

February 1, 2024

Derek Kramer, Chief Operating Officer  
Lightning Renewables, LLC.  
Missoula RNG  
201 Helios Way, Floor 6  
Houston, TX 77079

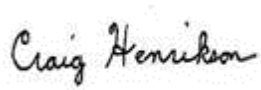
Sent via email: [dkramer@archaea.energy](mailto:dkramer@archaea.energy)

**RE: Final Decision for MAQP #5286-01**

Dear Mr. Kramer:

Montana Air Quality Permit (MAQP) #5286-01 is deemed final as of January 26, 2024, by DEQ. This permit is for a landfill gas processing system. All conditions of the Decision remain the same. Enclosed is a copy of your permit with the final date indicated.

For DEQ,



Craig P. Henrikson, P.E.  
Interim Permitting Services Section Supervisor  
Air Quality Bureau  
(406) 444-6711



John P. Proulx  
Air Quality Engineer  
Air Quality Bureau  
(406) 444-5391

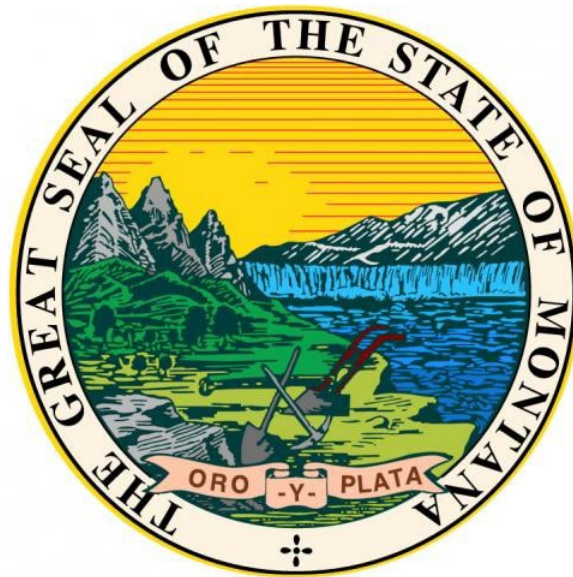
Enclosures

Montana Department of Environmental Quality  
Air, Energy & Mining Division  
Air Quality Bureau

Montana Air Quality Permit #5286-01

Lightning Renewables, LLC.  
Missoula RNG  
201 Helios Way, Floor 6  
Houston, TX 77027

January 26, 2024



# MONTANA AIR QUALITY PERMIT

Issued To: Lightning Renewables, LLC  
dba Lightning Renewables -  
Missoula RNG Facility  
3737 Coal Mine Rd  
Missoula, MT 59802

MAQP: #5286-01  
Administrative Amendment (AA) Request  
Received: 12/26/2023  
DEQ's Decision on AA: 01/10/2024  
Permit Final: 01/26/2024

A Montana Air Quality Permit (MAQP), with conditions, is hereby granted to Lightning Renewables, LLC dba Lightning Renewables – Missoula RNG facility (Lightning Renewables), pursuant to Sections 75-2-204 and 211 of the Montana Code Annotated (MCA), as amended, and Administrative Rules of Montana (ARM) 17.8.740, *et seq.*, as amended, for the following:

## Section I: Permitted Facilities

### A. Plant Location

The Lightning Renewables landfill gas collection system is located approximately 0.6 miles from the nearest commercial facility and 0.44 miles from the nearest private farmstead which is located directly east of the proposed pad for the new equipment. The proposed pad is located within Section 5, Township 13 North and Range 19 West. The surrounding area property is generally identified as “landfill” with legal parcels both under the ownership of Allied Waste and BFI Waste Systems. Existing ownership of Allied Waste and BFI Waste Systems are within Sections 5, 8, and 9 within Township 13 North and Range 19 West. Gas collection will occur in those areas producing enough methane from decomposing waste. The physical address of Lightning Renewables is 3737 Cole Mine Road, Missoula MT. The physical pad site is located within a legal parcel owned and operated as a landfill by Allied Waste Systems of Montana, LLC. Lightning Renewables will operate independent of the landfill.

### B. Current Permit Action

On December 26, 2023, the Department of Environmental Quality (DEQ) received a notification from Archaea Energy, on behalf of Lightning Renewables, LLC., of their corporate office change of address.

## Section II: Conditions and Limitations

### A. Emission Limitations

1. Lightning Renewables shall install and continuously operate process instrumentation to demonstrate that a minimum temperature of 1500 F (on a 15-minute rolling average) is being maintained whenever waste gas is being combusted in the TRO (ARM 17.8.749 and ARM 17.8.752).
2. Lightning Renewables shall not send waste gases to the TRO until the TRO temperatures have achieved 1500 degrees Fahrenheit (°F) and stabilized according to permit condition Section II.A.1 (ARM 17.8.749).

3. Lightning Renewables shall use pipeline quality natural gas as supplemental fuel for the backup flare and TRO and maintain good combustion practices to minimize emissions (ARM 17.8.749 and ARM 17.8.752).
4. Lightning Renewables shall install a TRO with design specifications for no less than 99.0 percent destruction efficiency or 20 parts per million volume (ppmv) as hexane (ARM 17.8.749 and ARM 17.8.752).
5. Lightning Renewables shall install a shrouded flare with design specifications for no less than 98.0 percent destruction efficiency (ARM 17.8.749 and ARM 17.8.752).
6. Emissions from TRO shall not exceed the following based on a 1-hour average (ARM 17.8.749 and ARM 17.8.752):

Oxides of Nitrogen (NO<sub>x</sub>) – 1.2 lb/hr  
 Carbon Monoxide (CO) – 2.4 pounds per hour (lb/hr)  
 Volatile Organic Compounds (VOC) – 1.5 lb/hr  
 Sulphur Dioxide (SO<sub>2</sub>) – 0.81 lb/hr  
 Hazardous Air Pollutants (HAPs) – . 4 lb/hr  
 Total Particulate Matter (PM<sub>Tot</sub>) – 0.3 lb/hr  
 Filterable and Condensable PM with an aerodynamic diameter of 10 microns or less (PM<sub>10</sub>) – 0.3 lb/hr  
 Filterable and Condensable PM with an aerodynamic diameter of 2.5 microns or less (PM<sub>2.5</sub>) – 0.3 lb/hr

7. Lightning Renewables shall install, operate, and maintain a shrouded “backup” flare to control emissions while the TRO is nonoperational (ARM 17.8.749 and ARM 17.8.752).
8. Emissions from backup flare shall not exceed the following based on a 1-hour average (ARM 17.8.749):

Oxides of Nitrogen (NO<sub>x</sub>) – 5.6 lb/hr  
 Carbon Monoxide (CO) – 24.3 pounds per hour (lb/hr)  
 Volatile Organic Compounds (VOC) – 0.52 lb/hr  
 Sulphur Dioxide (SO<sub>2</sub>) – 0.81 lb/hr  
 Hazardous Air Pollutants (HAPs) – .42 lb/hr  
 Total Particulate Matter (PM) – 1.5 lb/hr  
 Filterable and Condensable PM with an aerodynamic diameter of 10 microns or less (PM<sub>10</sub>) – 1.5 lb/hr  
 Filterable and Condensable PM with an aerodynamic diameter of 2.5 microns or less (PM<sub>2.5</sub>) – 1.5 lb/hr

9. Lightning Renewables shall limit heat input to the backup flare to 513,179 MMBtu/yr within a calendar year (or on a rolling 12-month basis if better approach) (ARM 17.8.749).

10. Lightning Renewables shall monitor and record the heat input to the backup flare in units of MMBtu/yr to facilitate compliance with condition Section II.A.9 (ARM 17.8.749).
11. Lightning Renewables shall limit the hours of operation of the backup flare to 7,000 hours per calendar year (hr/yr) (ARM 17.8.1204).
12. Lightning Renewables shall record and maintain the individual hours of operation of the TRO and backup flare (ARM17.8.749 and ARM 17.8.1212).
13. Lightning Renewables shall comply with all applicable standards and limitations, and the reporting, recordkeeping, and notification requirements contained in 40 CFR 60, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines and 40 CFR 63, Subpart ZZZZ, National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines, for any applicable diesel engine (ARM 17.8.340; 40 CFR 60, Subpart IIII; ARM 17.8.342 and 40 CFR 63, Subpart ZZZZ).
14. Lightning Renewables shall not cause or authorize emissions to be discharged into the outdoor atmosphere from the TRO or shrouded flare that exhibit an opacity of 10% or greater averaged over 6 consecutive minutes (ARM 17.8.316).
15. Lightning Renewables shall not cause or authorize emissions to be discharged into the outdoor atmosphere from any sources installed after November 23, 1968, that exhibit an opacity of 20% or greater averaged over 6 consecutive minutes (ARM 17.8.304).
16. Lightning Renewables shall not cause or authorize the use of any street, road, or parking lot without taking reasonable precautions to control emissions of airborne particulate matter (ARM 17.8.308).

#### B. Testing Requirements

1. All compliance source tests shall conform to the requirements of the Montana Source Test Protocol and Procedures Manual (ARM 17.8.106).
2. Lightning Renewables shall conduct initial source testing within 180 days of the initial startup of the TRO to demonstrate the destruction efficiency of the TRO to demonstrate compliance with the minimum destruction efficiency of either 99.0 percent or an outlet concentration of 20 ppmv of hexane.

Lightning Renewables shall utilize EPA Methods 25A, 7E, & 10 and/or equivalent methods to determine/validate VOC, NO<sub>x</sub>, & CO destruction performance respectively. Testing for NO<sub>x</sub> and CO shall occur concurrently (ARM 17.8.749).

3. Lightning Renewables shall conduct weekly observations for visible opacity of the TRO or flare, whichever is in operation. If visible opacity is observed, Lightning Renewables shall conduct an EPA Method 9 Visible Opacity determination to confirm opacity limits in Section II.A.14 (ARM 17.8.749).

4. In lieu of testing on the backup flare, Lightning Renewables shall submit the final design specifications for the backup flare installed for the project with an intended minimum design of 98.0 percent destruction efficiency. Design specifications shall include the calculations to support the calculated residence time and design minimum operating temperature (ARM 17.8.749).
5. DEQ may require further testing (ARM 17.8.105).

### C. Operational Reporting Requirements

1. Lightning Renewables shall supply DEQ with annual production information for all emission points, as required by DEQ in the annual emission inventory request. The request will include, but is not limited to, all sources of emissions identified in the emission inventory contained in the permit analysis.

Production information shall be gathered on a calendar-year basis and submitted to DEQ by the date required in the emission inventory request. Information shall be in the units required by DEQ. This information may be used to calculate operating fees, based on actual emissions from the facility, and/or to verify compliance with permit limitations (ARM 17.8.505). Lightning Renewables shall submit the following information annually to DEQ by March 1 of each year; the information may be submitted along with the annual emission inventory (ARM 17.8.505).

- a. hours of operation of the TRO
- b. hours of operation of the backup flare
- c. weekly opacity observations
- d. EPA Method 9 Test results

2. Lightning Renewables shall notify DEQ of any construction or improvement project conducted, pursuant to ARM 17.8.745, that would include the addition of a new emissions unit, change in control equipment, stack height, stack diameter, stack flow, stack gas temperature, source location, or fuel specifications, or would result in an increase in source capacity above its permitted operation.

The notice must be submitted to the DEQ, in writing, 10 days prior to startup or use of the proposed de minimis change, or as soon as reasonably practicable in the event of an unanticipated circumstance causing the de minimis change and must include the information requested in ARM 17.8.745(l)(d) (ARM 17.8.745).

3. All records compiled in accordance with this permit must be maintained by Lightning Renewables as a permanent business record for at least 5 years following the date of the measurement, must be available at the plant site for inspection by DEQ, and must be submitted to DEQ upon request. These records may be stored at a location other than the plant site upon approval by DEQ (ARM 17.8.749).

4. Lightning Renewables shall annually certify that its actual emissions are less than those that would require the source to obtain an air quality operating permit as required by ARM 17.8.1204(3)(b). The annual certification shall comply with the certification requirements of ARM 17.8.1207. The annual certification shall be submitted along with the annual emission inventory information (ARM 17.8.749 and ARM 17.8.1204).

#### D. Notifications

Lightning Renewables shall provide DEQ with written notification of the following information within the specified time periods (ARM 17.8.749):

Start-up date of the TRO and backup flare within 15 working days of the start-up date of each unit

### SECTION III: General Conditions

- A. Inspection – Lightning Renewables shall allow DEQ’s representatives access to the source at all reasonable times for the purpose of making inspections or surveys, collecting samples, obtaining data, auditing any monitoring equipment such as Continuous Emission Monitoring Systems (CEMS) or Continuous Emission Rate Monitoring Systems (CERMS), or observing any monitoring or testing, and otherwise conducting all necessary functions related to this permit.
- B. Waiver – The permit and the terms, conditions, and matters stated herein shall be deemed accepted if Lightning Renewables fails to appeal as indicated below.
- C. Compliance with Statutes and Regulations – Nothing in this permit shall be construed as relieving Lightning Renewables of the responsibility for complying with any applicable federal or Montana statute, rule, or standard, except as specifically provided in ARM 17.8.740, *et seq.* (ARM 17.8.756).
- D. Enforcement – Violations of limitations, conditions and requirements contained herein may constitute grounds for permit revocation, penalties, or other enforcement action as specified in Section 75-2-401, *et seq.*, MCA.
- E. Appeals – Any person or persons jointly or severally adversely affected by DEQ’s decision may request, within 15 days after DEQ renders its decision, upon affidavit setting forth the grounds therefor, a hearing before the Board of Environmental Review (Board). A hearing shall be held under the provisions of the Montana Administrative Procedures Act.

The filing of a request for a hearing does not stay the DEQ’s decision, unless the Board issues a stay upon receipt of a petition and a finding that a stay is appropriate under Section 75-2-211(11)(b), MCA. The issuance of a stay on a permit by the Board postpones the effective date of the DEQ’s decision until conclusion of the hearing and issuance of a final decision by the Board. If a stay is not issued by the Board, the DEQ’s decision on the application is final 16 days after DEQ’s decision is made.

- F. Permit Inspection – As required by ARM 17.8.755, Inspection of Permit, a copy of the air quality permit shall be made available for inspection by DEQ at the location of the source.
- G. Permit Fee – Pursuant to Section 75-2-220, MCA, failure to pay the annual operation fee by Lightning Renewables may be grounds for revocation of this permit, as required by that section and rules adopted thereunder by the Board.
- H. Duration of Permit – Construction or installation must begin, or contractual obligations entered into that would constitute substantial loss within 3 years of permit issuance and proceed with due diligence until the project is complete or the permit shall expire (ARM 17.8.762).



