06	—	3.44E-06	3.44E-06	—	—	6.87E-07	—	—	—	**1.46E-05**
Benzo(b)fluoranthene (205-99-2)	1.05E-05	—	5.15E-06	5.15E-06	—	—	3.62E-07	—	—	—	**2.12E-05**
Benzo(k)fluoranthene (207-08-9)	1.05E-05	—	5.15E-06	5.15E-06	—	—	5.66E-07	—	—	—	**2.14E-05**
Dibenzo(a,h)anthracene (53-70-3)	7.03E-06	—	3.44E-06	3.44E-06	—	—	2.13E-06	—	—	—	**1.60E-05**
Indeno(1,2,3-cd)pyrene (193-39-5)	1.05E-05	—	5.15E-06	5.15E-06	—	—	1.37E-06	—	—	—	**2.22E-05**
Ammonia (7664-41-7) [2]	1.00E+00	—	—	—	—	—	—	8.81E+02	8.18E+00	8.69E+01	**9.77E+02**
Hydrogen Sulfide (7783-06-4) [2]	1.98E+01	—	—	—	—	—	—	1.49E+03	1.64E+01	1.06E+02	**1.63E+03**

Estimated Actual Emissions Summary

	Annual Emissions Summary (continued)										
Emission Source (Unit ID Number)	**P01**	**P02**	**B01**	**B02**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**Facility Total**
Stack (Stack ID Number)	**S01**	**S02**	**S03**	**S04**	**S05**	**S06**	**S07**	**S08**	**S09**	**S10**	
Emission Source Description	**Flare**	**CO_2 Removal System**	**Boiler 1**	**Boiler 2**	**Back-up Generator 1**	**Back-up Generator 2**	**Fire Pump Engine**	**ORA Process Area Exhaust**	**ORA Non-Process Area Exhaust**	**Hydrolysis Tanks**	
Pollutant	**Actual Emissions (lbs/year)**	**Actual Emissions (lbs/year)**	**Actual Emissions (lbs/year)**	**Actual Emissions (lbs/year)**	**Actual Emissions (lbs/year)**	**Actual Emissions (lbs/year)**	**Actual Emissions (lbs/year)**	**Actual Emissions (lbs/year)**	**Actual Emissions (lbs/year)**	**Actual Emissions (lbs/year)**	**Actual Emissions (lbs/year)**
Criteria Pollutants											
NO_X	2.74E+03	---	1.72E+03	1.72E+03	1.71E+03	1.71E+03	1.93E+02	---	---	1.12E+03	**1.09E+04**
CO	3.23E+03	---	2.89E+03	2.89E+03	2.80E+03	2.80E+03	4.17E+01	---	---	---	**1.46E+04**
PM	5.34E+02	---	2.61E+02	2.61E+02	1.46E+01	1.46E+01	1.36E+01	---	---	---	**1.10E+03**
PM_{10}	5.34E+02	---	2.61E+02	2.61E+02	1.46E+01	1.46E+01	1.36E+01	---	---	---	**1.10E+03**
$PM_{2.5}$	5.34E+02	---	2.61E+02	2.61E+02	1.46E+01	1.46E+01	1.36E+01	---	---	---	**1.10E+03**
SO_2	5.73E+03	---	2.06E+01	2.06E+01	4.42E-01	4.42E-01	6.64E-02	---	---	2.40E+03	**8.17E+03**
VOC	3.86E+02	---	1.89E+02	1.89E+02	2.23E+01	2.23E+01	1.53E+01	---	---	---	**8.24E+02**
Lead	3.51E-02	---	1.72E-02	1.72E-02	---	---	---	---	---	---	**6.95E-02**
Greenhouse Gases											
CO_2	8.38E+06	1.50E+07	3.76E+06	3.76E+06	8.27E+04	8.27E+04	7.15E+03	---	---	---	**3.11E+07**
CH_4	1.58E+02	---	7.10E+01	7.10E+01	1.73E+02	1.73E+02	2.90E-01	---	---	---	**6.46E+02**
N_2O	1.58E+01	---	7.10E+00	7.10E+00	1.66E-01	1.66E-01	5.80E-02	---	---	---	**3.04E+01**
CO_2e	8.39E+06	1.50E+07	3.77E+06	3.77E+06	8.71E+04	8.71E+04	7.17E+03	---	---	---	**3.11E+07**
Hazardous Air Pollutants											
Benzene (71-43-2)	1.48E-01	---	7.21E-02	7.21E-02	1.19E+00	1.19E+00	4.09E-02	---	---	---	**2.71E+00**
1,4-Dichlorobenzene (106-46-7)	8.43E-02	---	4.12E-02	4.12E-02	---	---	---	---	---	---	**1.67E-01**
Formaldehyde (50-00-0)	5.27E+00	---	2.58E+00	2.58E+00	1.54E+01	1.54E+01	5.17E-02	---	---	---	**4.13E+01**
n-Hexane (110-54-3)	1.26E+02	---	6.18E+01	6.18E+01	---	---	---	---	---	---	**2.50E+02**
Toluene (108-88-3)	2.39E-01	---	1.17E-01	1.17E-01	4.20E-01	4.20E-01	1.79E-02	---	---	---	**1.33E+00**
Polycyclic Organic Matter (POM)	4.91E-02	---	2.40E-02	2.40E-02	1.79E-01	1.79E-01	7.37E-03	---	---	---	**4.62E-01**
Naphthalene (91-20-3) [1]	4.29E-02	---	2.10E-02	2.10E-02	7.30E-02	7.30E-02	3.72E-03	---	---	---	**2.35E-01**
1,1,2,2-Tetrachloroethane (79-34-5)	---	---	---	---	1.90E-02	1.90E-02	---	---	---	---	**3.80E-02**
1,1,2-Trichloroethane (79-00-5)	---	---	---	---	1.15E-02	1.15E-02	---	---	---	---	**2.30E-02**
1,3-Butadiene (106-99-0)	---	---	---	---	4.98E-01	4.98E-01	1.71E-03	---	---	---	**9.99E-01**
1,3-Dichloropropene (542-75-6)	---	---	---	---	9.55E-03	9.55E-03	---	---	---	---	**1.91E-02**
Acetaldehyde (75-07-0)	---	---	---	---	2.10E+00	2.10E+00	---	---	---	---	**4.20E+00**
Acrolein (107-02-8)	---	---	---	---	1.98E+00	1.98E+00	---	---	---	---	**3.95E+00**
Carbon Tetrachloride (56-23-5)	---	---	---	---	1.33E-02	1.33E-02	---	---	---	---	**2.66E-02**
Chlorobenzene (108-90-7)	---	---	---	---	9.70E-03	9.70E-03	---	---	---	---	**1.94E-02**
Chloroform (67-66-3)	---	---	---	---	1.03E-02	1.03E-02	---	---	---	---	**2.06E-02**
Dichloromethane (methylene chloride)	---	---	---	---	3.10E-02	3.10E-02	---	---	---	---	**6.20E-02**
Ethyl benzene (100-41-4)	---	---	---	---	1.86E-02	1.86E-02	---	---	---	---	**3.73E-02**
Ethylene Dibromide (106-93-4)	---	---	---	---	1.60E-02	1.60E-02	---	---	---	---	**3.20E-02**
Methanol (67-56-1)	---	---	---	---	2.30E+00	2.30E+00	---	---	---	---	**4.60E+00**
Styrene (100-42-5)	---	---	---	---	8.95E-03	8.95E-03	---	---	---	---	**1.79E-02**
Vinyl Chloride (75-01-4)	---	---	---	---	4.20E-01	4.20E-01	---	---	---	---	**8.39E-01**
Xylenes (1330-20-7)	---	---	---	---	5.40E-03	5.40E-03	---	---	---	---	**1.08E-02**
Arsenic (7440-38-2)	1.41E-02	---	6.87E-03	6.87E-03	---	---	---	---	---	---	**2.78E-02**
Beryllium (7440-41-7)	8.43E-04	---	4.12E-04	4.12E-04	---	---	---	---	---	---	**1.67E-03**
Cadmium (7440-43-9)	7.73E-02	---	3.78E-02	3.78E-02	---	---	---	---	---	---	**1.53E-01**
Chromium (7440-47-3)	9.84E-02	---	4.81E-02	4.81E-02	---	---	---	---	---	---	**1.95E-01**
Cobalt (7440-48-4)	5.90E-03	---	2.89E-03	2.89E-03	---	---	---	---	---	---	**1.17E-02**
Lead (7439-92-1)	3.51E-02	---	1.72E-02	1.72E-02	---	---	---	---	---	---	**6.95E-02**
Manganese (7439-96-5)	2.67E-02	---	1.31E-02	1.31E-02	---	---	---	---	---	---	**5.28E-02**
Mercury (7439-97-6)	1.83E-02	---	8.93E-03	8.93E-03	---	---	---	---	---	---	**3.61E-02**
Nickel (7440-02-0)	1.48E-01	---	7.21E-02	7.21E-02	---	---	---	---	---	---	**2.92E-01**
Selenium (7782-49-2)	1.69E-03	---	8.24E-04	8.24E-04	---	---	---	---	---	---	**3.34E-03**
Total HAPs	1.33E+02	---	6.49E+01	6.49E+01	2.44E+01	2.44E+01	1.70E-01	---	---	---	**3.11E+02**
Hazardous Air Contaminants											
Benz(a)anthracene (56-55-3)	1.26E-04	---	6.18E-05	6.18E-05	---	---	7.37E-05	---	---	---	**3.24E-04**
Benzo(a)pyrene (50-32-8)	8.43E-05	---	4.12E-05	4.12E-05	---	---	8.24E-06	---	---	---	**1.75E-04**
Benzo(b)fluoranthene (205-99-2)	1.26E-04	---	6.18E-05	6.18E-05	---	---	4.35E-06	---	---	---	**2.54E-04**
Benzo(k)fluoranthene (207-08-9)	1.26E-04	---	6.18E-05	6.18E-05	---	---	6.80E-06	---	---	---	**2.57E-04**
Dibenzo(a,h)anthracene (53-70-3)	8.43E-05	---	4.12E-05	4.12E-05	---	---	2.56E-05	---	---	---	**1.92E-04**
Indeno(1,2,3-cd)pyrene (193-39-5)	1.26E-04	---	6.18E-05	6.18E-05	---	---	1.64E-05	---	---	---	**2.67E-04**
Ammonia (7664-41-7) [2]	1.20E+01	---	---	---	---	---	---	1.06E+04	9.82E+01	1.04E+03	**1.17E+04**
Hydrogen Sulfide (7783-06-4) [2]	2.38E+02	---	---	---	---	---	---	1.79E+04	1.96E+02	1.28E+03	**1.96E+04**