Montana Air Quality Permit Analysis  
Lightning Renewables, LLC  
MAQP #5286-01

I. Introduction/Process Description

Lightning Renewables, LLC dba Lightning Renewables – Missoula RNG Facility (Lightning Renewables) installed and operates a landfill gas (LFG) processing system. The legal address of the facility is Section 5, Township 13 North, and Range 19 West. The physical address is 3737 Cole Mine Road, Missoula MT. The LFG processing facility is located at an existing municipal solid waste landfill owned and operated by Allied Waste Systems of Montana, LLC (Allied Waste). Lightning Renewables operates independently of the landfill.

A. Permitted Equipment

Lightning Renewables installed and operates a landfill gas processing system for the purpose of collecting, refining, and injecting renewable natural gas from an existing landfill into an existing natural gas pipeline. Equipment includes:

- Thermal recuperative oxidizer (TRO)
- Shrouded Backup flare
- 324 horsepower (hp) diesel generator
- Associated equipment including a closed system processing treatment train (treatment train) which conditions the waste gas received from the landfill allowing for the methane to be recovered and for the waste gases to be combusted either in the TRO or Backup flare.

B. Source Description

Lightning Renewables Missoula RNG plant utilizes landfill gas (LFG) generated from the Allied Waste as feedstock. The LFG received at Missoula RNG undergoes processing, consisting of dewatering/moisture removal, sulfur compound removal, filtration, temperature swing adsorption, membrane separation, and pressure swing adsorption. The refined RNG consists of greater than 95% methane, that is compressed and injected into a nearby natural gas transmission pipeline. The project uses thermal oxidizer pollution control equipment, a backup flare, and a diesel-fired emergency generator.

Currently, all landfill gases are collected at Allied Waste and are vented to an existing flare where they are combusted without the ability to recover any of the methane for beneficial use. The Allied Waste flare will continue to remain as a secondary backup for the new Lightning Renewables facility should Lightning Renewables suffer process upsets where waste gases are unable to be combusted by the new Lightning Renewables backup flare. Allied Waste currently holds an existing Title V Operating Permit (#OP2831-07) which authorizes the operation of the gas collection system and existing flare. The Title V Operating Permit for Allied Waste will remain in effect regardless of the status of this Montana Air Quality Permit (MAQP) being issued for Lightning Renewables.

The Lightning Renewables backup flare has 4 feasible modes of operation:

Mode 1: Land Fill Gas (LFG) from the landfill that is received during a Lightning Renewables power outage and, consequently, is sent to the flare after sulfur removal but prior to refinement.

Mode 2: LFG that is flared post-CO<sub>2</sub> removal due to process upset.

Mode 3: Off-specification product RNG of up to 97.5% CH<sub>4</sub> that is rejected by the pipeline for various reasons.

Mode 4: Temperature swing adsorption blowdown or vessel purge

C. Permit History

**MAQP #8262-00** was issued to Lightning Renewables, LLC. on May 8, 2023.

D. Current Permit Action

On December 26, 2023, DEQ received a notification from Archaea Energy, the parent company of Lightning Renewables, LLC., of a change of address. **MAQP #5286-01** replaces MAQP #5286-00.

II. Applicable Rules and Regulations

The following are partial explanations of some applicable rules and regulations that apply to the facility. The complete rules are stated in the Administrative Rules of Montana (ARM) and are available, upon request, from DEQ. Upon request, DEQ will provide references for the location of complete copies of all applicable rules and regulations or copies where appropriate.

A. ARM 17.8, Subchapter 1 – General Provisions, including but not limited to:

1. ARM 17.8.101 Definitions. This rule includes a list of applicable definitions used in this chapter, unless indicated otherwise in a specific subchapter.
2. ARM 17.8.105 Testing Requirements. Any person or persons responsible for the emission of any air contaminant into the outdoor atmosphere shall, upon written request of DEQ, provide the facilities and necessary equipment (including instruments and sensing devices) and shall conduct tests, emission or ambient, for such periods of time as may be necessary using methods approved by DEQ.
3. ARM 17.8.106 Source Testing Protocol. The requirements of this rule apply to any emission source testing conducted by DEQ, any source or other entity as required by any rule in this chapter, or any permit or order issued pursuant to this chapter, or the provisions of the Clean Air Act of Montana, 75-2-101, *et seq.*, Montana Code Annotated (MCA).

Lightning Renewables shall comply with the requirements contained in the Montana Source Test Protocol and Procedures Manual, including, but not limited to, using the proper test methods and supplying the required reports.

A copy of the Montana Source Test Protocol and Procedures Manual is available from DEQ upon request.

4. ARM 17.8.110 Malfunctions. (2) DEQ must be notified promptly by telephone whenever a malfunction occurs that can be expected to create emissions in excess of any applicable emission limitation or to continue for a period greater than 4 hours.
5. ARM 17.8.111 Circumvention. (1) No person shall cause or permit the installation or use of any device or any means that, without resulting in reduction of the total amount of air contaminant emitted, conceals or dilutes an emission of air contaminant that would otherwise violate an air pollution control regulation. (2) No equipment that may produce emissions shall be operated or maintained in such a manner as to create a public nuisance.

B. ARM 17.8, Subchapter 2 – Ambient Air Quality, including, but not limited to the following:

1. ARM 17.8.204 Ambient Air Monitoring
2. ARM 17.8.210 Ambient Air Quality Standards for Sulfur Dioxide
3. ARM 17.8.211 Ambient Air Quality Standards for Nitrogen Dioxide
4. ARM 17.8.212 Ambient Air Quality Standards for Carbon Monoxide
5. ARM 17.8.213 Ambient Air Quality Standard for Ozone
6. ARM 17.8.214 Ambient Air Quality Standard for Hydrogen Sulfide
7. ARM 17.8.220 Ambient Air Quality Standard for Settled Particulate Matter
8. ARM 17.8.221 Ambient Air Quality Standard for Visibility
9. ARM 17.8.222 Ambient Air Quality Standard for Lead
10. ARM 17.8.223 Ambient Air Quality Standard for PM<sub>10</sub>
11. ARM 17.8.230 Fluoride in Forage

Lightning Renewables must maintain compliance with the applicable ambient air quality standards.

C. ARM 17.8, Subchapter 3 – Emission Standards, including, but not limited to:

1. ARM 17.8.304 Visible Air Contaminants. This rule requires that no person may cause or authorize emissions to be discharged into the outdoor atmosphere from any source installed after November 23, 1968, that exhibit an opacity of 20% or greater averaged over 6 consecutive minutes.
2. ARM 17.8.308 Particulate Matter, Airborne. (1) This rule requires an opacity limitation of less than 20% for all fugitive emission sources and that reasonable precautions be taken to control emissions of airborne particulate matter. (2) Under this rule, Lightning Renewables shall not cause or authorize the use of any street, road, or parking lot without taking reasonable precautions to control emissions of airborne particulate matter.
3. ARM 17.8.309 Particulate Matter, Fuel Burning Equipment. This rule requires that no person shall cause, allow, or permit to be discharged into the atmosphere particulate matter caused by the combustion of fuel in excess of the amount determined by this rule.

4. ARM 17.8.310 Particulate Matter, Industrial Process. This rule requires that no person shall cause, allow, or permit to be discharged into the atmosphere particulate matter in excess of the amount set forth in this rule.
5. ARM 17.8.316 Incinerators. This rule requires that no person may cause or authorize emissions to be discharged into the outdoor atmosphere from any incinerator, particulate matter in excess of 0.10 grains per standard cubic foot of dry flue gas, adjusted to 12% carbon dioxide and calculated as if no auxiliary fuel had been used. Further, no person shall cause or authorize to be discharged into the outdoor atmosphere from any incinerator emissions that exhibit an opacity of 10% or greater averaged over 6 consecutive minutes.
6. ARM 17.8.322 Sulfur Oxide Emissions--Sulfur in Fuel. This rule requires that no person shall burn liquid, solid, or gaseous fuel in excess of the amount set forth in this rule.
7. ARM 17.8.324 Hydrocarbon Emissions--Petroleum Products. (3) No person shall load or permit the loading of gasoline into any stationary tank with a capacity of 250 gallons or more from any tank truck or trailer, except through a permanent submerged fill pipe, unless such tank is equipped with a vapor loss control device as described in (1) of this rule.
8. ARM 17.8.340 Standard of Performance for New Stationary Sources and Emission Guidelines for Existing Sources. This rule incorporates, by reference, 40 CFR Part 60, Standards of Performance for New Stationary Sources (NSPS). Lightning Renewables is considered an NSPS affected facility under 40 CFR Part 60 and is subject to the requirements of the following subparts.
  - a. 40 CFR 60, Subpart A – General Provisions apply to all equipment or facilities subject to an NSPS Subpart as listed below:
  - b. 40 CFR 60, Subpart JJJJ – Standard of Performance for Stationary Spark Ignition Internal Combustion Engines. The proposed engines are affected sources under this subpart because they are larger than 25 hp and are manufactured after January 1, 2008.
9. ARM 17.8.341 Emission Standards for Hazardous Air Pollutants. This source shall comply with the standards and provisions of 40 CFR Part 61, as appropriate.
  - a. 40 CFR 61, Subpart A – General Provisions apply to all equipment or facilities subject to a NESHAP Subpart as listed below:
  - b. 40 CFR 63, Subpart ZZZZ National Emission Standards for Hazardous Air Pollutants From Reciprocating Internal Combustion Engines. The proposed facility contains four stroke lean burn LFG engines at an area source of HAPs which are affected sources under 40 CFR 63 Subpart ZZZZ. However, because the LFG extraction and purification facility would be an area source of HAPs and not a major source of HAPs, the engines may meet the requirements of 40 CFR 63, Subpart ZZZZ by meeting the requirements of 40

CFR 60, Subpart IIII for spark ignition engines. No further requirements apply for such engines under 40 CFR 63, Subpart ZZZZ.

D. ARM 17.8, Subchapter 5 – Air Quality Permit Application, Operation, and Open Burning Fees, including, but not limited to:

1. ARM 17.8.504 Air Quality Permit Application Fees. This rule requires that an applicant submit an air quality permit application fee concurrent with the submittal of an air quality permit application. A permit application is incomplete until the proper application fee is paid to DEQ. An application fee was not required because the current permit action is considered an administrative change.
2. ARM 17.8.505 Air Quality Operation Fees. An annual air quality operation fee must, as a condition of continued operation, be submitted to DEQ by each source of air contaminants holding an air quality permit (excluding an open burning permit) issued by DEQ. The air quality operation fee is based on the actual or estimated actual amount of air pollutants emitted during the previous calendar year.

An air quality operation fee is separate and distinct from an air quality permit application fee. The annual assessment and collection of the air quality operation fee, described above, shall take place on a calendar-year basis. DEQ may insert into any final permit issued after the effective date of these rules, such conditions as may be necessary to require the payment of an air quality operation fee on a calendar-year basis, including provisions that prorate the required fee amount.

E. ARM 17.8, Subchapter 7 – Permit, Construction, and Operation of Air Contaminant Sources, including, but not limited to:

1. ARM 17.8.740 Definitions. This rule is a list of applicable definitions used in this chapter, unless indicated otherwise in a specific subchapter.
2. ARM 17.8.743 Montana Air Quality Permits--When Required. This rule requires a person to obtain an air quality permit or permit modification to construct, modify, or use any air contaminant sources that have the potential to emit (PTE) greater than 25 tons per year of any pollutant. Lightning Renewables has a PTE greater than 25 tons per year of Carbon Monoxide (CO); therefore, an air quality permit is required.
3. ARM 17.8.744 Montana Air Quality Permits--General Exclusions. This rule identifies the activities that are not subject to the Montana Air Quality Permit program.
4. ARM 17.8.745 Montana Air Quality Permits--Exclusion for De Minimis Changes. This rule identifies the de minimis changes at permitted facilities that do not require a permit under the Montana Air Quality Permit Program.
5. ARM 17.8.748 New or Modified Emitting Units--Permit Application Requirements.  
(1) This rule requires that a permit application be submitted prior to installation, modification, or use of a source. A permit application was not required for the current permit action because the permit change is considered an administrative change. (7)

This rule requires that the applicant notify the public by means of legal publication in a newspaper of general circulation in the area affected by the application for a permit. An affidavit of publication of public notice was not required for the current permit action because the permit change is considered an administrative change.

6. ARM 17.8.749 Conditions for Issuance or Denial of Permit. This rule requires that the permits issued by DEQ must authorize the construction and operation of the facility or emitting unit subject to the conditions in the permit and the requirements of this subchapter. This rule also requires that the permit must contain any conditions necessary to assure compliance with the Federal Clean Air Act (FCAA), the Clean Air Act of Montana, and rules adopted under those acts.
7. ARM 17.8.752 Emission Control Requirements. This rule requires a source to install the maximum air pollution control capability that is technically practicable and economically feasible, except that BACT shall be utilized. A BACT analysis was not required for the current permit action because the permit change is considered an administrative change.
8. ARM 17.8.755 Inspection of Permit. This rule requires that air quality permits shall be made available for inspection by DEQ at the location of the source.
9. ARM 17.8.756 Compliance with Other Requirements. This rule states that nothing in the permit shall be construed as relieving Lightning Renewables of the responsibility for complying with any applicable federal or Montana statute, rule, or standard, except as specifically provided in ARM 17.8.740, *et seq.*
10. ARM 17.8.759 Review of Permit Applications. This rule describes DEQ's responsibilities for processing permit applications and making permit decisions on those permit applications that do not require the preparation of an environmental impact statement.
11. ARM 17.8.760 Additional Review of Permit Applications. This rule describes DEQ's responsibilities for processing permit applications and making permit decisions on those applications that require an environmental impact statement.
12. ARM 17.8.762 Duration of Permit. An air quality permit shall be valid until revoked or modified, as provided in this subchapter, except that a permit issued prior to construction of a new or modified source may contain a condition providing that the permit will expire unless construction is commenced within the time specified in the permit, which in no event may be less than 1 year after the permit is issued.
13. ARM 17.8.763 Revocation of Permit. An air quality permit may be revoked upon written request of the permittee, or for violations of any requirement of the Clean Air Act of Montana, rules adopted under the Clean Air Act of Montana, the FCAA, rules adopted under the FCAA, or any applicable requirement contained in the Montana State Implementation Plan (SIP).
14. ARM 17.8.764 Administrative Amendment to Permit. An air quality permit may be amended for changes in any applicable rules and standards adopted by the Board of Environmental Review (Board) or changed conditions of operation at a source or stack that do not result in an increase of emissions as a result of those changed

conditions. The owner or operator of a facility may not increase the facility's emissions beyond permit limits unless the increase meets the criteria in ARM 17.8.745 for a de minimis change not requiring a permit, or unless the owner or operator applies for and receives another permit in accordance with ARM 17.8.748, ARM 17.8.749, ARM 17.8.752, ARM 17.8.755, and ARM 17.8.756, and with all applicable requirements in ARM Title 17, Chapter 8, Subchapters 8, 9, and 10.