Estimated Actual Emissions Summary

	Annual Emissions Summary (continued)										
Emission Source (Unit ID Number)	**P01**	**P02**	**B01**	**B02**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**Facility Total**
Stack (Stack ID Number)	**S01**	**S02**	**S03**	**S04**	**S05**	**S06**	**S07**	**S08**	**S09**	**S10**	
Emission Source Description	**Flare**	**CO_2 Removal System**	**Boiler 1**	**Boiler 2**	**Back-up Generator 1**	**Back-up Generator 2**	**Fire Pump Engine**	**ORA Process Area Exhaust**	**ORA Non-Process Area Exhaust**	**Hydrolysis Tanks**	
Pollutant	**Actual Emissions (tons/year)**	**Actual Emissions (tons/year)**	**Actual Emissions (tons/year)**	**Actual Emissions (tons/year)**	**Actual Emissions (tons/year)**	**Actual Emissions (tons/year)**	**Actual Emissions (tons/year)**	**Actual Emissions (tons/year)**	**Actual Emissions (tons/year)**	**Actual Emissions (tons/year)**	**Actual Emissions (tons/year)**
Criteria Pollutants											
NO_x	1.37E+00	—	8.59E-01	8.59E-01	8.53E-01	8.53E-01	9.67E-02	—	—	5.58E-01	**5.45E+00**
CO	1.62E+00	—	1.44E+00	1.44E+00	1.40E+00	1.40E+00	2.08E-02	—	—	—	**7.32E+00**
PM	2.67E-01	—	1.31E-01	1.31E-01	7.30E-03	7.30E-03	6.80E-03	—	—	—	**5.49E-01**
PM_{10}	2.67E-01	—	1.31E-01	1.31E-01	7.30E-03	7.30E-03	6.80E-03	—	—	—	**5.49E-01**
$PM_{2.5}$	2.67E-01	—	1.31E-01	1.31E-01	7.30E-03	7.30E-03	6.80E-03	—	—	—	**5.49E-01**
SO_2	2.86E+00	—	1.03E-02	1.03E-02	2.21E-04	2.21E-04	3.32E-05	—	—	1.20E+00	**4.08E+00**
VOC	1.93E-01	1.55E+00	9.45E-02	9.45E-02	1.11E-02	1.11E-02	7.67E-03	—	—	—	**1.96E+00**
Lead	1.76E-05	—	8.59E-06	8.59E-06	—	—	—	—	—	—	**3.47E-05**
Greenhouse Gases											
CO_2	4.19E+03	7.50E+03	1.88E+03	1.88E+03	4.14E+01	4.14E+01	3.57E+00	—	—	—	**1.55E+04**
CH_4	7.90E-02	—	3.55E-02	3.55E-02	8.65E-02	8.65E-02	1.45E-04	—	—	—	**3.23E-01**
N_2O	7.90E-03	—	3.55E-03	3.55E-03	8.29E-05	8.29E-05	2.90E-05	—	—	—	**1.52E-02**
CO_2e	4.20E+03	7.50E+03	1.88E+03	1.88E+03	4.35E+01	4.35E+01	3.59E+00	—	—	—	**1.56E+04**
Hazardous Air Pollutants											
Benzene (71-43-2)	7.38E-05	—	3.61E-05	3.61E-05	5.94E-04	5.94E-04	2.05E-05	—	—	—	**1.35E-03**
1,4-Dichlorobenzene (106-46-7)	4.22E-05	—	2.06E-05	2.06E-05	—	—	—	—	—	—	**8.34E-05**
Formaldehyde (50-00-0)	2.63E-03	—	1.29E-03	1.29E-03	7.71E-03	7.71E-03	2.59E-05	—	—	—	**2.07E-02**
n-Hexane (110-54-3)	6.32E-02	—	3.09E-02	3.09E-02	—	—	—	—	—	—	**1.25E-01**
Toluene (108-88-3)	1.19E-04	—	5.84E-05	5.84E-05	2.10E-04	2.10E-04	8.97E-06	—	—	—	**6.65E-04**
Polycyclic Organic Matter (POM)	2.45E-05	—	1.20E-05	1.20E-05	8.95E-05	8.95E-05	3.68E-06	—	—	—	**2.31E-04**
Naphthalene (91-20-3) [1]	2.14E-05	—	1.05E-05	1.05E-05	3.65E-05	3.65E-05	1.86E-06	—	—	—	**1.17E-04**
1,1,2,2-Tetrachloroethane (79-34-5)	—	—	—	—	9.51E-06	9.51E-06	—	—	—	—	**1.90E-05**
1,1,2-Trichloroethane (79-00-5)	—	—	—	—	5.75E-06	5.75E-06	—	—	—	—	**1.15E-05**
1,3-Butadiene (106-99-0)	—	—	—	—	2.49E-04	2.49E-04	8.57E-07	—	—	—	**4.99E-04**
1,3-Dichloropropene (542-75-6)	—	—	—	—	4.77E-06	4.77E-06	—	—	—	—	**9.55E-06**
Acetaldehyde (75-07-0)	—	—	—	—	1.05E-03	1.05E-03	—	—	—	—	**2.10E-03**
Acrolein (107-02-8)	—	—	—	—	9.89E-04	9.89E-04	—	—	—	—	**1.98E-03**
Carbon Tetrachloride (56-23-5)	—	—	—	—	6.65E-06	6.65E-06	—	—	—	—	**1.33E-05**
Chlorobenzene (108-90-7)	—	—	—	—	4.85E-06	4.85E-06	—	—	—	—	**9.70E-06**
Chloroform (67-66-3)	—	—	—	—	5.15E-06	5.15E-06	—	—	—	—	**1.03E-05**
Dichloromethane (methylene chloride)	—	—	—	—	1.55E-05	1.55E-05	—	—	—	—	**3.10E-05**
Ethyl benzene (100-41-4)	—	—	—	—	9.32E-06	9.32E-06	—	—	—	—	**1.86E-05**
Ethylene Dibromide (106-93-4)	—	—	—	—	8.01E-06	8.01E-06	—	—	—	—	**1.60E-05**
Methanol (67-56-1)	—	—	—	—	1.15E-03	1.15E-03	—	—	—	—	**2.30E-03**
Styrene (100-42-5)	—	—	—	—	4.47E-06	4.47E-06	—	—	—	—	**8.95E-06**
Vinyl Chloride (75-01-4)	—	—	—	—	2.10E-04	2.10E-04	—	—	—	—	**4.20E-04**
Xylenes (1330-20-7)	—	—	—	—	2.70E-06	2.70E-06	—	—	—	—	**5.40E-06**
Arsenic (7440-38-2)	7.03E-06	—	3.44E-06	3.44E-06	—	—	—	—	—	—	**1.39E-05**
Beryllium (7440-41-7)	4.22E-07	—	2.06E-07	2.06E-07	—	—	—	—	—	—	**8.34E-07**
Cadmium (7440-43-9)	3.86E-05	—	1.89E-05	1.89E-05	—	—	—	—	—	—	**7.64E-05**
Chromium (7440-47-3)	4.92E-05	—	2.40E-05	2.40E-05	—	—	—	—	—	—	**9.73E-05**
Cobalt (7440-48-4)	2.95E-06	—	1.44E-06	1.44E-06	—	—	—	—	—	—	**5.84E-06**
Lead (7439-92-1)	1.76E-05	—	8.59E-06	8.59E-06	—	—	—	—	—	—	**3.47E-05**
Manganese (7439-96-5)	1.33E-05	—	6.53E-06	6.53E-06	—	—	—	—	—	—	**2.64E-05**
Mercury (7439-97-6)	9.13E-06	—	4.47E-06	4.47E-06	—	—	—	—	—	—	**1.81E-05**
Nickel (7440-02-0)	7.38E-05	—	3.61E-05	3.61E-05	—	—	—	—	—	—	**1.46E-04**
Selenium (7782-49-2)	8.43E-07	—	4.12E-07	4.12E-07	—	—	—	—	—	—	**1.67E-06**
Total HAPs	6.63E-02	—	3.24E-02	3.24E-02	1.22E-02	1.22E-02	8.49E-05	—	—	—	**1.56E-01**
Hazardous Air Contaminants											
Benz(a)anthracene (56-55-3)	6.32E-08	—	3.09E-08	3.09E-08	—	—	3.68E-08	—	—	—	**1.62E-07**
Benzo(a)pyrene (50-32-8)	4.22E-08	—	2.06E-08	2.06E-08	—	—	4.12E-09	—	—	—	**8.75E-08**
Benzo(b)fluoranthene (205-99-2)	6.32E-08	—	3.09E-08	3.09E-08	—	—	2.17E-09	—	—	—	**1.27E-07**
Benzo(k)fluoranthene (207-08-9)	6.32E-08	—	3.09E-08	3.09E-08	—	—	3.40E-09	—	—	—	**1.28E-07**
Dibenzo(a,h)anthracene (53-70-3)	4.22E-08	—	2.06E-08	2.06E-08	—	—	1.28E-08	—	—	—	**9.62E-08**
Indeno(1,2,3-cd)pyrene (193-39-5)	6.32E-08	—	3.09E-08	3.09E-08	—	—	8.22E-09	—	—	—	**1.33E-07**
Ammonia (7664-41-7) [2]	6.00E-03	—	—	—	—	—	—	5.29E+00	4.91E-02	5.22E-01	**5.86E+00**
Hydrogen Sulfide (7783-06-4) [2]	1.19E-01	—	—	—	—	—	—	8.95E+00	9.82E-02	6.38E-01	**9.81E+00**

Flare Estimated Actual Emissions

Pilot Light Capacity	0.5 cfm	Maximum Annual Biogas Flaring Volume	70.00 MMscf/year
Flaring Capacity	1300 cfm	Maximum Biogas H2S Content (sent to flare)	500 ppm
Natural Gas Heating Value	1020 Btu/scf		

				Pilot Light		Emergency Flaring		Total	
Pollutant	Emission Factor	Units	Reference	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Criteria Pollutants									
NOx	39	lb/mmscf	[1]	1.17E-03	5.12E-03	3.04E+00	1.37E+00	3.04E+00	1.37E+00
CO	46	lb/mmscf	[1]	1.38E-03	6.04E-03	3.59E+00	1.61E+00	3.59E+00	1.62E+00
PM	7.6	lb/mmscf	[2]	2.28E-04	9.99E-04	5.93E-01	2.66E-01	5.93E-01	2.67E-01
PM_{10}	7.6	lb/mmscf	[2],[3]	2.28E-04	9.99E-04	5.93E-01	2.66E-01	5.93E-01	2.67E-01
$PM_{2.5}$	7.6	lb/mmscf	[2],[3]	2.28E-04	9.99E-04	5.93E-01	2.66E-01	5.93E-01	2.67E-01
SO_2	0.6	lb/mmscf	[2],[6]	1.80E-05	7.88E-05	6.38E+00	2.86E+00	6.38E+00	2.86E+00
VOC	5.5	lb/mmscf	[2]	1.65E-04	7.23E-04	4.29E-01	1.93E-01	4.29E-01	1.93E-01
Lead	5.00E-04	lb/mmscf	[3]	1.50E-08	6.57E-08	3.90E-05	1.75E-05	3.90E-05	1.76E-05
Greenhouse Gases									
CO_2	116.97608	lb/MMBtu	[5],[7]	3.58E+00	1.57E+01	9.31E+03	4.18E+03	9.31E+03	4.19E+03
CH_4	2.20E-03	lb/MMBtu	[5]	6.75E-05	2.95E-04	1.75E-01	7.87E-02	1.75E-01	7.90E-02
N_2O	2.20E-04	lb/MMBtu	[5]	6.75E-06	2.95E-05	1.75E-02	7.87E-03	1.75E-02	7.90E-03
CO_2e	na	na	[5]	3.58E+00	1.57E+01	9.32E+03	4.18E+03	9.32E+03	4.20E+03
Hazardous Air Pollutants									
Benzene (71-43-2)	2.10E-03	lb/mmscf	[4]	6.30E-08	2.76E-07	1.64E-04	7.35E-05	1.64E-04	7.38E-05
1,4-Dichlorobenzene (106-46-7)	1.20E-03	lb/mmscf	[4]	3.60E-08	1.58E-07	9.36E-05	4.20E-05	9.36E-05	4.22E-05
Formaldehyde (50-00-0)	7.50E-02	lb/mmscf	[4]	2.25E-06	9.86E-06	5.85E-03	2.63E-03	5.85E-03	2.63E-03
n-Hexane (110-54-3)	1.80E+00	lb/mmscf	[4]	5.40E-05	2.37E-04	1.40E-01	6.30E-02	1.40E-01	6.32E-02
Toluene (108-88-3)	3.40E-03	lb/mmscf	[4]	1.02E-07	4.47E-07	2.65E-04	1.19E-04	2.65E-04	1.19E-04
Polycyclic Organic Matter (POM)	6.98E-04	lb/mmscf	[4]	2.09E-08	9.17E-08	5.45E-05	2.44E-05	5.45E-05	2.45E-05
2-Methylnaphthalene	*2.40E-05*	*lb/mmscf*	[4]	*7.20E-10*	*3.15E-09*	*1.87E-06*	*8.40E-07*	*1.87E-06*	*8.43E-07*
3-Methylcholanthrene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.30E-08*	*1.40E-07*	*6.32E-08*
7,12- Dimethylbenz(a)anthracene	*1.60E-05*	*lb/mmscf*	[4]	*4.80E-10*	*2.10E-09*	*1.25E-06*	*5.60E-07*	*1.25E-06*	*5.62E-07*
Acenaphthene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.30E-08*	*1.40E-07*	*6.32E-08*
Acenaphthylene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.30E-08*	*1.40E-07*	*6.32E-08*
Anthracene	*2.40E-06*	*lb/mmscf*	[4]	*7.20E-11*	*3.15E-10*	*1.87E-07*	*8.40E-08*	*1.87E-07*	*8.43E-08*
Benz(a)anthracene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.30E-08*	*1.40E-07*	*6.32E-08*
Benzo(a)pyrene	*1.20E-06*	*lb/mmscf*	[4]	*3.60E-11*	*1.58E-10*	*9.36E-08*	*4.20E-08*	*9.36E-08*	*4.22E-08*
Benzo(b)fluoranthene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.30E-08*	*1.40E-07*	*6.32E-08*
Benzo(g,h,i)perylene	*1.20E-06*	*lb/mmscf*	[4]	*3.60E-11*	*1.58E-10*	*9.36E-08*	*4.20E-08*	*9.36E-08*	*4.22E-08*
Benzo(k)fluoranthene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.30E-08*	*1.40E-07*	*6.32E-08*
Chrysene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.30E-08*	*1.40E-07*	*6.32E-08*
Dibenzo(a,h)anthracene	*1.20E-06*	*lb/mmscf*	[4]	*3.60E-11*	*1.58E-10*	*9.36E-08*	*4.20E-08*	*9.36E-08*	*4.22E-08*
Fluoranthene	*3.00E-06*	*lb/mmscf*	[4]	*9.00E-11*	*3.94E-10*	*2.34E-07*	*1.05E-07*	*2.34E-07*	*1.05E-07*
Fluorene	*2.80E-06*	*lb/mmscf*	[4]	*8.40E-11*	*3.68E-10*	*2.18E-07*	*9.80E-08*	*2.18E-07*	*9.84E-08*
Indeno(1,2,3-cd)pyrene	*1.80E-06*	*lb/mmscf*	[4]	*5.40E-11*	*2.37E-10*	*1.40E-07*	*6.30E-08*	*1.40E-07*	*6.32E-08*
Naphthalene (91-20-3)	6.10E-04	lb/mmscf	[4]	*1.83E-08*	*8.02E-08*	*4.76E-05*	2.14E-05	*4.76E-05*	*2.14E-05*