15. ARM 17.8.765 Transfer of Permit. This rule states that an air quality permit may be transferred from one person to another if written notice of intent to transfer, including the names of the transferor and the transferee, is sent to DEQ.
16. ARM 17.8.770 Additional Requirements for Incinerators. This rule specifies the additional information that must be submitted to DEQ for incineration facilities subject to 75-2-215, Montana Code Annotated (MCA).
17. ARM 17.8.771 Mercury Emission Standards for Mercury-Emitting Generating Units. This rule identifies mercury emission limitation requirements, mercury control strategy requirements, and application requirements for mercury-emitting generating units.

F. ARM 17.8, Subchapter 8 – Prevention of Significant Deterioration of Air Quality, including, but not limited to:

1. ARM 17.8.801 Definitions. This rule is a list of applicable definitions used in this subchapter.
2. ARM 17.8.818 Review of Major Stationary Sources and Major Modifications--Source Applicability and Exemptions. The requirements contained in ARM 17.8.819 through ARM 17.8.827 shall apply to any major stationary source and any major modification, with respect to each pollutant subject to regulation under the FCAA that it would emit, except as this subchapter would otherwise allow.

This facility is not a major stationary source because this facility is not a listed source and the facility's PTE is below 250 tons per year of any pollutant (excluding fugitive emissions).

G. ARM 17.8, Subchapter 12 – Operating Permit Program Applicability, including, but not limited to:

1. ARM 17.8.1201 Definitions. (23) Major Source under Section 7412 of the FCAA is defined as any source having:
  - a. PTE > 100 tons/year of any pollutant;
  - b. PTE > 10 tons/year of any one hazardous air pollutant (HAP), PTE > 25 tons/year of a combination of all HAPs, or lesser quantity as DEQ may establish by rule; or
  - c. PTE > 70 tons/year of particulate matter with an aerodynamic diameter of 10 microns or less (PM<sub>10</sub>) in a serious PM<sub>10</sub> nonattainment area.

2. ARM 17.8.1204 Air Quality Operating Permit Program. (1) Title V of the FCAA amendments of 1990 requires that all sources, as defined in ARM 17.8.1204(1), obtain a Title V Operating Permit. In reviewing and issuing MAQP #5286-01 for Lightning Renewables, the following conclusions were made:

- a. The facility's PTE is less than 100 tons/year for any pollutant.
- b. The facility's PTE is less than 10 tons/year for any one HAP and less than 25 tons/year for all HAPs.
- c. This source is not located in a serious PM<sub>10</sub> nonattainment area.
- d. This facility is subject to any current NSPS (40 CFR 60, Subparts A and IIII).
- e. This facility is not subject to any current NESHAP standards (40 CFR 63, Subpart A and ZZZZ).
- f. This source is not a Title IV affected source, or a solid waste combustion unit.
- g. This source is not an EPA designated Title V source.
- h. As allowed by ARM 17.8.1204(3), DEQ may exempt a source from the requirement to obtain an air quality operating permit by establishing federally enforceable limitations which limit that source's potential to emit.
  - i. In applying for an exemption under this section, the owner or operator of the source shall certify to DEQ that the source's potential to emit, does not require the source to obtain an air quality operating permit.
  - ii. Any source that obtains a federally enforceable limit on potential to emit shall annually certify that its actual emissions are less than those that would require the source to obtain an air quality operating permit.

Lightning Renewables has taken federally enforceable permit limits to keep potential emissions below major source permitting thresholds. Therefore, the facility is not a major source and, thus a Title V operating permit is not required.

DEQ determined that the annual reporting requirements contained in the permit are sufficient to satisfy this requirement.

3. ARM 17.8.1207 Certification of Truth, Accuracy, and Completeness.

Lightning Renewables shall annually certify that its actual emissions are less than those that would require the source to obtain an air quality operating permit as required by ARM 17.8.1204 (3)(b). The annual certification shall comply with requirements of ARM 17.8.1207. The annual certification shall be submitted along with the annual emission inventory information.

Based on these facts, DEQ determined that Lightning Renewables will be a minor source of emissions as defined under Title V based on a requested federally enforceable permit limit.



### III. BACT Determination

A BACT determination is required for each new or modified source. Lightning Renewables shall install on the new or modified source the maximum air pollution control capability, which is technically practicable and economically feasible, except that BACT shall be utilized.

A BACT analysis was not required because the current permit action is considered an administrative change.

### IV. Emission Inventory

<b>CONTROLLED</b> <b>Emission Source</b>	<b>tons/year</b>							
	<b>PM<sub>Tot</sub></b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>NO<sub>x</sub></b>	<b>CO</b>	<b>VOC</b>	<b>SO<sub>2</sub></b>	<b>HAPs</b>
Thermal Recuperative Oxidizer	0.87	0.87	0.87	5.19	10.38	6.18	3.55	1.75
Flare	5.14	5.15	5.15	18.71	85.28	1.82	2.84	1.46
Natural Gas Emissions – TRO	0.250	0.250	0.250	--	--	0.180	0.020	0.062
Natural Gas Emissions – Flare	0.003	0.003	0.003	0.003	0.035	0.002	0.000	0.001
Emergency Generator	0.015	0.015	0.015	0.532	0.134	0.532	0.001	0.532
<b>Total Emissions</b>	<b>6.27</b>	<b>6.27</b>	<b>6.27</b>	<b>23.90</b>	<b>95.70</b>	<b>8.17</b>	<b>6.40</b>	<b>3.28</b>

**Notes:**

1. Values in table reflect "controlled" cells from subsequent worksheets
2. The Flare calculations represent landfill gas emissions with no refinement
3. NO<sub>x</sub> and CO TRO natural gas emissions are included in WG emissions factor, vender outlet guarantee.
4. PM emissions for the TRO and Flare are assumed to be PM<sub>2.5</sub> Fil. and Cond.

**Thermal Recuperative Oxidizer**

Hours of Operation = 8,760.00 hours	8760	<b>hours</b>
pounds per ton = 0.000500 lb/ton	0.0005	<b>lb/ton</b>
PM Emissions:		
PM Emissions = 0.872 ton/yr AP 42, Table 2.4-5	0.87	<b>ton/yr</b>
PM-10 Emissions:		
Emission Factor = 0.199 lb/hr (Assume All PM is PMtotal)	0.20	<b>lb/hr</b>
Calculation: ((8,760.00 hours) * (0.20 lb/hr) * (ton/2000 lb) = 0.872 ton/yr	0.87	<b>ton/yr</b>
PM2.5 Emissions		
Emission Factor = 0.199 lb/hr (Assume All PM is PMTotal)	0.20	<b>lb/hr</b>
Calculation: ((8,760.00 hours) * (0.20 lb/hr) * (ton/2000 lb) = 0.872 ton/yr	0.87	<b>ton/yr</b>
NO <sub>x</sub> Emissions:		
Emission Factor = 1.185 lb/hr Vendor Guarantee	1.185	<b>lb/hr</b>
Calculation: ((1.19 hours) * (0.20 lb/hr) * (ton/2000 lb) = 5.190 ton/yr	5.19	<b>ton/yr</b>
CO Emissions:		
Emission Factor = 2.371 lb/hr Vendor Guarantee	2.371	<b>lb/hr</b>
Calculation: ((8,760.00 hours) * (2.37 lb/hr) * (ton/2000 lb) = 10.385 ton/yr	10.38	<b>ton/yr</b>

VOC Emissions:  
 Emission Factor = 1.41 lb/hr Vendor Guarantee 1.41 **lb/hr**  
 Calculation: ((8,760.00 hours) \* (1.41 lb/hr) \* (ton/2000 lb) = 6.176 ton/yr 6.18 **ton/yr**

SOx Emissions:  
 Emission Factor = 0.81 lb/hr Mass Balance/process design 0.81 **lb/hr**  
 Calculation: ((8,760.00 hours) \* (0.810000 lb/hr) \* (ton/2000 lb) = 3.548 ton/yr 3.54 **ton/yr**

HAPs Emissions:  
 Emission Factor = 0.4 lb/hr Sampling Data 0.4 **lb/hr**  
 Calculation: ((8,760 hours) \* (0.4000 lb/hr) \* (ton/2000 lb) = 1.752 ton/yr 1.75 **ton/yr**

**Shrouded Flare**

Hours of Operation = 7,000.00 hours 7000 **hours**  
 pounds per ton = 0.000500 lb/ton 0.0005 **lb/ton**

PM Emissions:  
 PM Emissions = 5.142 ton/yr (AP-42, Table 2.4-4) 5.14 **ton/yr**

PM<sub>10</sub> Emissions:  
 Emission Factor = 1.469 lb/hr (Assume all PM is PM<sub>2.5</sub>) 1.47 **lb/hr**  
 Calculation: ((7,000.00 hours) \* (1.47 lb/hr) \* (ton/2000 lb) = 5.142 ton/yr 5.14 **ton/yr**

PM<sub>2.5</sub> Emissions  
 Emission Factor = 1.47 lb/hr (Assume all PM is PM<sub>2.5</sub>) 1.47 **lb/hr**  
 Calculation: ((7,000.00 hours) \* (1.47 lb/hr) \* (ton/2000 lb) = 5.145 ton/yr 5.15 **ton/yr**

NO<sub>x</sub> Emissions:  
 Emission Factor = 5.345 lb/hr AP 42, Section 13.5 5.345 **lb/hr**  
 Calculation: ((5.35 hours) \* (1.47 lb/hr) \* (ton/2000 lb) = 18.708 ton/yr 18.71 **ton/yr**

CO Emissions:  
 Emission Factor = 24.366 lb/hr AP 42, Section 13.5 24.366 **lb/hr**  
 Calculation: ((7,000.00 hours) \* (24.37 lb/hr) \* (ton/2000 lb) = 85.281 ton/yr 85.28 **ton/yr**

VOC Emissions:  
 Emission Factor = 0.519 lb/hr AP 42, Section 2.4.4.1 0.519 **lb/hr**  
 Calculation: ((5.35 hours) \* (1.47 lb/hr) \* (ton/2000 lb) = 1.817 ton/yr 1.82 **ton/yr**

SO<sub>x</sub> Emissions:  
 Emission Factor = 0.81 lb/hr Mass Balance 8.10E-01 **lb/hr**  
 Calculation: ((5.35 hours) \* (1.47 lb/hr) \* (ton/2000 lb) = 2.835 ton/yr 2.84 **ton/yr**

HAPs Emissions:  
 Emission Factor = 0.418 lb/hr Sampling Data 0.418 **lb/hr**  
 Calculation: ((7,000 hours) \* (0.4180 lb/hr) \* (ton/2000 lb) = 1.463 ton/yr 1.46 **ton/yr**

**Natural Gas Emissions - TRO**

Hours of Operation = 8,760.00 hours	8760	<b>hours</b>
pounds per ton = 0.000500 lb/ton	0.0005	<b>lb/ton</b>
PM Emissions:		
PM Emissions = 0.250 ton/yr Manufacturers Emission	0.25	<b>ton/yr</b>
PM <sub>10</sub> Emissions:		
Emission Factor = 0.057 lb/hr Manufacturers Emission	0.06	<b>lb/hr</b>
Calculation: ((8,760.00 hours) * (0.06 lb/hr) * (ton/2000 lb) = 0.250 ton/yr	0.25	<b>ton/yr</b>
PM <sub>2.5</sub> Emissions		
Emission Factor = 0.057 lb/hr Manufacturers Emission	0.06	<b>lb/hr</b>
Calculation: ((8,760.00 hours) * (0.06 lb/hr) * (ton/2000 lb) = 0.250 ton/yr	0.25	<b>ton/yr</b>
NO <sub>x</sub> Emissions:		
Emission Factor = 1.185 lb/hr Vendor Guarantee      1.185 lb/hr		
Calculation: ((1.19 hours) * (0.66 lb/hr) * (ton/2000 lb) = 5.190 ton/yr      5.19 ton/yr		
VOC Emissions:		
Emission Factor = 0.041 lb/hr Vendor Guarantee	0.04	<b>lb/hr</b>
Calculation: ((8,760.00 hours) * (0.04 lb/hr) * (ton/2000 lb) = 0.180 ton/yr	0.18	<b>ton/yr</b>
SO <sub>x</sub> Emissions:		
Emission Factor = 0.0045 lb/hr Mass Balance/process design	0.004500	<b>lb/hr</b>
Calculation: ((8,760.00 hours) * (0.004500 lb/hr) * (ton/2000 lb) = 0.020 ton/yr	0.0197	<b>ton/yr</b>
HAPs Emissions:		
Emission Factor = 0.0142 lb/hr Sampling Data	1.42E-02	<b>lb/hr</b>
Calculation: ((8,760 hours) * (0.0142 lb/hr) * (ton/2000 lb) = 0.062 ton/yr	0.062	<b>ton/yr</b>

**Natural Gas Emissions - Flare**

Hours of Operation = 7,000.00 hours	7000	<b>hours</b>
pounds per ton = 0.000500 lb/ton	0.0005	<b>lb/ton</b>
PM Emissions:		
PM Emissions = 0.003 ton/yr (Assume all PM < 1.0 um)	0.00266	<b>ton/yr</b>
PM <sub>10</sub> Emissions:		
Emission Factor = 0.00076 lb/hr (AP-42, Table 2.4-4)	0.00076	<b>lb/hr</b>
Calculation: ((7,000.00 hours) * (0.00 lb/hr) * (ton/2000 lb) = 0.003 ton/yr	0.00266	<b>ton/yr</b>
PM <sub>2.5</sub> Emissions		
Emission Factor = 0.00076 lb/hr (AP-42, Table 2.4-4)	0.00076	<b>lb/hr</b>
Calculation: ((7,000.00 hours) * (0.00 lb/hr) * (ton/2000 lb) = 0.003 ton/yr	0.00266	<b>ton/yr</b>
NO <sub>x</sub> Emissions:		
Emission Factor = 0.00076 lb/hr Vendor Guarantee	0.00076	<b>lb/hr</b>
Calculation: ((0.00 hours) * (0.00 lb/hr) * (ton/2000 lb) = 0.003 ton/yr	0.00266	<b>ton/yr</b>
CO Emissions:		
Emission Factor = 0.01 lb/hr Vendor Guarantee	0.01	<b>lb/hr</b>

Calculation: $((7,000.00 \text{ hours}) * (0.01 \text{ lb/hr}) * (\text{ton}/2000 \text{ lb}) = 0.035 \text{ ton/yr}$	0.035	ton/yr
<b>VOC Emissions:</b>		
Emission Factor = 0.00055 lb/hr Vendor Guarantee	0.00055	lb/hr
Calculation: $((7,000.00 \text{ hours}) * (0.00 \text{ lb/hr}) * (\text{ton}/2000 \text{ lb}) = 0.002 \text{ ton/yr}$	0.00193	ton/yr
<b>SOx Emissions:</b>		
Emission Factor = 0.00006 lb/hr Mass Balance/process design	0.000060	lb/hr
Calculation: $((7,000.00 \text{ hours}) * (0.000060 \text{ lb/hr}) * (\text{ton}/2000 \text{ lb}) = 0.000 \text{ ton/yr}$	0.0002	ton/yr
<b>HAPs Emissions:</b>		
Emission Factor = 0.000189 lb/hr Sampling Data	1.89E-04	lb/hr
Calculation: $((7,000 \text{ hours}) * (0.0002 \text{ lb/hr}) * (\text{ton}/2000 \text{ lb}) = 0.001 \text{ ton/yr}$	0.0006615	ton/yr

### Emergency Diesel Engine

Note: Emissions are based on the power output of the engine (324 hp).