Phenanathrene	*1.70E-05*	*lb/mmscf*	[4]	*5.10E-10*	*2.23E-09*	*1.33E-06*	*5.95E-07*	*1.33E-06*	*5.97E-07*
Pyrene	*5.00E-06*	*lb/mmscf*	[4]	*1.50E-10*	*6.57E-10*	*3.90E-07*	*1.75E-07*	*3.90E-07*	*1.76E-07*
Arsenic (7440-38-2)	2.00E-04	lb/mmscf	[4]	6.00E-09	2.63E-08	1.56E-05	7.00E-06	1.56E-05	7.03E-06
Beryllium (7440-41-7)	1.20E-05	lb/mmscf	[4]	3.60E-10	1.58E-09	9.36E-07	4.20E-07	9.36E-07	4.22E-07
Cadmium (7440-43-9)	1.10E-03	lb/mmscf	[4]	3.30E-08	1.45E-07	8.58E-05	3.85E-05	8.58E-05	3.86E-05
Chromium (7440-47-3)	1.40E-03	lb/mmscf	[4]	4.20E-08	1.84E-07	1.09E-04	4.90E-05	1.09E-04	4.92E-05
Cobalt (7440-48-4)	8.40E-05	lb/mmscf	[4]	2.52E-09	1.10E-08	6.55E-06	2.94E-06	6.55E-06	2.95E-06
Lead (7439-92-1)	5.00E-04	lb/mmscf	[3]	1.50E-08	6.57E-08	3.90E-05	1.75E-05	3.90E-05	1.76E-05
Manganese (7439-96-5)	3.80E-04	lb/mmscf	[4]	1.14E-08	4.99E-08	2.96E-05	1.33E-05	2.97E-05	1.33E-05
Mercury (7439-97-6)	2.60E-04	lb/mmscf	[4]	7.80E-09	3.42E-08	2.03E-05	9.10E-06	2.03E-05	9.13E-06
Nickel (7440-02-0)	2.10E-03	lb/mmscf	[4]	6.30E-08	2.76E-07	1.64E-04	7.35E-05	1.64E-04	7.38E-05
Selenium (7782-49-2)	2.40E-05	lb/mmscf	[4]	7.20E-10	3.15E-09	1.87E-06	8.40E-07	1.87E-06	8.43E-07
Total HAPs				5.67E-05	2.48E-04	1.47E-01	6.61E-02	1.47E-01	6.63E-02
Hazardous Air Contaminants									
Ammonia (7664-41-7)			[8]	0.00E+00	0.00E+00	1.71E-01	6.00E-03	1.71E-01	6.00E-03
Hydrogen Sulfide (7783-06-4)			[9]	0.00E+00	0.00E+00	3.40E+00	1.19E-01	3.40E+00	1.19E-01

[1] Draft AP-42, Section 2.4 "Municipal Solid Waste Landfills" (10/08) Table 2.4-4

Flare Estimated Actual Emissions

[2] AP-42 Section 1.4 "Natural Gas Combustion" (7/98) Table 1.4-2

[3] Assume PM = PM10 = PM2.5

[4] AP-42 Section 1.4 "Natural Gas Combustion" (7/98) Table 1.4-2

[5] 40 CFR Part 98, Subpart C, Tables C-1 and C-2

CO2e emission rate calculated based on Global Warming Potential (GWP) from Table A-1 to Subpart A of Part 98

GHG Pollutant	GWP	Mass EF (kg/MMBtu)	Mass EF (lb/MMBtu)
CO2	1	5.31E+01	1.17E+02
CH_4	25	1.00E-03	2.20E-03
N_2O	298	1.00E-04	2.20E-04

Conversion factor: 2.2046 lb/kg

[6] SO2 from combusting biogas based on H2S content of gas

Flaring can occur prior to H2S removal, after H2S removal, after dehydration/polishing, or after CO2 removal.

Worst case H2S concentration from these three streams is anticipated to be 500 ppm

SO2 emission rate conservatively based on a 500 ppm maximum concentration of hydrogen sulfide in the biogas sent to the flare assuming all hydrogen sulfide is converted to sulfur dioxide.

$2H_2S + 3O_2 \rightarrow 2SO_2 + 2H_2O$

Universal Gas Constant R =	0.08206	L*atm*mol-1*K-1	
P=	1	atm	
T =	298	K	
V/n = Molar Volume = RT/P	24.45388	L/g-mole	
Conversion Factor	28.317	L/cf	
Conversion Factor	453.6	g/lb	
Molar emission rate of H2S	9.96E-02	lbmol H2S/hr	(3.40E+00 lb H2S/hr)

Molar Emission Rate of H2S - Example Calculation: 1300 scfm biogas * 500 cf H2S/ 10^6 cf biogas * 1 g-mole H2s/24.45 L H2S * 28.317 L/cf * 1 lb/453 g * 60 min/hr

SO2 Emission rate	6.38E+00	lb SO2/hr	

Mass Emission Rate of SO2 - Example Calculation: 0.1 lb-mol H2S/hr * 2 mol SO2/2 mol H2S * 64.1 lb SO2/lb-mol SO2

Molar Annual Emissions of H2S based on 70 mmscf gas flared/year

	89.35	lbmol H2S/year	(3.05E+03 lb H2S/year)

Molar Annual Emissions of H2S - Example Calculation: 70 x 10^6 scf biogas/year * 500 cf H2S/ 10^6 cf biogas * 1 g-mole H2s/24.45 L H2S * 28.317 L/cf * 1 lb/453 gr

SO2 Annual Emissions	5.73E+03	lb SO2/year	(2.86E+00 tons SO2/year)

Annual Emissions of SO2 - Example Calculation: 89.35 lb-mol H2S/year * 2 mol SO2/2 mol H2S * 64.1 lb SO2/lb-mol SO2

[7] CO2 from the digester is not included in this calculation because it is accounted for in the emissions calculations for the CO2 removal process which assumes all CO2 in the biogas is emitted

[8] Ammonia emission rate assumes no ammonia is combusted in the flare.