Operational Capacity of Engine = 324 hp	324	hp
Hours of Operation = 500.00 hours	500	hours
grams per pound = 0.002205 g/lb	0.002205	g/lb

**PM Emissions:**

PM Emissions = 0.015 ton/yr (AP-42, Table 1.4-2)	0.0146	ton/yr
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**PM<sub>10</sub> Emissions:**

Emission Factor = 0.082 g/bhp-hr (Assumed all PM is PM <sub>2.5</sub> )	8.20E-02	g/bhp-hr
Calculation: $(0.082 \text{ g/bhp-hr}) * (324.0 \text{ hp}) * (324 \text{ hp}) * (0.002205 \text{ g/lb}) * (0.0820 \text{ g/bhp-hr}) * (\text{ton}/2000 \text{ lb}) = 0.01 \text{ ton/yr}$	0.0146	ton/yr

**PM<sub>2.5</sub> Emissions**

Emission Factor = 0.082 g/bhp-hr (Assumed all PM is PM <sub>2.5</sub> )	8.20E-02	g/bhp-hr
Calculation: $(0.082 \text{ g/bhp-hr}) * (324.0 \text{ hp}) * (324 \text{ hp}) * (0.002205 \text{ g/lb}) * (0.0820 \text{ g/bhp-hr}) * (\text{ton}/2000 \text{ lb}) = 0.01 \text{ ton/yr}$	0.0146	ton/yr

**NO<sub>x</sub> & VOC Emissions:**

Emission Factor = 2.98 g/bhp*hr Manufactures Emissions	2.98	g/bhp*hr
Calculation: $(2.98 \text{ g/bhp*hr}) * (324 \text{ hp}) * (500 \text{ hours}) * (0.002205 \text{ g/lb}) * (\text{ton}/2000 \text{ lb}) = 0.53 \text{ ton/yr}$	0.53	ton/yr

**CO Emissions:**

Emission Factor = 0.75 g/bhp*hr Manufactures Emissions	0.75	g/bhp*hr
Calculation: $(0.75 \text{ g/bhp*hr}) * (324 \text{ hp}) * (500 \text{ hours}) * (0.002205 \text{ g/lb}) * (\text{ton}/2000 \text{ lb}) = 0.13 \text{ ton/yr}$	0.13	ton/yr

**VOC Emissions:**

Emission Factor = 2.98 g/bhp*hr Manufactures Emissions	2.98	g/bhp*hr
Calculation: $(2.98 \text{ g/bhp*hr}) * (324 \text{ hp}) * (500 \text{ hours}) * (0.002205 \text{ g/lb}) * (\text{ton}/2000 \text{ lb}) = 0.53 \text{ ton/yr}$	0.53	ton/yr

**SOx Emissions:**

Emission Factor = 0.00152 lbs/MMBtu (AP-42, Table 1.4-2)	1.52E-03	lbs/MMBtu
Calculation: $(0.0015 \text{ lbs/MMBtu}) * (28 \text{ gal/hr}) * (0.137 \text{ MMBtu/gal}) * (500 \text{ hr/yr}) * (\text{ton}/2000 \text{ lb}) = 0.00 \text{ ton/yr}$	0.00146	ton/yr

## V. Existing Air Quality

The Lightning Renewables facility is located within an area of Missoula County that is designated as an Unclassifiable/Attainment area for the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants with the exception of PM<sub>10</sub> and CO. The area where the facility is proposed to be located is considered a maintenance area for PM<sub>10</sub> and CO. Missoula maintains control of the measures for PM<sub>10</sub> and CO under their SIP approved Air Quality County Program. The CO and PM<sub>10</sub> emissions associated with MAQP #5286-00 will not trigger any violations of the current Missoula County maintenance plan.

DEQ has determined that there will be no significant impacts to the NAAQS because the current permit action is considered an administrative change.

## VI. Air Quality Impacts

DEQ determined that there will be no impacts from this permitting action because the permitting change is considered an administrative action. Therefore, the DEQ believes this action will not cause or contribute to a violation of any ambient air quality standard.

## VII. Ambient Air Impact Analysis

Based on the information provided and the conditions established in MAQP #5286-01, DEQ determined that there will be no impacts from this permitting action. The DEQ believes it will not cause or contribute to a violation of any ambient air quality standard because the current permit action is considered an administrative change. .

## VIII. Health Risk Assessment

A health risk assessment was not required because the current permit action is considered an administrative change. However, the initial Health Risk Assessment associated with MAQP #5286-00 is still valid.

DEQ determined that the risks estimated in the risk assessment for the thermal oxidizer and the shrouded flare are in compliance with the requirement to demonstrate negligible risk to human health and the environment. As documented in the health risk assessment, and in accordance with the negligible risk requirement, no single HAP concentration results in Cancer Risk greater than 1.00E-06 and the sum of all HAPs results in a Cancer Risk of less than 1.00E-05. Further, the sum of Chronic Noncancer Reference Exposure Level (CNCREL) hazard quotient is less than 1.0 as required to demonstrate compliance with the negligible risk requirement.

Health Risk Assessment:

AERSCREEN 21112 / AERMOD 22112

12/06/22  
15:34:45

TITLE: ARCHAEA MISSOULA TRO SCENARIO

\*\*\*\*\* STACK PARAMETERS \*\*\*\*\*

SOURCE EMISSION RATE: 0.0522 g/s 0.414 lb/hr  
STACK HEIGHT: 18.29 meters 60.00 feet  
STACK INNER DIAMETER: 0.965 meters 38.00 inches  
PLUME EXIT TEMPERATURE: 699.8 K 800.0 Deg F  
PLUME EXIT VELOCITY: 8.099 m/s 26.57 ft/s  
STACK AIR FLOW RATE: 12557 ACFM  
RURAL OR URBAN: RURAL

INITIAL PROBE DISTANCE = 5025. meters 16486. feet

\*\*\*\*\* BUILDING DOWNWASH PARAMETERS \*\*\*\*\*

NO BUILDING DOWNWASH HAS BEEN REQUESTED FOR THIS ANALYSIS

\*\*\*\*\* PROBE ANALYSIS \*\*\*\*\*

25 meter receptor spacing: 15. meters - 5025. meters

Zo SECTOR	ROUGHNESS LENGTH	1-HR CONC (ug/m3)	DIST (m)	TEMPORAL PERIOD
1*	0.100	1.234	200.0	SUM

\* = worst case flow sector

\*\*\*\*\* MAKEMET METEOROLOGY PARAMETERS \*\*\*\*\*

MIN/MAX TEMPERATURE: 394.3 / 427.6 (K)

MINIMUM WIND SPEED: 0.5 m/s

ANEMOMETER HEIGHT: 10.000 meters

**SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES**

**DOMINANT SURFACE PROFILE:** Grassland  
**DOMINANT CLIMATE TYPE:** Average Moisture  
**DOMINANT SEASON:** Summer

**ALBEDO:** 0.18  
**BOWEN RATIO:** 0.80  
**ROUGHNESS LENGTH:** 0.100 (meters) SURFACE

**FRICITION VELOCITY (U\*) NOT ADUSTED**

**METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT**

YR MO DY JDY HR

-----  
10 06 15 15 01

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O	LEN	Z0	BOWEN	ALBEDO	REF	WS
-46.81	0.863	-9.000	0.020	-999.	1845.		1805.8	0.100	0.80	0.18	10.00	

HT	REF	TA	HT
10.0	427.6		2.0

WIND SPEED AT STACK HEIGHT (non-downwash): 11.3 m/s  
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT: 16.8 meters  
ESTIMATED FINAL PLUME RISE (non-downwash): 3.4 meters  
ESTIMATED FINAL PLUME HEIGHT (non-downwash): 20.2 meters

**METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT**

YR MO DY JDY HR

-----  
10 01 05 15 12

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O	LEN	Z0	BOWEN	ALBEDO	REF	WS
304.87	0.103	1.200	0.020	633.		76.	-1.0	0.100	0.80	0.18	0.50	

HT	REF	TA	HT
10.0	394.3		2.0

WIND SPEED AT STACK HEIGHT (non-downwash): 0.6 m/s  
 STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT: 18.3 meters  
 ESTIMATED FINAL PLUME RISE (non-downwash): 71.4 meters  
 ESTIMATED FINAL PLUME HEIGHT (non-downwash): 89.7 meters

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 \*\*\*\*\* AERSCREEN AUTOMATED DISTANCES \*\*\*\*\*  
 OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE  
 -----

DIST (m)	MAXIMUM 1-HR CONC (ug/m3)	DIST (m)	MAXIMUM 1-HR CONC (ug/m3)
15.24	0.2054	2525.00	0.3296
25.00	0.4816	2550.00	0.3278
50.00	0.7247	2575.00	0.3259
75.00	0.7010	2600.00	0.3240
100.00	0.8740	2625.00	0.3221
125.00	0.9595	2650.00	0.3202
150.00	1.036	2675.00	0.3184
175.00	1.186	2700.00	0.3165
200.00	1.234	2725.00	0.3146
225.00	1.207	2750.00	0.3127
250.00	1.150	2775.00	0.3108
275.00	1.145	2800.00	0.3090
300.00	1.112	2825.00	0.3071
325.00	1.064	2850.00	0.3052
350.00	1.008	2875.00	0.3033
375.00	0.9624	2900.00	0.3015
400.00	0.9347	2925.00	0.2996
425.00	0.9014	2950.00	0.2978
450.00	0.8686	2975.00	0.2960
475.00	0.8400	3000.00	0.2941
500.00	0.8092	3025.00	0.2923
525.00	0.7772	3050.00	0.2917
550.00	0.7451	3075.00	0.2913
575.00	0.7133	3100.00	0.2910
600.00	0.6823	3125.00	0.2906
625.00	0.6523	3150.00	0.2902
650.00	0.6345	3175.00	0.2897
675.00	0.6310	3200.00	0.2893
700.00	0.6260	3225.00	0.2888
725.00	0.6193	3250.00	0.2883
750.00	0.6113	3275.00	0.2878
775.00	0.6022	3300.00	0.2873



800.00	0.5923	3325.00	0.2868
825.00	0.5818	3350.00	0.2862
850.00	0.5708	3375.00	0.2856
875.00	0.5595	3400.00	0.2850
900.00	0.5480	3425.00	0.2844
925.00	0.5365	3450.00	0.2838
950.00	0.5249	3475.00	0.2832
975.00	0.5134	3500.00	0.2825
1000.00	0.5114	3525.00	0.2819
1025.00	0.5099	3550.00	0.2812
1050.00	0.5079	3575.00	0.2805
1075.00	0.5053	3600.00	0.2798
1100.00	0.5023	3625.00	0.2791
1125.00	0.4989	3650.00	0.2784
1150.00	0.4951	3675.00	0.2777
1175.00	0.4911	3700.00	0.2769
1200.00	0.4867	3725.00	0.2762
1225.00	0.4822	3750.00	0.2754
1250.00	0.4775	3775.00	0.2747
1275.00	0.4726	3800.00	0.2739
1300.00	0.4676	3825.00	0.2732
1325.00	0.4625	3850.00	0.2724
1350.00	0.4574	3875.00	0.2716
1375.00	0.4521	3900.00	0.2708
1400.00	0.4468	3925.00	0.2700
1425.00	0.4415	3950.00	0.2692
1450.00	0.4362	3975.00	0.2684
1475.00	0.4309	4000.00	0.2676
1500.00	0.4256	4025.00	0.2668
1525.00	0.4203	4050.00	0.2660
1550.00	0.4150	4075.00	0.2652
1575.00	0.4098	4100.00	0.2644
1600.00	0.4046	4125.00	0.2636
1625.00	0.3994	4150.00	0.2627
1650.00	0.3943	4175.00	0.2619
1675.00	0.3892	4200.00	0.2611
1700.00	0.3842	4225.00	0.2602
1725.00	0.3799	4250.00	0.2594
1750.00	0.3775	4275.00	0.2586
1775.00	0.3750	4300.00	0.2577
1800.00	0.3725	4325.00	0.2569
1825.00	0.3701	4350.00	0.2561
1850.00	0.3695	4375.00	0.2552
1875.00	0.3688	4400.00	0.2544
1900.00	0.3679	4425.00	0.2535
1925.00	0.3670	4450.00	0.2527
1950.00	0.3660	4475.00	0.2519
1975.00	0.3650	4500.00	0.2510
2000.00	0.3638	4525.00	0.2502
2025.00	0.3626	4550.00	0.2493

2050.00	0.3613	4575.00	0.2485
2075.00	0.3600	4600.00	0.2476
2100.00	0.3586	4625.00	0.2468
2125.00	0.3571	4650.00	0.2460
2150.00	0.3556	4675.00	0.2451
2175.00	0.3541	4700.00	0.2443
2200.00	0.3525	4725.00	0.2435
2225.00	0.3509	4750.00	0.2426
2250.00	0.3492	4775.00	0.2418
2275.00	0.3476	4800.00	0.2410
2300.00	0.3459	4825.00	0.2401
2325.00	0.3441	4850.00	0.2393
2350.00	0.3424	4875.00	0.2385
2375.00	0.3406	4900.00	0.2376
2400.00	0.3388	4925.00	0.2368
2425.00	0.3370	4950.00	0.2360
2450.00	0.3352	4975.00	0.2352
2475.00	0.3333	5000.00	0.2343
2500.00	0.3315	5025.00	0.2335

-----  
**\*\*\*\*\* AERSCREEN MAXIMUM IMPACT SUMMARY \*\*\*\*\***  
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CALCULATION PROCEDURE	MAXIMUM 1-HOUR CONC (ug/m3)	SCALED 3-HOUR CONC (ug/m3)	SCALED 8-HOUR CONC (ug/m3)	SCALED 24-HOUR CONC (ug/m3)	SCALED ANNUAL CONC (ug/m3)
----- FLAT TERRAIN	----- 1.234	----- 1.234	----- 1.111	----- 0.7407	----- 0.1234