Worst case NH3 concentration is anticipated to be 20 ppm

Universal Gas Constant R =	0.08206	L*atm*mol-1*K-1	
P=	1	atm	
T =	298	K	
V/n = Molar Volume = RT/P	24.45388	L/g-mole	
Conversion Factor	28.317	L/cf	
Conversion Factor	453.6	g/lb	
Molar emission rate of NH3	3.98E-03	lbmol NH3/hr	(1.71E-01 lb NH3/hr)

[9] Hydrogen sulfide emission rate assumes no hydrogen sulfide is combusted in the flare.

Worst case H2S concentration is anticipated to be 500 ppm

Universal Gas Constant R =	0.08206	L*atm*mol-1*K-1	
P=	1	atm	
T =	298	K	
V/n = Molar Volume = RT/P	24.45388	L/g-mole	
Conversion Factor	28.317	L/cf	
Conversion Factor	453.6	g/lb	
Molar emission rate of H2S	9.96E-02	lbmol H2S/hr	(3.40E+00 lb H2S/hr)

CO_2 Removal System Estimated Actual Emissions

Inlet Stream Data from Biogas Upgrader System Specification Sheets

	Nominal Value	Maximum Value	Units
Gas Flow:	631	1157	SCFM

	Nominal Value	Maximum Value	Units
Gas Composition:			
CH_4	60.0	70.0	% by volume
CO_2	39.7	55	% by volume
O_2	0.1	0.2	% by volume
N_2	0.2	1.2	% by volume
H_2O	Saturated		
H_2S	500	2500	ppmv
VOC	150	200	mg/m^3
NH_3	10	20	ppmv

Potential hourly emission rates are calculated based on maximum gas flow rate and maximum design pollutant concentrations, which are reflective of non-steady-state operation.
Potential annual emissions are calculated based on nominal gas flow rate and nominal design pollutant concentrations which are reflective of steady-state operation.

CO_2 Potential Emissions

R Constant 0.73024 $ft^3*atm*R^{-1}*lb\text{-}mol^{-1}$
lb CO_2/lb mol 44

Potential Hourly CO2 Emission Rate
Conservatively assume all CO_2 in inlet stream is emitted, at the maximum flow rate and CO_2 concentration
Assume mole % = volume %
1157 scfm * molar concentration* 1 atm / (0.73024 $ft^3*atm*R\text{-}1*lb\text{-}mol\text{-}1$ * (68+460.67)R) = lb mol/min
1.65 lb mol/min
4,352 lb/hr CO_2

Potential Annual CO2 Emissions
Conservatively assume all CO_2 in inlet stream is emitted, at the nomial flow rate and CO_2 concentration
Assume mole % = volume %
631 scfm * molar concentration* 1 atm / (0.73024 $ft^3*atm*R\text{-}1*lb\text{-}mol\text{-}1$ * (68+460.67)R) = lb mol/min
0.65 lb mol/min
1,713 lb/hr CO_2
7,503 tpy CO_2

VOC Potential Emissions

Potential Hourly VOC Emission Rate
Conservatively assume all VOC in inlet stream is emitted, at the maximum flow rate and VOC concentration
1157 scfm * (60 min/hour) * (1 m^3/35.315 ft^3) * concentration (mg/m^3) * (1 g/1000 mg) * (1 lb/453.592 g) = lb/hr
0.867 lb/hr VOC

Potential Annual VOC Emissions
Conservatively assume all VOC in inlet stream is emitted, at the nominal flow rate and VOC concentration
631 scfm * (60 min/hour) * (1 m^3/35.315 ft^3) * concentration (mg/m^3) * (1 g/1000 mg) * (1 lb/453.592 g) = lb/hr
0.355 lb/hr VOC
1.55 tpy VOC

Note: Although ammonia and hydrogen sulfide may be present in low quantities in the gases emitted from the CO2 removal system, emissions of these pollutants are already accounted for in the flare emissions calculations.

Waupaca AD1
Estimated Actual Emissions Calculations

Boiler 1 Estimated Actual Emissions

Fuel Type:	Natural Gas	
Maximum Fuel Consumption Rate:	3,922	scf/hr
Higher Heating Value:	1,020	Btu/scf
Estimated Heat Input Rate:	4.0	MMBtu/hr
Annual Hours of Operation:	8,760	hours
Fuel Sulfur Content:	---	---

	Natural Gas				
Pollutant	**Emission Factor**	**Emission Factor Units**	**Emission Factor Source**	**Hourly Emission Rate (lb/hr)**	**Annual Emissions (ton/year)**
Criteria Pollutants					
NO_X	50	lb/mmscf	1	0.196	0.86
CO	84	lb/mmscf	1	0.329	1.44
PM	7.6	lb/mmscf	1	0.0298	0.131
PM10	7.6	lb/mmscf	1	0.0298	0.131
PM2.5	7.6	lb/mmscf	1	0.0298	0.131
SO_2	0.6	lb/mmscf	1	2.35E-03	0.0103
VOC	5.5	lb/mmscf	1	0.0216	0.0945
Lead	5.00E-04	lb/mmscf	1	1.96E-06	8.59E-06
Greenhouse Gases					
CO_2	107	lb/MMBtu	2	430	1,882
CH_4	2.03E-03	lb/MMBtu	2	0.0081	0.035
N_2O	2.03E-04	lb/MMBtu	2	8.10E-04	3.55E-03
CO_2e				430	1,883
Hazardous Air Pollutants					
Benzene	2.10E-03	lb/mmscf	1	8.24E-06	3.61E-05
Dichlorobenzene	1.20E-03	lb/mmscf	1	4.71E-06	2.06E-05
Formaldehyde	7.50E-02	lb/mmscf	1	2.94E-04	1.29E-03
Hexane	1.80E+00	lb/mmscf	1	7.06E-03	0.0309
Toluene	3.40E-03	lb/mmscf	1	1.33E-05	5.84E-05

Waupaca AD1

Estimated Actual Emissions Calculations

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Hourly Emission Rate (lb/hr)	Annual Emissions (ton/year)
Polycyclic Organic Matter (POM)	6.98E-04	lb/mmscf	1	2.74E-06	1.20E-05
2-Methylnaphthalene	*2.40E-05*	*lb/mmscf*	1	9.41E-08	4.12E-07
3-Methylcholanthrene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
7,12- Dimethylbenz(a)anthracene	*1.60E-05*	*lb/mmscf*	1	6.27E-08	2.75E-07
Acenaphthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Acenaphthylene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Anthracene	*2.40E-06*	*lb/mmscf*	1	9.41E-09	4.12E-08
Benz(a)anthracene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Benzo(a)pyrene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Benzo(b)fluoranthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Benzo(g,h,i)perylene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Benzo(k)fluoranthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Chrysene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Dibenzo(a,h)anthracene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Fluoranthene	*3.00E-06*	*lb/mmscf*	1	1.18E-08	5.15E-08
Fluorene	*2.80E-06*	*lb/mmscf*	1	1.10E-08	4.81E-08
Indeno(1,2,3-cd)pyrene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Naphthalene	*6.10E-04*	*lb/mmscf*	1	2.39E-06	1.05E-05
Phenanathrene	*1.70E-05*	*lb/mmscf*	1	6.67E-08	2.92E-07
Pyrene	*5.00E-06*	*lb/mmscf*	1	1.96E-08	8.59E-08
Arsenic	2.00E-04	lb/mmscf	1	7.84E-07	3.44E-06
Beryllium	1.20E-05	lb/mmscf	1	4.71E-08	2.06E-07
Cadmium	1.10E-03	lb/mmscf	1	4.31E-06	1.89E-05
Chromium	1.40E-03	lb/mmscf	1	5.49E-06	2.40E-05
Cobalt	8.40E-05	lb/mmscf	1	3.29E-07	1.44E-06
Lead	5.00E-04	lb/mmscf	1	1.96E-06	8.59E-06
Manganese	3.80E-04	lb/mmscf	1	1.49E-06	6.53E-06
Mercury	2.60E-04	lb/mmscf	1	1.02E-06	4.47E-06
Nickel	2.10E-03	lb/mmscf	1	8.24E-06	3.61E-05
Selenium	2.40E-05	lb/mmscf	1	9.41E-08	4.12E-07
Total HAPs				**7.41E-03**	**3.24E-02**