**DISTANCE FROM SOURCE      201.00 meters**

**IMPACT AT THE  
 AMBIENT BOUNDARY              0.2054 0.2054      0.1848      0.1232      0.2054 E-01**

**DISTANCE FROM SOURCE      15.24 meters**

**TITLE: ARCHAEA MISSOULA FLARE SCENARIO - HOURLY**

\*\*\*\*\* **FLARE PARAMETERS** \*\*\*\*\*

SOURCE EMISSION RATE:	0.0528	g/s	0.419	lb/hr
FLARE HEIGHT:	12.192	meters	40.00	feet
EFF RELEASE HEIGHT:	19.799	meters	64.96	feet
HEAT RELEASE RATE:	0.5509E+07	cal/sec		
HEAT LOSS FRACTION:	0.550			
EFF STACK DIAMETER:	1.556	meters	61.24	inches
EFF EXIT TEMPERATURE:	1273.0	K	1831.7	Deg F
EFF EXIT VELOCITY:	20.000	m/s	65.62	ft/s
RURAL OR URBAN:	RURAL			
INITIAL PROBE DISTANCE =	5025.	meters	16486.	feet

\*\*\*\*\* **BUILDING DOWNWASH PARAMETERS** \*\*\*\*\*

**NO BUILDING DOWNWASH HAS BEEN REQUESTED FOR THIS ANALYSIS**

\*\*\*\*\* **PROBE ANALYSIS** \*\*\*\*\*

25 meter receptor spacing: 15. meters - 5025. meters

Zo SECTOR	ROUGHNESS LENGTH	1-HR CONC (ug/m3)	DIST (m)	TEMPORAL PERIOD
1*	0.100	0.5127	225.0	SUM

\* = worst case flow sector

\*\*\*\*\* **MAKEMET METEOROLOGY PARAMETERS** \*\*\*\*\*

MIN/MAX TEMPERATURE:394.3 / 427.6 (K)

MINIMUM WIND SPEED: 0.5 m/s

ANEMOMETER HEIGHT: 10.000 meters

**SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES**

DOMINANT SURFACE PROFILE: Grassland  
DOMINANT CLIMATE TYPE: Average Moisture  
DOMINANT SEASON: Summer

ALBEDO: 0.18  
BOWEN RATIO: 0.80  
ROUGHNESS LENGTH: 0.100 (meters) SURFACE

FRICITION VELOCITY (U\*) NOT ADUSTED

**METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT**

YR MO DY JDY HR

10 06 21 21 01

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O	LEN	Z0	BOWEN	ALBEDO	REF WS
-64.00	1.561	-9.000	0.020	-999.	4000.		7809.7	0.100	0.80	0.18	18.00

HT	REF TA	HT
10.0	427.6	2.0

WIND SPEED AT STACK HEIGHT (non-downwash): 20.7 m/s  
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT: 18.1 meters  
ESTIMATED FINAL PLUME RISE (non-downwash): 5.2 meters  
ESTIMATED FINAL PLUME HEIGHT (non-downwash): 23.3 meters

**METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT**

YR MO DY JDY HR

10 01 16 21 12

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O	LEN	Z0	BOWEN	ALBEDO	REF WS
726.07	0.115	1.800	0.020	1541.		89.	-1.0	0.100	0.80	0.18	0.50

HT	REF TA	HT
-----		
10.0	427.6	2.0

WIND SPEED AT STACK HEIGHT (non-downwash):	0.7 m/s
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT:	19.8 meters
ESTIMATED FINAL PLUME RISE (non-downwash):	566.6 meters
ESTIMATED FINAL PLUME HEIGHT (non-downwash):	586.4 meters

\*\*\*\*\* AERSCREEN AUTOMATED DISTANCES \*\*\*\*\*  
**OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE**

DIST (m)	MAXIMUM 1-HR CONC (ug/m3)	DIST (m)	MAXIMUM 1-HR CONC (ug/m3)
15.24	0.3806E-01	2525.00	0.7078E-01
25.00	0.8596E-01	2550.00	0.7009E-01
50.00	0.1207	2575.00	0.6941E-01
75.00	0.1209	2600.00	0.6873E-01
100.00	0.1297	2625.00	0.6807E-01
125.00	0.1517	2650.00	0.6741E-01
150.00	0.2382	2675.00	0.6676E-01
175.00	0.4052	2700.00	0.6612E-01
200.00	0.4881	2725.00	0.6548E-01
225.00	0.5127	2750.00	0.6485E-01
250.00	0.5099	2775.00	0.6423E-01
275.00	0.4909	2800.00	0.6362E-01
300.00	0.4642	2825.00	0.6301E-01
325.00	0.4531	2850.00	0.6241E-01
350.00	0.4355	2875.00	0.6182E-01
375.00	0.4143	2900.00	0.6128E-01
400.00	0.3916	2925.00	0.6103E-01
425.00	0.3686	2950.00	0.6078E-01
450.00	0.3648	2975.00	0.6053E-01
475.00	0.3602	3000.00	0.6028E-01
500.00	0.3529	3025.00	0.6002E-01
525.00	0.3437	3050.00	0.5976E-01
550.00	0.3334	3075.00	0.5950E-01
575.00	0.3223	3100.00	0.5924E-01
600.00	0.3108	3125.00	0.5897E-01
625.00	0.2991	3150.00	0.5871E-01
650.00	0.2875	3175.00	0.5844E-01
675.00	0.2761	3200.00	0.5817E-01
700.00	0.2650	3225.00	0.5790E-01
725.00	0.2543	3250.00	0.5762E-01

750.00	0.2499	3275.00	0.5735E-01
775.00	0.2482	3300.00	0.5708E-01
800.00	0.2458	3325.00	0.5680E-01
825.00	0.2430	3350.00	0.5653E-01
850.00	0.2396	3375.00	0.5625E-01
875.00	0.2360	3400.00	0.5597E-01
900.00	0.2320	3425.00	0.5570E-01
925.00	0.2279	3450.00	0.5542E-01
950.00	0.2236	3475.00	0.5514E-01
975.00	0.2192	3500.00	0.5486E-01
1000.00	0.2147	3525.00	0.5459E-01
1025.00	0.2102	3550.00	0.5431E-01
1050.00	0.2057	3575.00	0.5403E-01
1075.00	0.2012	3600.00	0.5376E-01
1100.00	0.1968	3625.00	0.5348E-01
1125.00	0.1924	3650.00	0.5321E-01
1150.00	0.1880	3675.00	0.5293E-01
1175.00	0.1838	3700.00	0.5266E-01
1200.00	0.1796	3725.00	0.5238E-01
1225.00	0.1755	3750.00	0.5211E-01
1250.00	0.1718	3775.00	0.5184E-01
1275.00	0.1683	3800.00	0.5157E-01
1300.00	0.1649	3825.00	0.5130E-01
1325.00	0.1615	3850.00	0.5103E-01
1350.00	0.1582	3875.00	0.5076E-01
1375.00	0.1550	3900.00	0.5049E-01
1400.00	0.1518	3925.00	0.5023E-01
1425.00	0.1487	3950.00	0.4996E-01
1450.00	0.1457	3975.00	0.4970E-01
1475.00	0.1428	4000.00	0.4944E-01
1500.00	0.1399	4025.00	0.4917E-01
1525.00	0.1371	4050.00	0.4891E-01
1550.00	0.1344	4075.00	0.4865E-01
1575.00	0.1317	4100.00	0.4839E-01
1600.00	0.1292	4125.00	0.4814E-01
1625.00	0.1266	4150.00	0.4788E-01
1650.00	0.1242	4175.00	0.4763E-01
1675.00	0.1218	4200.00	0.4737E-01
1700.00	0.1194	4225.00	0.4712E-01
1725.00	0.1172	4250.00	0.4687E-01
1750.00	0.1149	4275.00	0.4662E-01
1775.00	0.1128	4300.00	0.4638E-01
1800.00	0.1107	4325.00	0.4613E-01
1825.00	0.1086	4350.00	0.4588E-01
1850.00	0.1066	4375.00	0.4564E-01
1875.00	0.1047	4400.00	0.4540E-01
1900.00	0.1028	4425.00	0.4516E-01
1925.00	0.1010	4450.00	0.4492E-01
1950.00	0.9917E-01	4475.00	0.4468E-01
1975.00	0.9742E-01	4500.00	0.4444E-01

2000.00	0.9572E-01	4525.00	0.4421E-01
2025.00	0.9405E-01	4550.00	0.4397E-01
2050.00	0.9243E-01	4575.00	0.4374E-01
2075.00	0.9086E-01	4600.00	0.4351E-01
2100.00	0.8932E-01	4625.00	0.4328E-01
2125.00	0.8781E-01	4650.00	0.4305E-01
2150.00	0.8635E-01	4675.00	0.4283E-01
2175.00	0.8492E-01	4700.00	0.4260E-01
2200.00	0.8353E-01	4725.00	0.4238E-01
2225.00	0.8217E-01	4750.00	0.4216E-01
2250.00	0.8085E-01	4775.00	0.4194E-01
2275.00	0.7955E-01	4800.00	0.4172E-01
2300.00	0.7829E-01	4825.00	0.4150E-01
2325.00	0.7706E-01	4850.00	0.4128E-01
2350.00	0.7585E-01	4875.00	0.4107E-01
2375.00	0.7506E-01	4900.00	0.4085E-01
2400.00	0.7433E-01	4925.00	0.4064E-01
2425.00	0.7360E-01	4950.00	0.4043E-01
2450.00	0.7289E-01	4975.00	0.4022E-01
2475.00	0.7218E-01	5000.00	0.4001E-01
2500.00	0.7147E-01	5025.00	0.3981E-01

\*\*\*\*\* AERSCREEN MAXIMUM IMPACT SUMMARY \*\*\*\*\*

CALCULATION PROCEDURE	MAXIMUM 1-HOUR CONC (ug/m3)	SCALED 3-HOUR CONC (ug/m3)	SCALED 8-HOUR CONC (ug/m3)	SCALED 24-HOUR CONC (ug/m3)	SCALED ANNUAL CONC (ug/m3)
FLAT TERRAIN	0.5142	0.5142	0.4628	0.3085	0.5142E-01

**DISTANCE FROM SOURCE 234.00 meters**

**IMPACT AT THE AMBIENT BOUNDARY 0.3806E-01 0.3806E-01 0.3426E-01 0.2284E-01 0.3806E-02**

**DISTANCE FROM SOURCE 15.24 meters**

**AERSCREEN 21112 / AERMOD 22112**

**12/06/22**

**15:36:56**

**TITLE: ARCHAEA MISSOULA FLARE SCENARIO - Annual**

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**\*\*\*\*\* FLARE PARAMETERS \*\*\*\*\***  
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SOURCE EMISSION RATE:	0.0393	g/s	0.312	lb/hr
FLARE HEIGHT:	12.192	meters	40.00	feet
EFF RELEASE HEIGHT:	19.799	meters	64.96	feet
HEAT RELEASE RATE:	0.5509E+07	cal/sec		
HEAT LOSS FRACTION:	0.550			
EFF STACK DIAMETER:	1.556	meters	61.24	inches
EFF EXIT TEMPERATURE:	1273.0	K	1831.7	Deg F
EFF EXIT VELOCITY:	20.000	m/s	65.62	ft/s
RURAL OR URBAN:	RURAL			
INITIAL PROBE DISTANCE =	5025.	meters	16486.	feet

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**\*\*\*\*\* BUILDING DOWNWASH PARAMETERS \*\*\*\*\***  
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**NO BUILDING DOWNWASH HAS BEEN REQUESTED FOR THIS ANALYSIS**

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**\*\*\*\*\* PROBE ANALYSIS \*\*\*\*\***  
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25 meter receptor spacing: 15. meters - 5025. meters

Zo SECTOR	ROUGHNESS LENGTH	1-HR CONC (ug/m3)	DIST (m)	TEMPORAL PERIOD
1*	0.100	0.3818	225.0	SUM

\* = worst case flow sector

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**\*\*\*\*\* MAKEMET METEOROLOGY PARAMETERS \*\*\*\*\***  
 -----

MIN/MAX TEMPERATURE: 394.3 / 427.6 (K)

MINIMUM WIND SPEED: 0.5 m/s

ANEMOMETER HEIGHT: 10.000 meters

SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES



**DOMINANT SURFACE PROFILE:** Grassland  
**DOMINANT CLIMATE TYPE:** Average Moisture  
**DOMINANT SEASON:** Summer

**ALBEDO:** 0.18  
**BOWEN RATIO:** 0.80  
**ROUGHNESS LENGTH:** 0.100 (meters) SURFACE

**FRICITION VELOCITY (U\*) NOT ADUSTED**

**METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT**

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**YR MO DY JDY HR**

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10 06 21 21 01

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O	LEN	Z0	BOWEN	ALBEDO	REF	WS
-64.00	1.561	-9.000	0.020	-999.	4000.		7809.7	0.100	0.80	0.18	18.00	

HT	REF	TA	HT
10.0	427.6		2.0

WIND SPEED AT STACK HEIGHT (non-downwash): 20.7 m/s  
 STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT: 18.1 meters  
 ESTIMATED FINAL PLUME RISE (non-downwash): 5.2 meters  
 ESTIMATED FINAL PLUME HEIGHT (non-downwash): 23.3 meters

**METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT**

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**YR MO DY JDY HR**

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10 01 16 21 12

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O	LEN	Z0	BOWEN	ALBEDO	REF	WS
726.07	0.115	1.800	0.020	1541.		89.	-1.0	0.100	0.80	0.18	0.50	

HT	REF TA	HT
-----		
10.0	427.6	2.0

WIND SPEED AT STACK HEIGHT (non-downwash):	0.7 m/s
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT:	19.8 meters
ESTIMATED FINAL PLUME RISE (non-downwash):	566.6 meters
ESTIMATED FINAL PLUME HEIGHT (non-downwash):	586.4 meters

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**\*\*\*\*\* AERSCREEN AUTOMATED DISTANCES \*\*\*\*\***  
**OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE**  
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DIST (m)	MAXIMUM 1-HR CONC (ug/m3)	DIST (m)	MAXIMUM 1-HR CONC (ug/m3)
15.24	0.2834E-01	2525.00	0.5270E-01
25.00	0.6401E-01	2550.00	0.5219E-01
50.00	0.8986E-01	2575.00	0.5168E-01
75.00	0.9003E-01	2600.00	0.5118E-01
100.00	0.9657E-01	2625.00	0.5069E-01
125.00	0.1129	2650.00	0.5020E-01
150.00	0.1774	2675.00	0.4971E-01
175.00	0.3017	2700.00	0.4923E-01
200.00	0.3635	2725.00	0.4876E-01
225.00	0.3818	2750.00	0.4829E-01
250.00	0.3797	2775.00	0.4783E-01
275.00	0.3655	2800.00	0.4737E-01
300.00	0.3457	2825.00	0.4692E-01
325.00	0.3374	2850.00	0.4648E-01
350.00	0.3243	2875.00	0.4604E-01
375.00	0.3085	2900.00	0.4563E-01
400.00	0.2916	2925.00	0.4545E-01
425.00	0.2744	2950.00	0.4526E-01
450.00	0.2717	2975.00	0.4508E-01
475.00	0.2682	3000.00	0.4489E-01
500.00	0.2628	3025.00	0.4470E-01
525.00	0.2560	3050.00	0.4450E-01
550.00	0.2483	3075.00	0.4431E-01
575.00	0.2400	3100.00	0.4411E-01
600.00	0.2314	3125.00	0.4392E-01
625.00	0.2227	3150.00	0.4372E-01
650.00	0.2141	3175.00	0.4352E-01
675.00	0.2056	3200.00	0.4331E-01
700.00	0.1974	3225.00	0.4311E-01
725.00	0.1894	3250.00	0.4291E-01

750.00	0.1861	3275.00	0.4271E-01
775.00	0.1848	3300.00	0.4250E-01
800.00	0.1831	3325.00	0.4230E-01
825.00	0.1809	3350.00	0.4209E-01
850.00	0.1784	3375.00	0.4189E-01
875.00	0.1757	3400.00	0.4168E-01
900.00	0.1728	3425.00	0.4147E-01
925.00	0.1697	3450.00	0.4127E-01
950.00	0.1665	3475.00	0.4106E-01
975.00	0.1632	3500.00	0.4085E-01
1000.00	0.1599	3525.00	0.4065E-01
1025.00	0.1565	3550.00	0.4044E-01
1050.00	0.1532	3575.00	0.4024E-01
1075.00	0.1498	3600.00	0.4003E-01
1100.00	0.1465	3625.00	0.3983E-01
1125.00	0.1433	3650.00	0.3962E-01
1150.00	0.1400	3675.00	0.3942E-01
1175.00	0.1368	3700.00	0.3921E-01
1200.00	0.1337	3725.00	0.3901E-01
1225.00	0.1307	3750.00	0.3881E-01
1250.00	0.1279	3775.00	0.3860E-01
1275.00	0.1253	3800.00	0.3840E-01
1300.00	0.1228	3825.00	0.3820E-01
1325.00	0.1203	3850.00	0.3800E-01
1350.00	0.1178	3875.00	0.3780E-01
1375.00	0.1154	3900.00	0.3760E-01
1400.00	0.1131	3925.00	0.3740E-01
1425.00	0.1108	3950.00	0.3720E-01
1450.00	0.1085	3975.00	0.3701E-01
1475.00	0.1063	4000.00	0.3681E-01
1500.00	0.1042	4025.00	0.3662E-01
1525.00	0.1021	4050.00	0.3642E-01
1550.00	0.1001	4075.00	0.3623E-01
1575.00	0.9810E-01	4100.00	0.3604E-01
1600.00	0.9617E-01	4125.00	0.3585E-01
1625.00	0.9429E-01	4150.00	0.3566E-01
1650.00	0.9246E-01	4175.00	0.3547E-01
1675.00	0.9067E-01	4200.00	0.3528E-01
1700.00	0.8894E-01	4225.00	0.3509E-01
1725.00	0.8724E-01	4250.00	0.3490E-01
1750.00	0.8559E-01	4275.00	0.3472E-01
1775.00	0.8399E-01	4300.00	0.3453E-01
1800.00	0.8242E-01	4325.00	0.3435E-01
1825.00	0.8090E-01	4350.00	0.3417E-01
1850.00	0.7941E-01	4375.00	0.3399E-01
1875.00	0.7797E-01	4400.00	0.3381E-01
1900.00	0.7656E-01	4425.00	0.3363E-01
1925.00	0.7518E-01	4450.00	0.3345E-01
1950.00	0.7385E-01	4475.00	0.3327E-01
1975.00	0.7254E-01	4500.00	0.3309E-01

2000.00	0.7127E-01	4525.00	0.3292E-01
2025.00	0.7004E-01	4550.00	0.3275E-01
2050.00	0.6883E-01	4575.00	0.3257E-01
2075.00	0.6766E-01	4600.00	0.3240E-01
2100.00	0.6651E-01	4625.00	0.3223E-01
2125.00	0.6539E-01	4650.00	0.3206E-01
2150.00	0.6430E-01	4675.00	0.3189E-01
2175.00	0.6324E-01	4700.00	0.3172E-01
2200.00	0.6220E-01	4725.00	0.3156E-01
2225.00	0.6119E-01	4750.00	0.3139E-01
2250.00	0.6020E-01	4775.00	0.3123E-01
2275.00	0.5924E-01	4800.00	0.3106E-01
2300.00	0.5830E-01	4825.00	0.3090E-01
2325.00	0.5738E-01	4850.00	0.3074E-01
2350.00	0.5648E-01	4875.00	0.3058E-01
2375.00	0.5589E-01	4900.00	0.3042E-01
2400.00	0.5535E-01	4925.00	0.3026E-01
2425.00	0.5481E-01	4950.00	0.3011E-01
2450.00	0.5427E-01	4975.00	0.2995E-01
2475.00	0.5375E-01	5000.00	0.2980E-01
2500.00	0.5322E-01	5025.00	0.2964E-01

\*\*\*\*\* AERSCREEN MAXIMUM IMPACT SUMMARY \*\*\*\*\*

CALCULATION	MAXIMUM 1-HOUR CONC	SCALE D 3- HOUR CONC	SCALE D 8- HOUR CONC	SCALED 24-HOUR CONC	SCALED ANNUAL CONC
PROCEDURE	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)
FLAT TERRAIN	0.3829	0.3829	0.3446	0.2297	0.3829E-01

**DISTANCE FROM SOURCE 234.00 meters**

**IMPACT AT THE AMBIENT BOUNDARY 0.2834E-01 0.2834E-01 0.2551E-01 0.1701E-01 0.2834E-02**

**DISTANCE FROM SOURCE 15.24 meters**

### Archaea Missoula RNG - Human Health Risk Assessment

**Appendix D-1. Thermal Oxidizer Toxic Risk Assessment**

**Human Health Risk Assessment for the TOX**

Cancer and Noncancer Chronic Modeled Concentration	1.23E-01	ug/m3 / lb/hr Total Hap Emission Rate
Noncancer Acute Modeled Concentration	1.23E+00	ug/m3 / lb/hr Total Hap Emission Rate

Stack Parameters (Exhaust Stack)

Stack Height (ft)	Stack Diameter (in)	Stack Temp (F)	Stack Flow Rate (acfm)	Total HAP Hourly Emission Rate (lb/hr)
60	38	800	12,557	0.414

HAP Category / Pollutant Name	CAS #	Annual Fraction of all HAPS	Calculated Annual HAP Concentration (ug/m3)	1 hr Fraction of all HAPS	Calculated 1 hr HAP Concentration (ug/m3)	ARM 17.8.770 De Minimis Levels			Exceed ARM 17.8.770 Table 1?	Exceed ARM 17.8.770 Table 2 Chronic?	Exceed ARM 17.8.770 Table 2 Acute?
						Table 1 Cancer Annual (ug/m3)	Table 2 Noncancer Chronic Annual (ug/m3)	Table 2 Noncancer Acute Annual (ug/m3)			
1,1,1-Trichloroethane	71556	2.53E-05	3.12E-06	2.53E-05	3.12E-05	N/A	3.2000E+00	1.9000E+03	No	No	No
1,1,2,2-Tetrachloroethane	79345	3.08E-06	3.80E-07	3.08E-06	3.80E-06	1.7241E-03	N/A	N/A	No	No	No
1,1,2-Trichloroethane	79005	2.44E-06	3.02E-07	2.44E-06	3.02E-06	6.2500E-03	N/A	N/A	No	No	No
1,1-Dichloroethane	75343	1.14E-04	1.40E-05	1.14E-04	1.40E-04	N/A	N/A	N/A	No	No	No
1,1-Dichloroethene	75354	1.78E-06	2.19E-07	1.78E-06	2.19E-06	2.0000E-03	3.2000E-01	N/A	No	No	No
1,2,4-Trichlorobenzene	120821	9.31E-06	1.15E-06	9.31E-06	1.15E-05	N/A	N/A	N/A	No	No	No
1,2-Dichloroethane	107062	2.90E-04	3.58E-05	2.90E-04	3.58E-04	3.8462E-03	9.5000E-01	N/A	No	No	No
1,2-Dichloropropane	78875	3.52E-05	4.34E-06	3.52E-05	4.34E-05	N/A	4.0000E-02	N/A	No	No	No
1,3-Butadiene	106990	3.24E-05	4.00E-06	3.24E-05	4.00E-05	3.5714E-04	N/A	N/A	No	No	No
1,4-Dichlorobenzene	106467	2.16E-04	2.66E-05	2.16E-04	2.66E-04	9.0909E-03	8.0000E+00	N/A	No	No	No
2-Butanone	78933	2.07E-03	2.56E-04	2.07E-03	2.56E-03	N/A	1.0000E+01	N/A	No	No	No
2-Methylnaphthalene	91576	4.35E-07	5.36E-08	4.35E-07	5.36E-07	N/A	N/A	N/A	No	No	No
3-Methylcholanthrene	56495	3.26E-08	4.02E-09	3.26E-08	4.02E-08	N/A	N/A	N/A	No	No	No
7,12-Dimethylbenz(a)anthracene	57976	2.90E-07	3.58E-08	2.90E-07	3.58E-07	N/A	N/A	N/A	No	No	No
Acenaphthene	83329	3.26E-08	4.02E-09	3.26E-08	4.02E-08	N/A	N/A	N/A	No	No	No
Acenaphthylene	208968	3.26E-08	4.02E-09	3.26E-08	4.02E-08	N/A	N/A	N/A	No	No	No
Acetone	67641	2.84E-03	3.50E-04	2.84E-03	3.50E-03	N/A	N/A	N/A	No	No	No
Acrylonitrile	107131	1.36E-04	1.68E-05	1.36E-04	1.68E-04	1.4706E-03	2.0000E-02	N/A	No	No	No
Anthracene	120127	4.35E-08	5.36E-09	4.35E-08	5.36E-08	N/A	N/A	N/A	No	No	No
Arsenic	7440382	4.35E-06	5.36E-07	4.35E-06	5.36E-06	2.3256E-05	5.0000E-03	N/A	No	No	No
Benz(a)anthracene	56553	3.26E-08	4.02E-09	3.26E-08	4.02E-08	5.8824E-05	N/A	N/A	No	No	No
Benzene	71432	9.88E-04	1.22E-04	9.88E-04	1.22E-03	1.2048E-02	7.1000E-01	N/A	No	No	No
Benzo(a)pyrene	50328	2.17E-08	2.68E-09	2.17E-08	2.68E-08	5.8824E-05	N/A	N/A	No	No	No
Benzo(b)fluoranthene	205992	3.26E-08	4.02E-09	3.26E-08	4.02E-08	5.8824E-05	N/A	N/A	No	No	No
Benzo(g,h,i)perylene	191242	2.17E-08	2.68E-09	2.17E-08	2.68E-08	N/A	N/A	N/A	No	No	No
Benzo(k)fluoranthene	207089	3.26E-08	4.02E-09	3.26E-08	4.02E-08	5.8824E-05	N/A	N/A	No	No	No
Benzyl Chloride	100447	5.72E-06	7.06E-07	5.72E-06	7.06E-06	N/A	1.2000E-01	5.0000E-01	No	No	No
Beryllium	7440417	2.17E-07	2.68E-08	2.17E-07	2.68E-07	4.1667E-05	4.8000E-05	N/A	No	No	No
Bromodichloromethane	75274	3.00E-06	3.70E-07	3.00E-06	3.70E-06	N/A	N/A	N/A	No	No	No
Bromoform	75252	9.26E-06	1.14E-06	9.26E-06	1.14E-05	9.0909E-02	N/A	N/A	No	No	No
Bromomethane	74839	2.00E-06	2.46E-07	2.00E-06	2.46E-06	N/A	5.0000E-02	N/A	No	No	No
Cadmium	7440439	2.54E-05	3.13E-06	2.54E-05	3.13E-05	5.5556E-05	3.5000E-02	N/A	No	No	No
Carbon Disulfide	75150	5.26E-05	6.48E-06	5.26E-05	6.48E-05	N/A	7.0000E+00	N/A	No	No	No
Carbon Tetrachloride	56235	2.82E-06	3.48E-07	2.82E-06	3.48E-06	6.6667E-03	2.4000E-02	1.9000E+00	No	No	No
Carbonyl Sulfide	463581	2.64E-05	3.26E-06	2.64E-05	3.26E-05	N/A	N/A	N/A	No	No	No
Chlorobenzene	108907	2.06E-06	2.55E-07	2.06E-06	2.55E-06	N/A	7.0000E-01	N/A	No	No	No