Waupaca AD1
Estimated Actual Emissions Calculations

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Hourly Emission Rate (lb/hr)	Annual Emissions (ton/year)

Sources	Source#
AP-42 Chapter 1.4 (Small Boilers, Low-NO_X burners)	1
40 CFR pt. 98, Tables A-1, C-1, and C-2	2

Waupaca AD1
Estimated Actual Emissions Calculations

Boiler 2 Estimated Actual Emissions

Fuel Type:	Natural Gas	
Maximum Fuel Consumption Rate:	3,922	scf/hr
Higher Heating Value:	1,020	Btu/scf
Estimated Heat Input Rate:	4.0	MMBtu/hr
Annual Hours of Operation:	8,760	hours
Fuel Sulfur Content:	---	---

	Natural Gas				
Pollutant	**Emission Factor**	**Emission Factor Units**	**Emission Factor Source**	**Hourly Emission Rate (lb/hr)**	**Annual Emissions (ton/year)**
Criteria Pollutants					
NO_X	50	lb/mmscf	1	0.196	0.86
CO	84	lb/mmscf	1	0.329	1.44
PM	7.6	lb/mmscf	1	0.0298	0.131
PM10	7.6	lb/mmscf	1	0.0298	0.131
PM2.5	7.6	lb/mmscf	1	0.0298	0.131
SO_2	0.6	lb/mmscf	1	2.35E-03	0.0103
VOC	5.5	lb/mmscf	1	0.0216	0.0945
Lead	5.00E-04	lb/mmscf	1	1.96E-06	8.59E-06
Greenhouse Gases					
CO_2	107	lb/MMBtu	2	430	1,882
CH_4	2.03E-03	lb/MMBtu	2	0.0081	0.035
N_2O	2.03E-04	lb/MMBtu	2	8.10E-04	3.55E-03
CO_2e				430	1,883
Hazardous Air Pollutants					
Benzene	2.10E-03	lb/mmscf	1	8.24E-06	3.61E-05
Dichlorobenzene	1.20E-03	lb/mmscf	1	4.71E-06	2.06E-05
Formaldehyde	7.50E-02	lb/mmscf	1	2.94E-04	1.29E-03
Hexane	1.80E+00	lb/mmscf	1	7.06E-03	0.0309
Toluene	3.40E-03	lb/mmscf	1	1.33E-05	5.84E-05

Waupaca AD1

Estimated Actual Emissions Calculations

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Hourly Emission Rate (lb/hr)	Annual Emissions (ton/year)
Polycyclic Organic Matter (POM)	6.98E-04	lb/mmscf	1	2.74E-06	1.20E-05
2-Methylnaphthalene	*2.40E-05*	*lb/mmscf*	1	9.41E-08	4.12E-07
3-Methylcholanthrene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
7,12- Dimethylbenz(a)anthracene	*1.60E-05*	*lb/mmscf*	1	6.27E-08	2.75E-07
Acenaphthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Acenaphthylene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Anthracene	*2.40E-06*	*lb/mmscf*	1	9.41E-09	4.12E-08
Benz(a)anthracene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Benzo(a)pyrene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Benzo(b)fluoranthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Benzo(g,h,i)perylene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Benzo(k)fluoranthene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Chrysene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Dibenzo(a,h)anthracene	*1.20E-06*	*lb/mmscf*	1	4.71E-09	2.06E-08
Fluoranthene	*3.00E-06*	*lb/mmscf*	1	1.18E-08	5.15E-08
Fluorene	*2.80E-06*	*lb/mmscf*	1	1.10E-08	4.81E-08
Indeno(1,2,3-cd)pyrene	*1.80E-06*	*lb/mmscf*	1	7.06E-09	3.09E-08
Naphthalene	*6.10E-04*	*lb/mmscf*	1	2.39E-06	1.05E-05
Phenanathrene	*1.70E-05*	*lb/mmscf*	1	6.67E-08	2.92E-07
Pyrene	*5.00E-06*	*lb/mmscf*	1	1.96E-08	8.59E-08
Arsenic	2.00E-04	lb/mmscf	1	7.84E-07	3.44E-06
Beryllium	1.20E-05	lb/mmscf	1	4.71E-08	2.06E-07
Cadmium	1.10E-03	lb/mmscf	1	4.31E-06	1.89E-05
Chromium	1.40E-03	lb/mmscf	1	5.49E-06	2.40E-05
Cobalt	8.40E-05	lb/mmscf	1	3.29E-07	1.44E-06
Lead	5.00E-04	lb/mmscf	1	1.96E-06	8.59E-06
Manganese	3.80E-04	lb/mmscf	1	1.49E-06	6.53E-06
Mercury	2.60E-04	lb/mmscf	1	1.02E-06	4.47E-06
Nickel	2.10E-03	lb/mmscf	1	8.24E-06	3.61E-05
Selenium	2.40E-05	lb/mmscf	1	9.41E-08	4.12E-07
Total HAPs				**7.41E-03**	**3.24E-02**

Waupaca AD1

Estimated Actual Emissions Calculations

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Hourly Emission Rate (lb/hr)	Annual Emissions (ton/year)

Sources	Source#
AP-42 Chapter 1.4 (Small Boilers, Low-NO_X burners)	1
40 CFR pt. 98, Tables A-1, C-1, and C-2	2

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Waupaca AD1
Estimated Actual Emissions Calculations

Backup Generator 1 Estimated Actual Emissions

Assumptions:	
Rated Capacity, kW	750
Brake Horsepower, bhp	1,114
Natural Gas Rated Capacity, MMBtu/hr	7.5
Hours of Operation	100
Fuel	Natural Gas
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
Btu/MMBtu	1,000,000
hr/yr	8,760

	Pollutant	EPA Pollutant Type	CAS Number	AP-42 Emission Factors[1] (lb/MMBtu)	Natural Gas Hourly Emissions (lb/hr)	Natural Gas Annual Emissions (TPY)
	Criteria Pollutants					
	NO_x	criteria	NA	2.27	17.1	0.853
	CO	criteria	NA	3.72	28.0	1.40
	PM	criteria	NA	0.0194	0.146	7.30E-03
	PM10	criteria	NA	0.0194	0.146	7.30E-03
	PM2.5	criteria	NA	0.0194	0.146	7.30E-03
	SO_2	criteria	NA	5.88E-04	4.42E-03	2.21E-04
	VOC	criteria	NA	0.0296	0.223	0.0111
	Greenhouse Gases					
	CO_2e	GHG	NA	115.8	871	43.5
	CO_2	GHG	NA	110.0	827	41.35
	CH4	GHG	NA	0.230	1.73	0.086
2	N2O	GHG	NA	2.20E-04	1.66E-03	8.29E-05
	Hazardous Air Pollutants					
	1,1,2,2-Tetrachloroethane	HAP	79345	2.53E-05	1.90E-04	9.51E-06
	1,1,2-Trichloroethane	HAP	79005	1.53E-05	1.15E-04	5.75E-06
	1,3-Butadiene	HAP	106990	6.63E-04	4.98E-03	2.49E-04
	1,3-Dichloropropene	HAP	542756	1.27E-05	9.55E-05	4.77E-06
	Acetaldehyde	HAP	75070	2.79E-03	2.10E-02	1.05E-03
	Acrolein	HAP	107028	2.63E-03	1.98E-02	9.89E-04
	Benzene	HAP	71432	1.58E-03	1.19E-02	5.94E-04
	Carbon Tetrachloride	HAP	56235	1.77E-05	1.33E-04	6.65E-06
	Chlorobenzene	HAP	108907	1.29E-05	9.70E-05	4.85E-06
	Chloroform	HAP	67663	1.37E-05	1.03E-04	5.15E-06
	Dichloromethane (methylene chloride)	HAP	75092	4.12E-05	3.10E-04	1.55E-05
	Ethyl benzene	HAP	100414	2.48E-05	1.86E-04	9.32E-06
	Ethylene Dibromide	HAP	106934	2.13E-05	1.60E-04	8.01E-06
	Formaldehyde	HAP	50000	2.05E-02	1.54E-01	7.71E-03
	Methanol	HAP	67561	3.06E-03	2.30E-02	1.15E-03
	Naphthalene	HAP (POM)	91203	9.71E-05	7.30E-04	3.65E-05
	PAH	HAP (POM)	various	1.41E-04	1.06E-03	5.30E-05
	Styrene	HAP	100425	1.19E-05	8.95E-05	4.47E-06
	Toluene	HAP	108883	5.58E-04	4.20E-03	2.10E-04
	Vinyl Chloride	HAP	75014	7.18E-06	5.40E-05	2.70E-06
	Xylenes	HAP	1330207	1.95E-04	1.47E-03	7.33E-05
3	Total POMs	HAP	00017	2.38E-04	1.79E-03	8.95E-05
	Total HAPs				2.44E-01	1.22E-02

1 AP-42 emission factors are based on natural gas and LPG, AP-42 Chapter 3.2 Natural Gas-fired Reciprocating Engines, Table 3.2-3 (4-Stroke Rich-Burn Engines), July 2000.
2 N2O emission factors from 40 CFR 98 Subpart C, Table C-2, (N2O = 1.0 x 10^-4 kg N2O/MMBtu), November 29, 2013.
3 Individual polycyclic organic matter (POMs) are listed separately, but only counted in the Total HAPs as Total POMs. POMs include polycyclic aromatic hydrocarbon compounds (PAHs).

Waupaca AD1
Estimated Actual Emissions Calculations

Backup Generator 2 Estimated Actual Emissions

Assumptions:	
Rated Capacity, kW	750
Brake Horsepower, bhp	1,114
Natural Gas Rated Capacity, MMBtu/hr	7.5
Hours of Operation	100
Fuel	Natural Gas
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
CO_2 to CO_2e	1
CH_4 to CO_2e	25
N_2O to CO_2e	298
Btu/MMBtu	1,000,000
hr/yr	8,760

	Pollutant	EPA Pollutant Type	CAS Number	AP-42 Emission Factors[1] (lb/MMBtu)	Natural Gas Hourly Emissions (lb/hr)	Natural Gas Annual Emissions (TPY)
	Criteria Pollutants					
	NO_X	criteria	NA	2.27	17.1	0.853
	CO	criteria	NA	3.72	28.0	1.40
	PM	criteria	NA	0.0194	0.146	7.30E-03
	PM10	criteria	NA	0.0194	0.146	7.30E-03
	PM2.5	criteria	NA	0.0194	0.146	7.30E-03
	SO_2	criteria	NA	5.88E-04	4.42E-03	2.21E-04
	VOC	criteria	NA	0.0296	0.223	0.0111
	Greenhouse Gases					
	CO_2e	GHG	NA	115.8	871	43.5
	CO_2	GHG	NA	110.0	827	41.35
	CH4	GHG	NA	0.230	1.73	0.086
2	N2O	GHG	NA	2.20E-04	1.66E-03	8.29E-05
	Hazardous Air Pollutants					
	1,1,2,2-Tetrachloroethane	HAP	79345	2.53E-05	1.90E-04	9.51E-06
	1,1,2-Trichloroethane	HAP	79005	1.53E-05	1.15E-04	5.75E-06
	1,3-Butadiene	HAP	106990	6.63E-04	4.98E-03	2.49E-04
	1,3-Dichloropropene	HAP	542756	1.27E-05	9.55E-05	4.77E-06
	Acetaldehyde	HAP	75070	2.79E-03	2.10E-02	1.05E-03
	Acrolein	HAP	107028	2.63E-03	1.98E-02	9.89E-04
	Benzene	HAP	71432	1.58E-03	1.19E-02	5.94E-04
	Carbon Tetrachloride	HAP	56235	1.77E-05	1.33E-04	6.65E-06
	Chlorobenzene	HAP	108907	1.29E-05	9.70E-05	4.85E-06
	Chloroform	HAP	67663	1.37E-05	1.03E-04	5.15E-06
	Dichloromethane (methylene chloride)	HAP	75092	4.12E-05	3.10E-04	1.55E-05
	Ethyl benzene	HAP	100414	2.48E-05	1.86E-04	9.32E-06
	Ethylene Dibromide	HAP	106934	2.13E-05	1.60E-04	8.01E-06
	Formaldehyde	HAP	50000	2.05E-02	1.54E-01	7.71E-03
	Methanol	HAP	67561	3.06E-03	2.30E-02	1.15E-03
	Naphthalene	HAP (POM)	91203	9.71E-05	7.30E-04	3.65E-05
	PAH	HAP (POM)	various	1.41E-04	1.06E-03	5.30E-05
	Styrene	HAP	100425	1.19E-05	8.95E-05	4.47E-06
	Toluene	HAP	108883	5.58E-04	4.20E-03	2.10E-04
	Vinyl Chloride	HAP	75014	7.18E-06	5.40E-05	2.70E-06
	Xylenes	HAP	1330207	1.95E-04	1.47E-03	7.33E-05
3	Total POMs	HAP	00017	2.38E-04	1.79E-03	8.95E-05
	Total HAPs				2.44E-01	1.22E-02

1 AP-42 emission factors are based on natural gas and LPG, AP-42 Chapter 3.2 Natural Gas-fired Reciprocating Engines, Table 3.2-3 (4-Stroke Rich-Burn Engines), July 2000.
2 N2O emission factors from 40 CFR 98 Subpart C, Table C-2, (N2O = 1.0 x 10^-4 kg N2O/MMBtu), November 29, 2013.
3 Individual polycyclic organic matter (POMs) are listed separately, but only counted in the Total HAPs as Total POMs. POMs include polycyclic aromatic hydrocarbon compounds (PAHs).

Fire Pump Estimated Actual Emissions

Assumptions:	
Rated Capacity, Horsepower (HP)	106
Diesel Fuel Consumption Rate, gal/hr	3.2
Rated Capacity, MMBtu/hr	0.44
Fuel Sulfur Content (%)	0.0015
Hours of Operation	100
Diesel Average Heating Value (Btu/lb) [4]	19,300
Diesel Density (lb/gal) [4]	7.1
Conversion Factors:	
lb/ton	2,000
lb/kg	2.204
lb/g	0.002204
kW to HP	1.34
Btu/MMBtu	1,000,000
hr/yr	8,760