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Chloroethane	75003	1.89E-04	2.33E-05	1.89E-04	2.33E-04	N/A	1.0000E+02	N/A	No	No	No
Chloroform	67663	2.19E-06	2.70E-07	2.19E-06	2.70E-06	4.3478E-03	3.5000E-01	N/A	No	No	No
Chloromethane	74873	3.24E-05	4.00E-06	3.24E-05	4.00E-05	N/A	N/A	N/A	No	No	No
Chromium	18540299	2.54E-05	3.13E-06	2.54E-05	3.13E-05	8.3333E-06	2.0000E-05	N/A	No	No	No
Chrysene	218019	3.26E-08	4.02E-09	3.26E-08	4.02E-08	N/A	N/A	N/A	No	No	No
cis-1,3-Dichloropropene	542756	2.03E-06	2.51E-07	2.03E-06	2.51E-06	N/A	2.0000E-01	N/A	No	No	No
Cobalt	7440484	1.52E-06	1.88E-07	1.52E-06	1.88E-06	N/A	N/A	N/A	No	No	No
Dibenzo(a,h)anthracene	53703	2.17E-08	2.68E-09	2.17E-08	2.68E-08	5.8824E-05	N/A	N/A	No	No	No
Dichlorobenzene	541731	2.35E-05	2.91E-06	2.35E-05	2.91E-05	N/A	N/A	N/A	No	No	No
Dichlorodifluoromethane	75718	5.32E-04	6.56E-05	5.32E-04	6.56E-04	N/A	N/A	N/A	No	No	No
Dichloromethane	75092	9.18E-04	1.13E-04	9.18E-04	1.13E-03	2.1277E-01	3.0000E+01	3.5000E+01	No	No	No
Dimethyl Sulfide	75183	6.19E-04	7.63E-05	6.19E-04	7.63E-04	N/A	N/A	N/A	No	No	No
Ethylbenzene	100414	4.34E-03	5.36E-04	4.34E-03	5.36E-03	N/A	1.0000E+01	N/A	No	No	No
Ethylene Dibromide	106934	3.44E-06	4.25E-07	3.44E-06	4.25E-06	4.5455E-04	4.6000E-02	N/A	No	No	No
Fluoranthene	206440	5.43E-08	6.70E-09	5.43E-08	6.70E-08	N/A	N/A	N/A	No	No	No
Fluorene	86737	5.07E-08	6.26E-09	5.07E-08	6.26E-08	N/A	N/A	N/A	No	No	No
Formaldehyde	50000	1.36E-03	1.68E-04	1.36E-03	1.68E-03	7.6923E-03	3.6000E-02	3.7000E+00	No	No	No
Hexachlorobutadiene	87683	9.56E-06	1.18E-06	9.56E-06	1.18E-05	4.5455E-03	N/A	N/A	No	No	No
Hexane	110543	3.57E-02	4.41E-03	3.57E-02	4.41E-02	N/A	2.0000E+00	N/A	No	No	No
Hydrogen Chloride	7647010	8.57E-01	1.06E-01	8.57E-01	1.06E+00	N/A	2.0000E-01	3.0000E+01	No	No	No
Hydrogen Fluoride	7664393	6.36E-02	7.85E-03	6.36E-02	7.85E-02	N/A	5.9000E-02	5.8000E+00	No	No	No
Hydrogen Sulfide	7783064	2.75E-04	3.39E-05	2.75E-04	3.39E-04	N/A	N/A	N/A	No	No	No
Indeno(1,2,3-cd)pyrene	193395	3.26E-08	4.02E-09	3.26E-08	4.02E-08	5.8824E-05	N/A	N/A	No	No	No
Lead	7439921	9.05E-06	1.12E-06	9.05E-06	1.12E-05	N/A	1.5000E-02	N/A	No	No	No
Manganese	7439965	6.88E-06	8.49E-07	6.88E-06	8.49E-06	N/A	5.0000E-04	N/A	No	No	No
Mercury	7439976	1.17E-05	1.44E-06	1.17E-05	1.44E-05	N/A	3.0000E-03	3.0000E-01	No	No	No
Methyl Isobutyl Ketone	108101	4.53E-04	5.59E-05	4.53E-04	5.59E-04	N/A	N/A	N/A	No	No	No
Methyl Mercaptan	74931	1.29E-04	1.60E-05	1.29E-04	1.60E-04	N/A	N/A	N/A	No	No	No
Methyl Tert Butyl Ether	1634044	7.38E-05	9.10E-06	7.38E-05	9.10E-05	N/A	3.0000E+01	N/A	No	No	No
Naphthalene	91203	1.10E-05	1.36E-06	1.10E-05	1.36E-05	N/A	1.4000E-01	N/A	No	No	No
Nickel	7440020	3.80E-05	4.69E-06	3.80E-05	4.69E-05	3.8462E-04	2.4000E-03	1.0000E-02	No	No	No
Phenanthrene	85018	3.08E-07	3.80E-08	3.08E-07	3.80E-07	N/A	N/A	N/A	No	No	No
Pyrene	129000	9.05E-08	1.12E-08	9.05E-08	1.12E-07	N/A	N/A	N/A	No	No	No
Selenium	7782492	4.35E-07	5.36E-08	4.35E-07	5.36E-07	N/A	5.0000E-03	2.0000E-02	No	No	No
Styrene	100425	4.01E-04	4.95E-05	4.01E-04	4.95E-04	N/A	1.0000E+01	N/A	No	No	No
t-1,2-Dichloroethene	156605	6.69E-05	8.26E-06	6.69E-05	8.26E-05	N/A	N/A	N/A	No	No	No
t-1,3-Dichloropropene	542756	2.03E-06	2.51E-07	2.03E-06	2.51E-06	N/A	2.0000E-01	N/A	No	No	No
Tetrachloroethene	127184	7.70E-04	9.50E-05	7.70E-04	9.50E-04	1.6949E-02	3.5000E-01	6.8000E+01	No	No	No
Toluene	108883	1.41E-02	1.74E-03	1.41E-02	1.74E-02	N/A	4.0000E+00	N/A	No	No	No
Trichloroethene	79016	3.85E-04	4.75E-05	3.85E-04	4.75E-04	5.0000E-02	6.4000E+00	N/A	No	No	No
Vinyl Acetate	108054	2.10E-06	2.60E-07	2.10E-06	2.60E-06	N/A	2.0000E+00	N/A	No	No	No
Vinyl Chloride	75014	5.04E-04	6.22E-05	5.04E-04	6.22E-04	1.2821E-03	N/A	N/A	No	No	No
Xylenes	1330207	1.10E-02	1.35E-03	1.10E-02	1.35E-02	N/A	3.0000E+00	4.4000E+01	No	No	No

## Archaea Missoula RNG - Human Health Risk Assessment

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## Archaea Missoula RNG - Human Health Risk Assessment

### Appendix D-2. Back-Up Flare Toxic Risk Assessment

#### Human Health Risk Assessment for the Flare Mode #2

Cancer and Noncancer Chronic Modeled Concentration	3.83E-02 ug/m3
Noncancer Acute Modeled Concentration	5.14E-01 ug/m3

#### Stack Parameters

Stack Height (ft)	Heat Release (cal/s)	Radiative Heat Loss Fraction	Total HAP Hourly Emission Rate (lb/hr)	Total HAP Annual Emission Rate (lb/hr)
40	5,509,047	0.55	0.419	0.312

HAP Category / Pollutant Name	CAS #	Annual Fraction of all HAPS	Calculated Annual HAP Concentration (ug/m3)	1 hr Fraction of all HAPS	Calculated 1 hr HAP Concentration (ug/m3)	ARM 17.8.770 De Minimis Levels			Exceed ARM 17.8.770 Table 1?	Exceed ARM 17.8.770 Table 2 Chronic?	Exceed ARM 17.8.770 Table 2 Acute?
						Table 1 Cancer Annual (ug/m3)	Table 2 Noncancer Chronic Annual (ug/m3)	Table 2 Noncancer Acute Annual (ug/m3)			
1,1,1-Trichloroethane	71556	5.00E-05	1.91E-06	5.00E-05	2.57E-05	N/A	3.2000E+00	1.9000E+03	No	No	No
1,1,2,2-Tetrachloroethane	79345	6.09E-06	2.33E-07	6.09E-06	3.13E-06	1.7241E-03	N/A	N/A	No	No	No
1,1,2-Trichloroethane	79005	4.84E-06	1.85E-07	4.84E-06	2.49E-06	6.2500E-03	N/A	N/A	No	No	No
1,1-Dichloroethane	75343	2.25E-04	8.61E-06	2.25E-04	1.16E-04	N/A	N/A	N/A	No	No	No
1,1-Dichloroethene	75354	3.51E-06	1.35E-07	3.51E-06	1.81E-06	2.0000E-03	3.2000E-01	N/A	No	No	No
1,2,4-Trichlorobenzene	120821	1.84E-05	7.05E-07	1.84E-05	9.47E-06	N/A	N/A	N/A	No	No	No
1,2-Dichloroethane	107062	5.74E-04	2.20E-05	5.74E-04	2.95E-04	3.8462E-03	9.5000E-01	N/A	No	No	No
1,2-Dichloropropane	78875	6.96E-05	2.67E-06	6.96E-05	3.58E-05	N/A	4.0000E-02	N/A	No	No	No
1,3-Butadiene	106990	6.41E-05	2.45E-06	6.41E-05	3.29E-05	3.5714E-04	N/A	N/A	No	No	No
1,4-Dichlorobenzene	106467	4.26E-04	1.63E-05	4.26E-04	2.19E-04	9.0909E-03	8.0000E+00	N/A	No	No	No
2-Butanone	78933	4.10E-03	1.57E-04	4.10E-03	2.11E-03	N/A	1.0000E+01	N/A	No	No	No
2-Methylnaphthalene	91576	5.73E-09	2.19E-10	5.73E-09	2.95E-09	N/A	N/A	N/A	No	No	No
3-Methylcholanthrene	56495	4.30E-10	1.65E-11	4.30E-10	2.21E-10	N/A	N/A	N/A	No	No	No
7,12-Dimethylbenz(a)anthracene	57976	3.82E-09	1.46E-10	3.82E-09	1.97E-09	N/A	N/A	N/A	No	No	No
Acenaphthene	83329	4.30E-10	1.65E-11	4.30E-10	2.21E-10	N/A	N/A	N/A	No	No	No
Acenaphthylene	208968	4.30E-10	1.65E-11	4.30E-10	2.21E-10	N/A	N/A	N/A	No	No	No
Acetone	67641	5.62E-03	2.15E-04	5.62E-03	2.89E-03	N/A	N/A	N/A	No	No	No
Acrylonitrile	107131	2.69E-04	1.03E-05	2.69E-04	1.39E-04	1.4706E-03	2.0000E-02	N/A	No	No	No
Anthracene	120127	5.73E-10	2.19E-11	5.73E-10	2.95E-10	N/A	N/A	N/A	No	No	No
Arsenic	7440382	5.73E-08	2.19E-09	5.73E-08	2.95E-08	N/A	N/A	N/A	No	No	No
Benz(a)anthracene	56553	4.30E-10	1.65E-11	4.30E-10	2.21E-10	5.8824E-05	N/A	N/A	No	No	No
Benzene	71432	1.88E-03	7.19E-05	1.88E-03	9.66E-04	1.2048E-02	7.1000E-01	N/A	No	No	No
Benzo(a)pyrene	50328	2.87E-10	1.10E-11	2.87E-10	1.47E-10	5.8824E-05	N/A	N/A	No	No	No
Benzo(b)fluoranthene	205992	4.30E-10	1.65E-11	4.30E-10	2.21E-10	5.8824E-05	N/A	N/A	No	No	No
Benzo(g,h,i)perylene	191242	2.87E-10	1.10E-11	2.87E-10	1.47E-10	N/A	N/A	N/A	No	No	No
Benzo(k)fluoranthene	207089	4.30E-10	1.65E-11	4.30E-10	2.21E-10	5.8824E-05	N/A	N/A	No	No	No
Benzyl Chloride	100447	1.13E-05	4.33E-07	1.13E-05	5.82E-06	N/A	1.2000E-01	5.0000E-01	No	No	No
Beryllium	7440417	2.87E-09	1.10E-10	2.87E-09	1.47E-09	4.1667E-05	4.8000E-05	N/A	No	No	No
Bromodichloromethane	75274	5.94E-06	2.27E-07	5.94E-06	3.05E-06	N/A	N/A	N/A	No	No	No
Bromoform	75252	1.83E-05	7.02E-07	1.83E-05	9.42E-06	9.0909E-02	N/A	N/A	No	No	No
Bromomethane	74839	3.95E-06	1.51E-07	3.95E-06	2.03E-06	N/A	5.0000E-02	N/A	No	No	No
Cadmium	7440439	3.34E-07	1.28E-08	3.34E-07	1.72E-07	5.5556E-05	3.5000E-02	N/A	No	No	No
Carbon Disulfide	75150	1.04E-04	3.98E-06	1.04E-04	5.35E-05	N/A	7.0000E+00	N/A	No	No	No
Carbon Tetrachloride	56235	5.58E-06	2.14E-07	5.58E-06	2.87E-06	6.6667E-03	2.4000E-02	1.9000E+00	No	No	No
Carbonyl Sulfide	463581	5.23E-05	2.00E-06	5.23E-05	2.69E-05	N/A	N/A	N/A	No	No	No
Chlorobenzene	108907	4.08E-06	1.56E-07	4.08E-06	2.10E-06	N/A	7.0000E-01	N/A	No	No	No



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Chloroethane	75003	3.74E-04	1.43E-05	3.74E-04	1.92E-04	N/A	1.0000E+02	N/A	No	No	No
Chloroform	67663	4.33E-06	1.66E-07	4.33E-06	2.23E-06	4.3478E-03	3.5000E-01	N/A	No	No	No
Chloromethane	74873	6.41E-05	2.45E-06	6.41E-05	3.29E-05	N/A	N/A	N/A	No	No	No
Chromium	18540299	3.34E-07	1.28E-08	3.34E-07	1.72E-07	8.3333E-06	2.0000E-05	N/A	No	No	No
Chrysene	218019	4.30E-10	1.65E-11	4.30E-10	2.21E-10	N/A	N/A	N/A	No	No	No
cis-1,3-Dichloropropene	542756	4.02E-06	1.54E-07	4.02E-06	2.07E-06	N/A	2.0000E-01	N/A	No	No	No
Cobalt	7440484	2.01E-08	7.68E-10	2.01E-08	1.03E-08	N/A	N/A	N/A	No	No	No
Dibenzo(a,h)anthracene	53703	2.87E-10	1.10E-11	2.87E-10	1.47E-10	5.8824E-05	N/A	N/A	No	No	No
Dichlorobenzene	541731	3.11E-07	1.19E-08	3.11E-07	1.60E-07	N/A	N/A	N/A	No	No	No
Dichlorodifluoromethane	75718	1.05E-03	4.03E-05	1.05E-03	5.41E-04	N/A	N/A	N/A	No	No	No
Dichloromethane	75092	1.82E-03	6.96E-05	1.82E-03	9.34E-04	2.1277E-01	3.0000E+01	3.5000E+01	No	No	No
Dimethyl Sulfide	75183	1.22E-03	4.69E-05	1.22E-03	6.29E-04	N/A	N/A	N/A	No	No	No
Ethylbenzene	100414	8.60E-03	3.29E-04	8.60E-03	4.42E-03	N/A	1.0000E+01	N/A	No	No	No
Ethylene Dibromide	106934	6.81E-06	2.61E-07	6.81E-06	3.50E-06	4.5455E-04	4.6000E-02	N/A	No	No	No
Fluoranthene	206440	7.17E-10	2.74E-11	7.17E-10	3.68E-10	N/A	N/A	N/A	No	No	No
Fluorene	86737	6.69E-10	2.56E-11	6.69E-10	3.44E-10	N/A	N/A	N/A	No	No	No
Formaldehyde	50000	1.79E-05	6.86E-07	1.79E-05	9.21E-06	7.6923E-03	3.6000E-02	3.7000E+00	No	No	No
Hexachlorobutadiene	87683	1.89E-05	7.24E-07	1.89E-05	9.72E-06	4.5455E-03	N/A	N/A	No	No	No
Hexane	110543	6.57E-03	2.52E-04	6.57E-03	3.38E-03	N/A	2.0000E+00	N/A	No	No	No
Hydrogen Chloride	7647010	8.48E-01	3.25E-02	8.48E-01	4.36E-01	N/A	2.0000E-01	3.0000E+01	No	No	No
Hydrogen Fluoride	7664393	6.29E-02	2.41E-03	6.29E-02	3.24E-02	N/A	5.9000E-02	5.8000E+00	No	No	No
Hydrogen Sulfide	7783064	5.44E-04	2.08E-05	5.44E-04	2.80E-04	N/A	N/A	N/A	No	No	No
Indeno(1,2,3-cd)pyrene	193395	4.30E-10	1.65E-11	4.30E-10	2.21E-10	5.8824E-05	N/A	N/A	No	No	No
Lead	7439921	1.19E-07	4.57E-09	1.19E-07	6.14E-08	N/A	1.5000E-02	N/A	No	No	No
Manganese	7439965	9.08E-08	3.48E-09	9.08E-08	4.67E-08	N/A	5.0000E-04	N/A	No	No	No
Mercury	7439976	6.96E-06	2.67E-07	6.96E-06	3.58E-06	N/A	3.0000E-03	3.0000E-01	No	No	No
Methyl Isobutyl Ketone	108101	8.96E-04	3.43E-05	8.96E-04	4.61E-04	N/A	N/A	N/A	No	No	No
Methyl Mercaptan	74931	2.56E-04	9.80E-06	2.56E-04	1.32E-04	N/A	N/A	N/A	No	No	No
Methyl Tert Butyl Ether	1634044	1.46E-04	5.59E-06	1.46E-04	7.50E-05	N/A	3.0000E+01	N/A	No	No	No
Naphthalene	91203	1.46E-07	5.58E-09	1.46E-07	7.49E-08	N/A	1.4000E-01	N/A	No	No	No
Nickel	7440020	5.02E-07	1.92E-08	5.02E-07	2.58E-07	3.8462E-04	2.4000E-03	1.0000E-02	No	No	No
Phenanthrene	85018	4.06E-09	1.55E-10	4.06E-09	2.09E-09	N/A	N/A	N/A	No	No	No
Pyrene	129000	1.19E-09	4.57E-11	1.19E-09	6.14E-10	N/A	N/A	N/A	No	No	No
Selenium	7782492	5.73E-09	2.19E-10	5.73E-09	2.95E-09	N/A	5.0000E-03	2.0000E-02	No	No	No
Styrene	100425	7.93E-04	3.04E-05	7.93E-04	4.08E-04	N/A	1.0000E+01	N/A	No	No	No
t-1,2-Dichloroethene	156605	1.32E-04	5.07E-06	1.32E-04	6.81E-05	N/A	N/A	N/A	No	No	No
t-1,3-Dichloropropene	542756	4.02E-06	1.54E-07	4.02E-06	2.07E-06	N/A	2.0000E-01	N/A	No	No	No
Tetrachloroethene	127184	1.52E-03	5.83E-05	1.52E-03	7.83E-04	1.6949E-02	3.5000E-01	6.8000E+01	No	No	No
Toluene	108883	2.78E-02	1.07E-03	2.78E-02	1.43E-02	N/A	4.0000E+00	N/A	No	No	No
Trichloroethene	79016	7.62E-04	2.92E-05	7.62E-04	3.92E-04	5.0000E-02	6.4000E+00	N/A	No	No	No
Vinyl Acetate	108054	4.16E-06	1.59E-07	4.16E-06	2.14E-06	N/A	2.0000E+00	N/A	No	No	No
Vinyl Chloride	75014	9.97E-04	3.82E-05	9.97E-04	5.13E-04	1.2821E-03	N/A	N/A	No	No	No
Xylenes	1330207	2.17E-02	8.30E-04	2.17E-02	1.11E-02	N/A	3.0000E+00	4.4000E+01	No	No	No