Pollutant	EPA Pollutant Type	CAS Number	Emission Factors[1,2,3] (lb/MMBtu)	Hourly Emissions (lb/hr)	Annual Emissions (TPY)
Criteria Pollutants					
NO_X	criteria	NA	4.41	1.93	0.0967
CO	criteria	NA	0.95	0.417	0.0208
PM	criteria	NA	0.31	0.136	6.80E-03
PM10	criteria	NA	0.31	0.136	6.80E-03
PM2.5	criteria	NA	0.31	0.136	6.80E-03
SO_2	criteria	NA	1.52E-03	6.64E-04	3.32E-05
VOC	criteria	NA	0.350	0.153	7.67E-03
Greenhouse Gases					
CO_2e	GHG	NA	163.1	71.5	3.57
CO_2	GHG	NA	6.61E-03	2.90E-03	1.45E-04
CH4	GHG	NA	1.32E-03	5.80E-04	2.90E-05
N2O	GHG	NA	---	71.7	3.59
Hazardous Air Pollutants					
1,3-Butadiene	HAP	106990	3.91E-05	1.71E-05	8.57E-07
Acenaphthene	HAP (POM)	83329	1.42E-06	6.23E-07	3.11E-08
Acenaphthylene	HAP (POM)	208968	5.06E-06	2.22E-06	1.11E-07
Acetaldehyde	HAP	75070	7.67E-04	3.36E-04	1.68E-05
Acrolein	HAP	107028	9.25E-05	4.06E-05	2.03E-06
Anthracene	HAP (POM)	120127	1.87E-06	8.20E-07	4.10E-08
Benzene	HAP	71432	9.33E-04	4.09E-04	2.05E-05
Benzo(a)anthracene	HAP (POM)	56553	1.68E-06	7.37E-07	3.68E-08
Benzo(a)pyrene	HAP (POM)	50328	1.88E-07	8.24E-08	4.12E-09
Benzo(b)fluoranthene	HAP (POM)	205992	9.91E-08	4.35E-08	2.17E-09
Benzo(g,h,i)perylene	HAP (POM)	191242	4.89E-07	2.14E-07	1.07E-08
Benzo(k)fluoranthene	HAP (POM)	207089	1.55E-07	6.80E-08	3.40E-09
Chrysene	HAP (POM)	218019	3.53E-07	1.55E-07	7.74E-09
Dibenzo(a,h)anthracene	HAP (POM)	53703	5.83E-07	2.56E-07	1.28E-08
Fluoranthene	HAP (POM)	206440	7.61E-06	3.34E-06	1.67E-07
Fluorene	HAP (POM)	86737	2.92E-05	1.28E-05	6.40E-07
Formaldehyde	HAP	50000	1.18E-03	5.17E-04	2.59E-05
Indeno(1,2,3-cd)pyrene	HAP (POM)	193395	3.75E-07	1.64E-07	8.22E-09
Naphthalene	HAP (POM)	91203	8.48E-05	3.72E-05	1.86E-06
Phenanthrene	HAP (POM)	85018	2.94E-05	1.29E-05	6.45E-07
Pyrene	HAP (POM)	129000	4.78E-06	2.10E-06	1.05E-07
Toluene	HAP	108883	4.09E-04	1.79E-04	8.97E-06
Xylenes	HAP	1330207	2.85E-04	1.25E-04	6.25E-06
Total POM [3]	HAP	00017	1.68E-04	7.37E-05	3.68E-06
Total HAPs				0.0017	8.49E-05

1 Emission factors for NOx, CO, PM, PM10, PM2.5, and VOC are based on diesel fuel, AP-42 Chapter 3.3 Gasoline And Diesel Industrial Engines, Tables 3.3-1 and 3.3-2, October 1996. Non-methane hydrocarbons are assumed to equal total hydrocarbons. PM, PM10, and PM2.5 are assumed to be equivalent. SO2 emission factor based on diesel fuel, AP-42 Chapter 3.4 Large Stationary Diesel And All Stationary Dual-fuel Engines, Table 3.4-1, October 1996.

2 Individual polycyclic organic matter (POM) are listed separately, but only counted in the Total HAPs as Total POM. POM include polycyclic aromatic hydrocarbon compounds (PAHs).

3 Greenhouse Gas (GHG) emission factors based on 40 CFR pt. 98, Table C-1 and C-2. Assume Distillate Fuel Oil No. 2 factors for diesel.

ORA Building and Hydrolysis Tanks Estimated Actual Emissions

Exhaust Stream Data from System Specification Sheets

Exhaust Stream	ORA Building (Process Area)		ORA Building (Non-Process Area)	Hydrolysis Tanks	
Description	ColdOX System Inlet	ColdOX System Outlet	Rooftop Unit Exhaust	DEO Unit Inlet	DEO Unit Outlet
Volumetric Flow (ft^3/h)	3,023,392	3,023,392	51,240	31,255	31,255
Volumetric Flow (m^3/h)	85,613	85,613	1,452	855	855
Hazardous Air Contaminants					
Average NH_3 (ppm)	9	1	5	87	4
Average NH_3 (mg/m^3)	6	1	4	61	3
Total NH_3 (mg/h)	547,444	54,744	5,084	54,022	2,701
Total NH_3 (g/h)	547	55	5	54	3
Average H_2S (ppm)	8	1	5	53	3
Average H_2S (mg/m3)	11	1	7	75	4
Total H_2S (mg/h)	926,888	92,689	10,167	66,045	3,302
Total H_2S (g/h)	927	93	10	66	3
NH_3 (lb/hr) [1]	1.21	*0.121*	0.0112	0.119	*0.00595*
NH_3 (tpy) [1]	5.29	*0.529*	0.0491	0.522	*0.0261*
H_2S (lb/hr) [2]	2.04	*0.204*	0.0224	0.146	*0.00728*
H_2S (tpy) [2]	8.95	*0.895*	0.0982	0.638	*0.0319*
NH_3 Removal Efficiency (%)	90		N/A	95	
H_2S Removal Efficiency (%)	90		N/A	95	
Criteria Pollutants					
NO_X (lb/hr) [3]	---	---	---	---	0.127
NO_X (tpy)	---	---	---	---	0.558
SO_2 (lb/hr) [4]	---	---	---	---	0.274
SO_2 (tpy)	---	---	---	---	1.20

[1] As a worst-case assumption, NH_3 emissions are calculated assuming 0% removal by the odor control system

[2] As a worst-case assumption, H_2S emissions are calculated assuming 0% removal by the odor control system

Note: The ColdOx system is a low temperature air treatment, so it will not create NO_X, but mainly convert NH_3 and H_2S to ammonium sulfate salt and similar compounds, which are water soluble. The DEO system uses elevated temperature and oxygen to destroy H_2S, forming some NO_X and SO_2 in the process.

[3] Emissions of NO_X estimated assuming that all NH_3 is converted to NO_2 by the DEO odor control system

$4NH_3 + 7O_2 \rightarrow 4NO_2 + 6H_2O$

NH_3 Molecular Weight (lb/lbmol) 43.03

NO_2 Molecular Weight (lb/lbmol) 46.01

Mass emission rate of NO2 - Example Calculation: (0.12 lb NH3/hr) * (1 lbmol NH3/43.03 lb H2S) * (4 lbmol NH3/4 lbmol NO2) * (46.01 lb NO2/lbmol NO2) = 0.13 lb NO2/hr

[4] Emissions of SO_2 estimated assuming that all H_2S is converted to SO_2 by the DEO odor control system

$2H_2S + 3O_2 \rightarrow 2SO_2 + 2H_2O$

H_2S Molecular Weight (lb/lbmol) 34.10

SO_2 Molecular Weight (lb/lbmol) 64.07

Mass emission rate of SO2 - Example Calculation: (0.15 lb H2S/hr) * (1 lbmol H2S/34.10 lb H2S) * (2 lbmol H2S/2 lbmol SO2) * (64.07 lb SO2/lbmol SO2) = 0.27 lb SO2/hr

Appendix F

Biogas Hydrogen Sulfide Data – Salisbury, VT Co-Digestion Facility

BRAUN
INTERTEC

Salisbury (Both Digesters)	Mean H2S Content, ppm	Standard Deviation, ppm H2S	Mean + 2 Standard Deviations, ppm H2S
January	209.0	101.4	411.7
February	150.2	71.7	293.5
March	74.5	25.0	124.5
April	246.6	115.7	478.0
May	217.4	65.0	347.5
June	253.6	59.5	372.6
July	201.8	37.7	277.1
August	193.7	48.4	290.4
September	211.0	63.4	337.8
October	265.1	46.5	358.1
November	313.1	69.0	451.0
December	232.4	65.8	364.1
		MAX	**478.0**