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### Appendix D-3. Thermal Oxidizer and Back-Up Flare Toxic Risk Assessment

#### Human Health Risk Assessment for the TOX + Flare Combined Operation

HAP Category / Pollutant Name	CAS #	Calculated Annual HAP Concentration (ug/m3)	Calculated 1 hr HAP Concentration (ug/m3)	ARM 17.8.770 De Minimis Levels			Exceed ARM 17.8.770 Table 1?	Exceed ARM 17.8.770 Table 2 Chronic?	Exceed ARM 17.8.770 Table 2 Acute?
				Table 1 Cancer Annual (ug/m3)	Table 2 Noncancer Chronic Annual (ug/m3)	Table 2 Noncancer Acute Annual (ug/m3)			
1,1,1-Trichloroethane	71556	5.03E-06	5.69E-05	N/A	3.2000E+00	1.9000E+03	No	No	No
1,1,2,2-Tetrachloroethane	79345	6.13E-07	6.93E-06	1.7241E-03	N/A	N/A	No	No	No
1,1,2-Trichloroethane	79005	4.87E-07	5.50E-06	6.2500E-03	N/A	N/A	No	No	No
1,1-Dichloroethane	75343	2.26E-05	2.56E-04	N/A	N/A	N/A	No	No	No
1,1-Dichloroethene	75354	3.54E-07	4.00E-06	2.0000E-03	3.2000E-01	N/A	No	No	No
1,2,4-Trichlorobenzene	120821	1.85E-06	2.10E-05	N/A	N/A	N/A	No	No	No
1,2-Dichloroethane	107062	5.78E-05	6.53E-04	3.8462E-03	9.5000E-01	N/A	No	No	No
1,2-Dichloropropane	78875	7.01E-06	7.92E-05	N/A	4.0000E-02	N/A	No	No	No
1,3-Butadiene	106990	6.45E-06	7.29E-05	3.5714E-04	N/A	N/A	No	No	No
1,4-Dichlorobenzene	106467	4.29E-05	4.85E-04	9.0909E-03	8.0000E+00	N/A	No	No	No
2-Butanone	78933	4.13E-04	4.67E-03	N/A	1.0000E+01	N/A	No	No	No
2-Methylnaphthalene	91576	5.39E-08	5.39E-07	N/A	N/A	N/A	No	No	No
3-Methylcholanthrene	56495	4.04E-09	4.04E-08	N/A	N/A	N/A	No	No	No
7,12-Dimethylbenz(a)anthracene	57976	3.59E-08	3.60E-07	N/A	N/A	N/A	No	No	No
Acenaphthene	83329	4.04E-09	4.04E-08	N/A	N/A	N/A	No	No	No
Acenaphthylene	208968	4.04E-09	4.04E-08	N/A	N/A	N/A	No	No	No
Acetone	67641	5.65E-04	6.39E-03	N/A	N/A	N/A	No	No	No
Acrylonitrile	107131	2.71E-05	3.07E-04	1.4706E-03	2.0000E-02	N/A	No	No	No
Anthracene	120127	5.39E-09	5.39E-08	N/A	N/A	N/A	No	No	No
Arsenic	7440382	5.39E-07	5.39E-06	2.3256E-05	5.0000E-03	N/A	No	No	No
Benz(a)anthracene	56553	4.04E-09	4.04E-08	5.8824E-05	N/A	N/A	No	No	No
Benzene	71432	1.94E-04	2.18E-03	1.2048E-02	7.1000E-01	N/A	No	No	No
Benzo(a)pyrene	50328	2.69E-09	2.70E-08	5.8824E-05	N/A	N/A	No	No	No
Benzo(b)fluoranthene	205992	4.04E-09	4.04E-08	5.8824E-05	N/A	N/A	No	No	No
Benzo(g,h,i)perylene	191242	2.69E-09	2.70E-08	N/A	N/A	N/A	No	No	No
Benzo(k)fluoranthene	207089	4.04E-09	4.04E-08	5.8824E-05	N/A	N/A	No	No	No
Benzyl Chloride	100447	1.14E-06	1.29E-05	N/A	1.2000E-01	5.0000E-01	No	No	No
Beryllium	7440417	2.69E-08	2.70E-07	4.1667E-05	4.8000E-05	N/A	No	No	No
Bromodichloromethane	75274	5.98E-07	6.76E-06	N/A	N/A	N/A	No	No	No
Bromoform	75252	1.84E-06	2.09E-05	9.0909E-02	N/A	N/A	No	No	No
Bromomethane	74839	3.98E-07	4.50E-06	N/A	5.0000E-02	N/A	No	No	No
Cadmium	7440439	3.14E-06	3.15E-05	5.5556E-05	3.5000E-02	N/A	No	No	No
Carbon Disulfide	75150	1.05E-05	1.18E-04	N/A	7.0000E+00	N/A	No	No	No
Carbon Tetrachloride	56235	5.61E-07	6.35E-06	6.6667E-03	2.4000E-02	1.9000E+00	No	No	No
Carbonyl Sulfide	463581	5.26E-06	5.95E-05	N/A	N/A	N/A	No	No	No
Chlorobenzene	108907	4.11E-07	4.64E-06	N/A	7.0000E-01	N/A	No	No	No
Chloroethane	75003	3.77E-05	4.26E-04	N/A	1.0000E+02	N/A	No	No	No
Chloroform	67663	4.36E-07	4.93E-06	4.3478E-03	3.5000E-01	N/A	No	No	No
Chloromethane	74873	6.45E-06	7.29E-05	N/A	N/A	N/A	No	No	No

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Chromium	18540299	3.14E-06	3.15E-05	8.3333E-06	2.0000E-05	N/A	No	No	No
Chrysene	218019	4.04E-09	4.04E-08	N/A	N/A	N/A	No	No	No
cis-1,3-Dichloropropene	542756	4.05E-07	4.58E-06	N/A	2.0000E-01	N/A	No	No	No
Cobalt	7440484	1.88E-07	1.89E-06	N/A	N/A	N/A	No	No	No
Dibenzo(a,h)anthracene	53703	2.69E-09	2.70E-08	5.8824E-05	N/A	N/A	No	No	No
Dichlorobenzene	541731	2.92E-06	2.92E-05	N/A	N/A	N/A	No	No	No
Dichlorodifluoromethane	75718	1.06E-04	1.20E-03	N/A	N/A	N/A	No	No	No
Dichloromethane	75092	1.83E-04	2.07E-03	2.1277E-01	3.0000E+01	3.5000E+01	No	No	No
Dimethyl Sulfide	75183	1.23E-04	1.39E-03	N/A	N/A	N/A	No	No	No
Ethylbenzene	100414	8.65E-04	9.78E-03	N/A	1.0000E+01	N/A	No	No	No
Ethylene Dibromide	106934	6.86E-07	7.75E-06	4.5455E-04	4.6000E-02	N/A	No	No	No
Fluoranthene	206440	6.73E-09	6.74E-08	N/A	N/A	N/A	No	No	No
Fluorene	86737	6.28E-09	6.29E-08	N/A	N/A	N/A	No	No	No
Formaldehyde	50000	1.68E-04	1.69E-03	7.6923E-03	3.6000E-02	3.7000E+00	No	No	No
Hexachlorobutadiene	87683	1.90E-06	2.15E-05	4.5455E-03	N/A	N/A	No	No	No
Hexane	110543	4.66E-03	4.74E-02	N/A	2.0000E+00	N/A	No	No	No
Hydrogen Chloride	7647010	1.38E-01	1.49E+00	N/A	2.0000E-01	3.0000E+01	No	No	No
Hydrogen Fluoride	7664393	1.03E-02	1.11E-01	N/A	5.9000E-02	5.8000E+00	No	No	No
Hydrogen Sulfide	7783064	5.48E-05	6.19E-04	N/A	N/A	N/A	No	No	No
Indeno(1,2,3-cd)pyrene	193395	4.04E-09	4.04E-08	5.8824E-05	N/A	N/A	No	No	No
Lead	7439921	1.12E-06	1.12E-05	N/A	1.5000E-02	N/A	No	No	No
Manganese	7439965	8.53E-07	8.54E-06	N/A	5.0000E-04	N/A	No	No	No

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Mercury	7439976	1.71E-06	1.80E-05	N/A	3.0000E-03	3.0000E-01	No	No	No
Methyl Isobutyl Ketone	108101	9.02E-05	1.02E-03	N/A	N/A	N/A	No	No	No
Methyl Mercaptan	74931	2.58E-05	2.91E-04	N/A	N/A	N/A	No	No	No
Methyl Tert Butyl Ether	1634044	1.47E-05	1.66E-04	N/A	3.0000E+01	N/A	No	No	No
Naphthalene	91203	1.37E-06	1.37E-05	N/A	1.4000E-01	N/A	No	No	No
Nickel	7440020	4.71E-06	4.72E-05	3.8462E-04	2.4000E-03	1.0000E-02	No	No	No
Phenanthrene	85018	3.81E-08	3.82E-07	N/A	N/A	N/A	No	No	No
Pyrene	129000	1.12E-08	1.12E-07	N/A	N/A	N/A	No	No	No
Selenium	7782492	5.39E-08	5.39E-07	N/A	5.0000E-03	2.0000E-02	No	No	No
Styrene	100425	7.98E-05	9.02E-04	N/A	1.0000E+01	N/A	No	No	No
t-1,2-Dichloroethene	156605	1.33E-05	1.51E-04	N/A	N/A	N/A	No	No	No
t-1,3-Dichloropropene	542756	4.05E-07	4.58E-06	N/A	2.0000E-01	N/A	No	No	No
Tetrachloroethene	127184	1.53E-04	1.73E-03	1.6949E-02	3.5000E-01	6.8000E+01	No	No	No
Toluene	108883	2.81E-03	3.18E-02	N/A	4.0000E+00	N/A	No	No	No
Trichloroethene	79016	7.67E-05	8.67E-04	5.0000E-02	6.4000E+00	N/A	No	No	No
Vinyl Acetate	108054	4.19E-07	4.74E-06	N/A	2.0000E+00	N/A	No	No	No
Vinyl Chloride	75014	1.00E-04	1.13E-03	1.2821E-03	N/A	N/A	No	No	No
Xylenes	1330207	2.18E-03	2.47E-02	N/A	3.0000E+00	4.4000E+01	No	No	No

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IX. Taking or Damaging Implication Analysis

As required by 2-10-105, MCA, DEQ conducted a private property taking and damaging assessment which is located in the attached environmental assessment.

YES	NO	
X		1. Does the action pertain to land or water management or environmental regulation affecting private real property or water rights?
	X	2. Does the action result in either a permanent or indefinite physical occupation of private property?
	X	3. Does the action deny a fundamental attribute of ownership? (ex.: right to exclude others, disposal of property)
	X	4. Does the action deprive the owner of all economically viable uses of the property?
	X	5. Does the action require a property owner to dedicate a portion of property or to grant an easement? [If no, go to (6)].
		5a. Is there a reasonable, specific connection between the government requirement and legitimate state interests?
		5b. Is the government requirement roughly proportional to the impact of the proposed use of the property?
	X	6. Does the action have a severe impact on the value of the property? (consider economic impact, investment-backed expectations, character of government action)
	X	7. Does the action damage the property by causing some physical disturbance with respect to the property in excess of that sustained by the public generally?
	X	7a. Is the impact of government action direct, peculiar, and significant?
	X	7b. Has government action resulted in the property becoming practically inaccessible, waterlogged or flooded?
	X	7c. Has government action lowered property values by more than 30% and necessitated the physical taking of adjacent property or property across a public way from the property in question?
	X	Takings or damaging implications? (Taking or damaging implications exist if YES is checked in response to question 1 and also to any one or more of the following questions: 2, 3, 4, 6, 7a, 7b, 7c; or if NO is checked in response to questions 5a or 5b; the shaded areas)

X. Environmental Assessment

This permitting action will not result in an increase of emissions from the facility and is considered an administrative action; therefore, an Environmental Assessment is not required.

Analysis Prepared by: John P. Proulx, Air Quality Engineer  
Date: 01/03/2024